APPENDIX A

ONSITE AND OFFSITE BATCH PLANT EVALUATION

MEMORANDUM FOR RECORD:

SUBJECT: On-site versus Off-Site Concrete Batch Plant Analysis and Quarry Locations
Center Hill Dam Seepage Repair Project, DeKalb County, Tennessee

1. PURPOSE AND NEED

The original design and specifications called for an on-site batch plant. The contractor has requested permission to out-source the batch plant off-site.

2. INTRODUCTION

The 2006 Environmental Assessment (EA), completed as part of the Major Rehabilitation Evaluation Report (MRER), decision document, addressed construction activities necessary for seepage repairs at the main and saddle dams at the Center Hill Dam and Lake Project. The EA is titled: Proposed Center Hill Dam Seepage Rehabilitation, Environmental Assessment, Supplement 1; DeKalb County, Tennessee, April 2006.

a. The selected repair alternative is to grout and install a barrier wall into the main dam embankment, and grout and install a barrier wall into the saddle dam embankment.
b. The EA anticipated that "A grout production plant would be located in an existing parking and staging area located adjacent to the saddle dam." This site was the closest location to the saddle dam. It was anticipated that a plant would provide grout/concrete for injection into the saddle dam and access road; and concrete for barrier wall construction into the saddle dam. Continuous use of this one site assumed that all the work would be accomplished sequentially, and not concurrently.

3. BARRIER WALL CONSTRUCTION TIME LINE AND BATCH PLANT OPERATIONS

The main dam barrier wall construction contract has been awarded excluding the proposed grouting and barrier wall construction at the Saddle Dam.

a. The main dam grouting and barrier wall construction is a separate contract; the repair work would require a separate, dedicated, batch plant. The original design and specifications called for an on-site batch plant. The COR has requested permission to out-source the batch-plant off-site
b. Main dam grouting and barrier wall construction plans and specifications are being implemented now.
c. The main dam barrier wall is scheduled to take 2.5 years to complete. It is anticipated that work on the saddle dam would begin independently and within the next 1 year.
d. To meet construction schedule, a batch plant is expected to operate 6 days a week, 24 hours a day (2 12-hour shifts).
e. If production falls behind, a 7th day would be added to the schedule.
f. Approximately two acres are needed to set-up the batch plant and store materials to maintain 24-hour production.

4. SADDLE DAM – NEW REPAIR ALTERNATIVES

New repair alternatives, in addition to the selected alternative, are being considered to repair the saddle dam. These new alternatives will be addressed in an EA in 2012.

a. New saddle dam repair alternatives would require a specifically designed concrete plant operation located as close as possible to the saddle dam and dedicated to saddle dam repairs to meet concrete time requirements and continuous production volume.
b. It is anticipated that a contract to repair the saddle dam would overlap with the current main dam repair contract. Under this scenario; two batch plants would be needed. One batch plant would supply a specific concrete blend for the main dam barrier wall; and one batch plant would supply a different customized concrete blend for the saddle dam repairs.

5. BARRIER WALL CONSTRUCTION – CONCRETE INGREDIENTS AND ESTIMATED TRUCKS NUMBERS

A batch plant must prepare a concrete mixture specific to engineering requirements under the main dam barrier wall contract. Ingredients are listed in Table 1.

a. The concrete mixture is unique and is not similar to standard ingredients and portions used at commercial batch plants for public construction use.
b. Fly ash is a unique ingredient used to accelerate concrete drying. Drying time is critical for this project.
c. About 9,275 trucks would be needed to deliver concrete materials (**Error! Reference source not found.**).
d. After the concrete materials are mixed, it would take approximately 9,375 concrete trucks to deliver the mixed concrete.

Table 1. Concrete Materials and Estimated Number of Trucks.

Material	Estimated Quantity (Tons)	Estimated Number of trucks
A Mix of Portland cement and fly ash	23,625	1,575
Course aggregate (rock)	63,000	4,200
Fine aggregate (sand)	52,500	3,500
Estimated Totals	139,125	9,275

6. BARRIER WALL CONSTRUCTION – CONCRETE TIME REQUIREMENT

Concrete delivery must meet a maximum forty-five (45) minutes engineering time requirement* (see specification below) from mixing to complete concrete discharge. Estimated time from concrete preparation to full discharge (a. – c.) are provided below (Chad Braun, Corps Construction Engineer, verbal communication).

a. The process of mixing concrete materials and pouring the mixture into a concrete truck, takes approximately 10 minutes. At this point, the truck can leave the batch plant.
b. At the dam, each concrete batch will be tested for mix quality. Testing takes about 10 minutes.
c. After passing the test, the truck is positioned and the concrete discharged. This action takes approximately 10 minutes.
d. In summary, mixing, testing, and discharge time would take approximately 30 minutes.
e. Times do not consider delivery time or delivery time lost for inclement weather or traffic problems.

* *DIVISION 03 – CONCRETE – SECTION 03 37 29*
CONCRETE FOR CONCRETE ENCASEMENT AND BARRIER WALLS – 3.3.1 Time Interval Between Mixing and Placing
Concrete shall be placed within thirty (30) minutes after mixing or agitating ceases. When a truck mixer or agitator is used for transporting concrete mixed by a concrete plant mixer, the concrete shall be delivered to the site of the work, and discharge shall be completed within forty-five (45) minutes after introduction of the cement to the aggregates.

7. BARRIER WALL CONSTRUCTION – ALTERNATIVE ON-SITE BATCH PLANTS

An on-site batch plant can meet the minimum forty-five (45) minutes engineering time requirements noted in Section 4. Delivery time would be minimal. Alternative on-site batch plant locations were identified (Figure 4). Each site was considered and observations noted in Table 2.

Figure 1. Center Hill Lake Project and Alternative On-Site Batch Plant Locations.

Table 2. Center Hill Dam and Lake - Alternative On-site Batch Plant Locations Current Project Use Considerations.

No.	Name and City	General Description and Considerations
1.	Left Rim Side – old disposal site location	This site has been used for soil and rock disposal since 1949. This site is accessed by a non-public gravel road. This site has been identified as a disposal site for main dam barrier wall contract.
2.	Left Rim Side – grout/concrete solids processing site	This site has been used for soil and rock disposal and as a contractor staging area. This site is accessed by a non-public gravel road. This site has been identified as a waste grout and concrete processing site for the main dam barrier wall contract.
3.	Left Rim Side – Former Contractor laydown area	This site has been used as a contractor staging area. The site is accessed by a public road also used by the Long Branch Campground, fishermen, boaters (to access the boat ramp to the tail water), and Corps construction and power house personnel. This site has been identified for construction of a second storm water holding pond for the main dam barrier wall contract.
4.	Right Rim Side – Wolf Island walking trail and river access	This site is currently a paved asphalt parking lot for public access to the Wolf Island greenway, river fishing, and boat ramp access to the tail water. This site is accessed by a public road shared by the Corps Resource Management Office. This office stores boats and other equipment for emergency responses. This office requires a clear road.
5.	Right Rim Side – river overlook	This site is a widened section of Highway 96. This site contains public restrooms and an overlook of the dam and tail water. There is a blind curve approaching this site. Parked trucks delivering materials could result in traffic accidents. This site is narrow. Placement of barricades to prevent public access would reduce the amount of useable space. This location is unsafe.
6.	Right Rim Side – Saddle Dam staging area.	This site has been used as a contractor staging and parking area. This site is accessed by a non-public gravel road. New saddle dam repair alternatives would require a site specific batch plant and specific concrete mix at this location, different than barrier wall construction.

8. ON-SITE BATCH PLANT SUMMARY

Six potential on-site batch plant locations were considered. Each on-site batch plant location would have issues due to several reasons. Three sites (1, 2, and 3) are currently committed for other uses under the barrier wall construction. Two sites (4, 5) are not practical due to public safety and emergency response conflicts. One site (6) may be used for saddle dam repairs which may select a different repair alternative that requires a unique type of batch plant. Additional on-site concerns include limited space and issues related to local delivery of materials to produce concrete on site. Traffic and related noise and safety considerations would be more adverse with an on-site batch plant that could endanger campers, fishermen, and boaters visiting the project site.

9. ALTERNATIVE OFF-SITE BATCH PLANTS

Center Hill Dam, potential batch plants, potential quarries, and critical 15-mile radius is shown in Figure 2. A 15-mile radius was selected to screen the required travel time range to the dam. Three possible off-site batch plants are listed in Table 3.

a. An off-site batch plant would have to add travel time from the batch plant to the dam in addition to the approximate 30 minutes anticipated to mix, test, and discharge the concrete batch (See Section 4).
b. An off-site batch plant would be acceptable provided the batch plant can meet minimum forty-five (45) minutes engineering time requirement and concrete quality requirements.
c. Around 9,375 concrete trucks would be needed to deliver the concrete mixture to the dam. Table 3 lists potential off-site batch plants, travel distance and time, total concrete batch time, and total round-trip travel distance for 9,375 concrete trucks.

Table 3. Potential Batch Plants, Distance, Travel, and Delivery Time for each concrete batch (9,375 trucks).

No.	Name	City	One-Way Travel Distance (mi)	One-Way Travel Time (min)*	One-Way Concrete Batch Total Delivery Time (mi)**	Total Round Trip Travel Distance (mi)
1.	IMI-TN, INC	Buffalo Valley	4.3	5.7	35.7	80,625
2.	Cumberland Supply Co	Carthage	17.8	20.7	50.7	333,750
3.	IMI-Irving Materials	Smithville	16.4	22.1	52.1	307,500

* Travel *time assumes non-stop 45 mph on primary roads and 60 mph on the I-40 interstate.*

***Total delivery time for one batch of concrete (concrete mixing + one-way travel time + testing + set-up and discharge)*

10. OFF-SITE BATCH PLANT SUMMARY

Concrete trucks from an off-site plant would be required to meet the 45-minutes engineering time requirement. Three batch plants have the potential to meet this time, although additional approval will be needed. For each of these batch plants the local communities would experience increased noise and traffic over the estimated 2.5 year life of the barrier wall construction project.

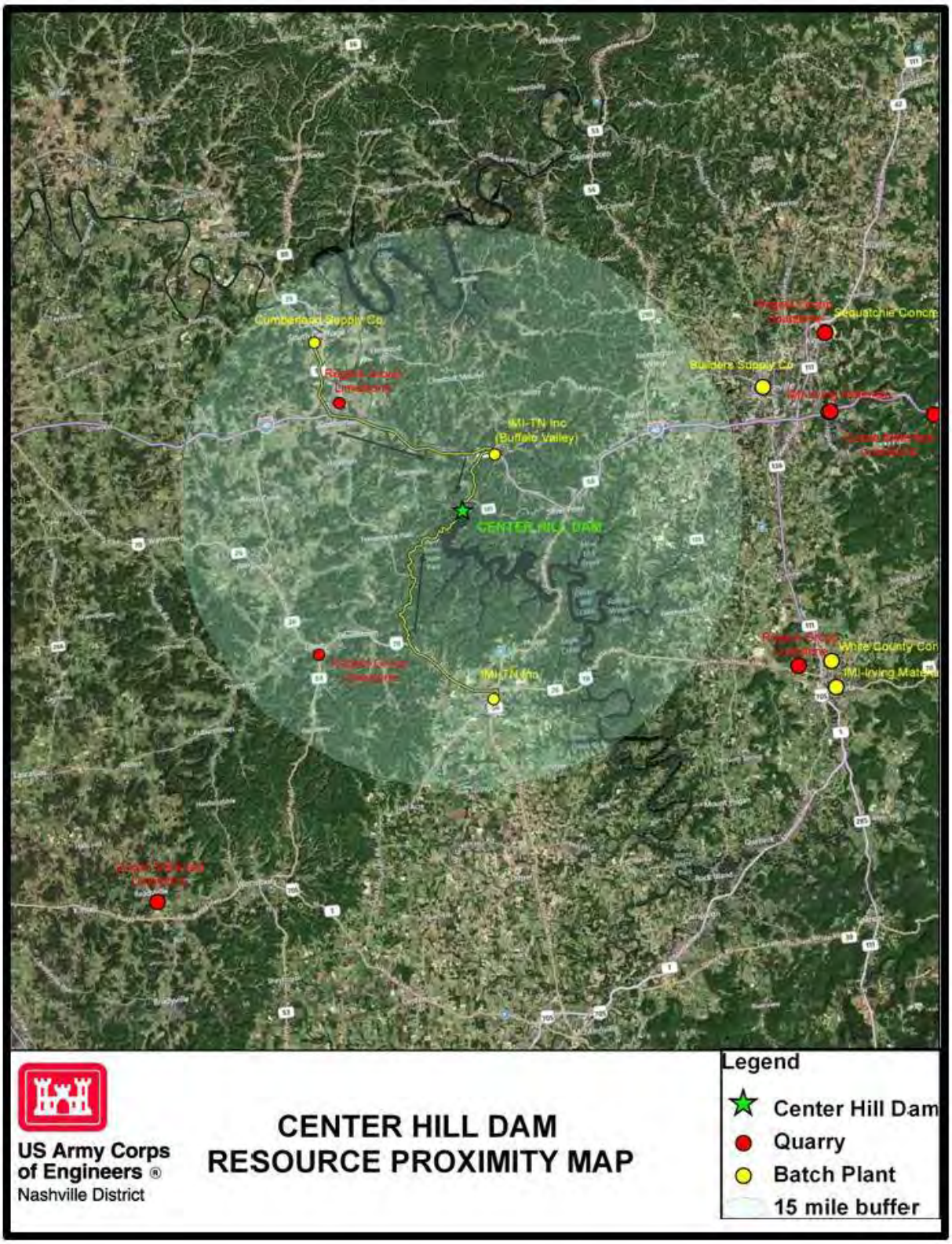

Figure 2. Quarry and Batch Plant Locations Near Center Hill Dam and Lake. Critical 15-mile radius marked.

11. POTENTIAL AGGREGATE QUARRYS.

There are approximately 7 quarries within a 30-mile radius to Center Hill Dam that could provide aggregate to the Barrier Wall Construction Project (Table 4). Quarry locations are shown in Figure 1.

Table 4. Potential Quarries and distance within a 30-mile radius from Center Hill Dam.

No.	Name	City	Miles		No.	Name	City	Miles
1.	Rogers Group	Gordonsville*	8.5		5.	Rogers Group	Algood*	21.5
2.	Rogers Group	Liberty	10.8		6.	IMI – Irving Materials	Cookeville*	21.2
3.	Rogers Group	Sparta	19.8		7.	Vulcan Materials	Readyville	26.4
4.	Vulcan Materials	Cookeville*	20.3					

** Located approximately within 5 miles of I-40*

a. All concrete materials (Table 1) would have to be trucked-in and stored at the batch plant to ensure uninterrupted concrete mixing and delivery.
b. Fine aggregate (sand) and Course aggregate (limestone rock) must be obtained from **an acceptable** quarry meeting Corps requirements*.

   * *DIVISION 03 – CONCRETE – SECTION 03 37 29*
   CONCRETE FOR CONCRETE ENCASEMENT AND BARRIER WALLS – 2.1.2.5 Aggregate Sources
   Aggregate sources shall be furnished from a source designated by the Contractor and accepted by the COR, subject to the conditions stated herein. The proposed aggregate source shall meet the quality criteria designated in paragraph QUALITY. The COR will evaluate the source based on that criteria. When investigating the source, the Contractor shall notify the COR in writing at least thirty (30) days prior to sampling the source. Government representatives shall be present when the samples are taken for testing. The quarry shall be sampled and mapped by a registered geologist approved by the COR. It is the Contractor's responsibility to determine that the aggregate source is capable of providing the quality, quantities, gradation required at the rate needed to maintain the scheduled progress of work. Samples for acceptance testing shall be provided in accordance with paragraph QUALITY requirements. If the source initial proposed by the Contractor for aggregate does not meet the quality requirements of paragraph QUALITY, the source shall not be used and another source shall be investigated at the expense of the Contractor.

c. Based on Corps requirements, not all quarries may meet quality requirements.
d. Quality requirements, not distance, will determine the quarry selection(s).

12. QUARRY SUMMARY

All concrete materials (Table 1) would be delivered from off-site suppliers to any on or off-site batch plant location. As long as the aggregates and cement are not mixed, the individual ingredients have no storage time limits. Materials would be delivered on a regular basis (24 hours/7 days) and stocked on site to ensure a continuous supply of mixed concrete. All course and fine aggregates would come from an approved quarry. Quarries are located in sparsely populated areas. Four of the potential quarries are located near I-40 (within 5 miles). Noise created by quarry delivery trucks continuously travelling to and on I-40 would not be noticeable and would likely blend with background noise already created by other trucks and traffic continuously travelling on I-40. Three of the quarries are located on primary roads. Noise created by rural quarry delivery trucks continuously travelling the primary roads may be limited as the primary roads are located in sparsely populated areas. Round trip travel distance would affect air quality. Impacts would be reduced if the closest quarries meeting quality requirements were used.

13. COMPLIANCE WITH OTHER LAWS

The use of the off-site batch plants and the quarry sites were considered under the National Historic Preservation Act (NHPA). The Cumberland Supply, Co plant in Carthage, TN; and the IMI-Irving Co. plant in Smithville, TN are established concrete batch plants. While IMI, TN Inc batch plant in Buffalo Valley is recent construction, it was constructed in a previously disturbed area and there are no historic structures eligible for the National Register of Historic Places in the batch plant's viewshed. The construction of the IMI, TN Inc batch plant was not constructed with the intent to avoid the requirements of section 106 of the NHPA, did not cause effects on historic properties, and would continue in use after completion of the Center Hill Dam barrier wall Seepage Rehabilitation Project. The seven possible quarry locations are existing quarries and a new quarry is not being developed. In sum, the use of the pre-existing commercially and publically available batch plants and quarries is an undertaking with no potential to cause effects on historic properties and there is no statutory authority of the NHPA under these circumstances.

14. RECOMMENDATIONS

Six potential on-site batch plants were considered and evaluated. Each potential on-site location has issues which make them likely impracticable choices. Some on-site locations would be used for other construction activities. Other on-site locations had more public safety and traffic concerns. Based on this review of on-site batch plant locations, a TDEC permitted off-site batch plant should be considered.

Three off-site batch plants located with a 15-mile radius were considered. All three have the potential to meet the 45-minutes engineering time requirement; however concrete batch testing will be required to confirm concrete quality prior to final batch plant selection(s). Approximately 9,375 trucks would deliver batch concrete to the dam. Total round-trip mileage was assessed since truck emissions can impact air quality and local transportation uses. An environmental consideration would be to use a batch plant, or a combination of batch plants that have the least total round-trip miles over the life of the project to produce the smallest impact to air quality and traffic.

Seven quarries are located with a 30-mile radius of the Center Hill Project. Concrete ingredients (Table 1) have no time limits as long as they are not mixed with cement. Materials can be stockpiled on site and continuously delivered around the clock to ensure continuous concrete production. Quarries will provide fine and course aggregates; however, only those quarries meeting mandated quality requirements will be used for this project. As with the selection of an off-site batch plant, approved quarries that have the least total round-trip miles over the life of the project would produce the smallest impact to air quality, noise, and traffic.

Quarry deliveries to an on or off-site batch plant would have similar impacts because the concrete materials must be delivered to any batch plant location. Noise and traffic caused by quarry and concrete materials delivery may be less noticeable at batch plants located near a major 4-lane highway such as the I-40 corridor. This major travel corridor is designed to minimize noise disturbance to adjacent populations and to pass large volumes of traffic 24-hours a day, every day. As a batch plant location becomes more rural, there could be concerns for more impacts from noise and traffic as travel shifts from a 4-lane highway to a 2-lane highway. Use of quarries and batch plants located closest to the Center Hill project would have the least impacts to noise, traffic, and air quality.

Quarry approval and concrete batches time limits would drive selection of any combination of quarry and batch plant selections. This review has addressed noise, traffic and air quality for any combination of quarries, on-site, and off-site batch plants and has concluded that the overall impacts of an on versus off-site batch plant are negligible and the consideration of off-site batch plants is a minor modification to the EA.

Joy Broach
Biologist
Project Planning Branch

APPENDIX B

SUMMARY OF CONSULTATION UNDER 106 OF THE NHPA

Summary of Consultation under Section 106 of the NHPA

Section 106 of the National Historic Preservation Act of 1966, as amended (NHPA), and its implementing regulations at 36 CFR 800 require consideration of cultural resources prior to a federal undertaking and requires consultation with the State Historic Preservation Officer (SHPO), Federally recognized tribes with a connection to the project location and other consulting parties defined at §800.3. The NHPA only affords protection to sites, buildings structures, or objects listed in or determined eligible for listing in the National Register of Historic Places (NRHP). Archival research for this project involved consulting the National Register of Historic Places, the Tennessee Historical Commission National Register and structure files, and the Tennessee Division of Archaeology site and survey files. Table C.1 summarizes the parties consulted, the mechanisms for consultation, and responses to the consultation. The Section106 consultation for the proposed action has lead to a "no historic properties affected" determination.

Table C.1 Summary of consultation under Section 106 of the NHPA

Consulting Agency	Corps Date	Response Date	Comments
TN SHPO	May 2, 2012	May 15, 2012	Concur-Corps provisional no adverse effect contingent upon inspection of surface after wood piles are removed. On August 15 2012, the laydown area was inspected following the clearing of the wood piles. No cultural resources were identified, and final coordination with the SHPO is expected to lead to a "no historic properties" affected determination.
Absentee-Shawnee Tribe of Indians	July 11, 2012	August 15, 2012*	
Cherokee Nation	July 11, 2012	August 15, 2012*	
Chickasaw Nation	July 11, 2012	August 15, 2012*	
Eastern Band of Cherokee Indians	July 11, 2012	August 15, 2012*	
Eastern Shawnee Tribe of Indians	July 11, 2012	August 15, 2012*	
Shawnee Tribe	July 11, 2012	August 15, 2012*	
United Keetoowah Band of Cherokee	July 11, 2012	August 15, 2012*	

*Response date reflects the end of the 30 day comment period. No Response implies concurrence with the Corps finding of "historic properties affected, no adverse effect" as per 36 CFR 800.5(c)(1).

APPENDIX C
PROPOSED MITIGATION PLAN

MITIGATION PLAN

SEEPAGE AND REHABILITATION PROJECT
CENTER HILL DAM AND LAKE
DEKALB COUNTY, TENNESSEE

Prepared by:
U.S. Army Corps of Engineers, Nashville District
Project Planning Branch
Environmental Section

21 October 2013

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1.0 INTRODUCTION

1.1 Project Background

The Center Hill Dam Seepage and Rehabilitation Project (Project) is located in the Caney Fork watershed. This watershed covers nearly 2,174 square miles and is identified by the U.S. Geological Survey (USGS) with an 8-digit hydrologic unit code (HUC05130108). Center Hill Dam is located at mile 26.6 on the Caney Fork River in DeKalb County, Tennessee (Figure 1). The Project was fully operational in 1951. The main and saddle dam embankments were built on karst geology using accepted engineering practices of the day. Since the 1960's, seepage flows through solution features within the limestone formations have been increasing at the main and saddle dam embankments, left rim, right rim and abutment.

1.2 Purpose for Federal Action

The purpose and need for federal action is to reduce the risk of dam failure and to consider revisions to project features from the previously approved 2006 Major Rehabilitation Evaluation Report (MRER) plan as described in the draft 2013 MRER Supplement. Provision for measures to address safety and improved monitoring for future seepage problems as part of on-going dam safety is also within the scope of this mitigation plan. Since 2006, new information resulted in changes to the previously approved2006 MRER plan. These changes are currently under NEPA review and are found in the Environmental Assessment, Supplement 3 (2013). The major change is consideration of the reinforced compacted concrete berm (RCC Berm) alternative at the saddle dam to address dam failure risk.

Simultaneous with the RCC Berm design, measures were added to address erosion and seepage monitoring. Measures include left rim stabilization, sinkhole repairs, dam safety clearing (to prevent roots within or near the structure), spring culvert and weir repairs, and upper and lower leak weir repairs. All the measures can be done independent of the seepage repairs. Measures are noted here because the first three measures would affect forest resources.

1.3 Need for a Mitigation Plan

On August 31, 2009, *Implementation Guidance (IG) for Section 2036 (a) of the Water Resources Development Act of 2007 – Mitigation for Fish and Wildlife and Wetland Losses* was released. The purpose of Section 2036 (a) was to insure that any report submitted to Congress for authorization shall not select a project alternative unless such report contains (1) a specific recommendation with a specific plan to mitigate fish and wildlife losses or (2) the Secretary determines that the project will have negligible adverse impacts. The need for this mitigation plan is to show that the project would have negligible adverse impacts to fish, wildlife, and wetland losses. This mitigation plan demonstrates that damages to all significant ecological resources, both terrestrial and aquatic, have been avoided and minimized to the extent practicable, and that any remaining unavoidable damages have been compensated for or mitigated to in-kind conditions. This mitigation plan shows that the recommended project would not have more than negligible adverse impacts on ecological resources.

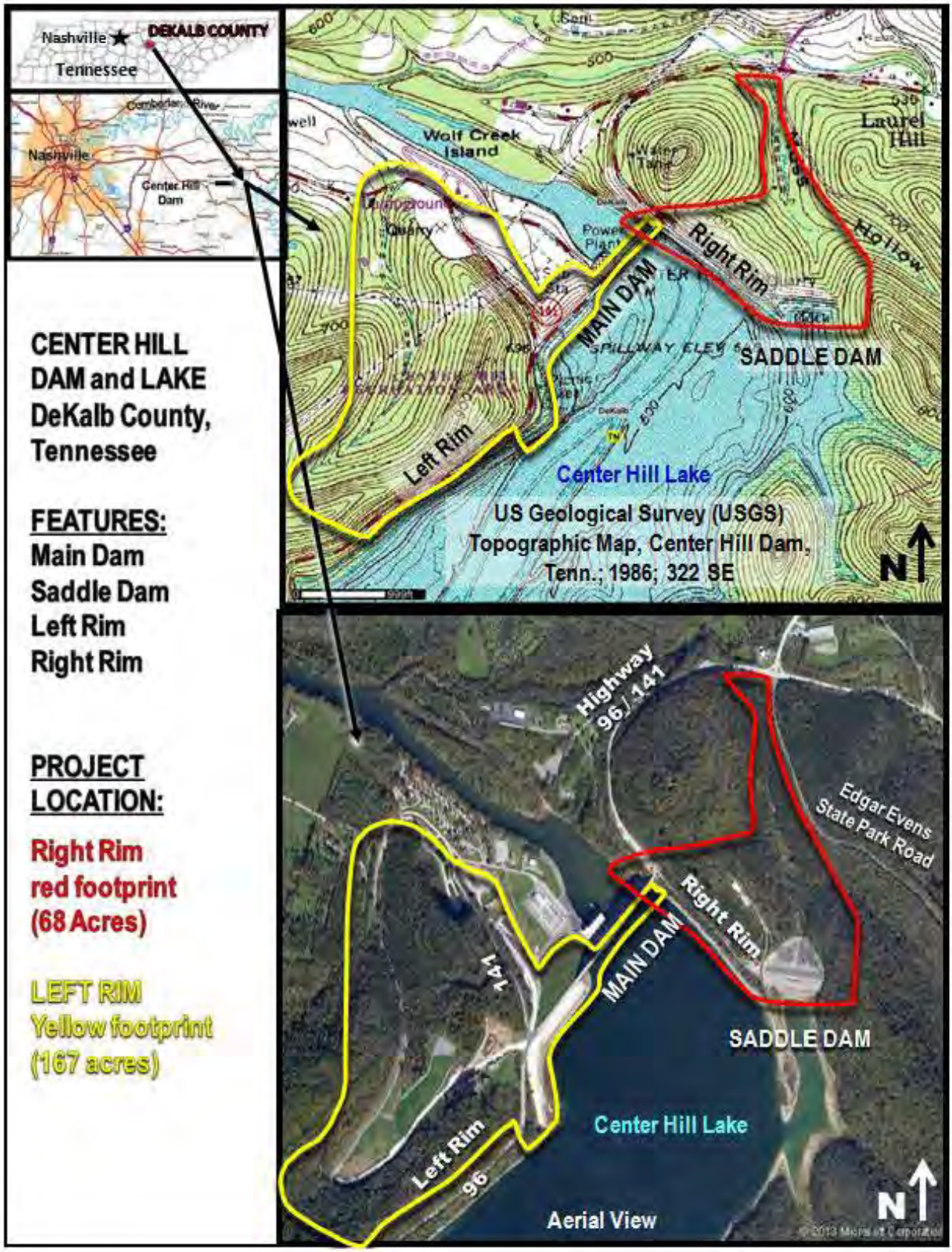

Figure 1. Center Hill Dam and Vicinity Map

1.4 Project Phasing

Given the long construction time, project impacts were anticipated to be phased and were addressed on completion of each project feature (Table 1). The total Project area is about 235 acres. However, as new seepage repair alternatives developed for the left and right rims, the project was divided into the Left Rim (167 acres) and Right Rim (68 acres) portions.

Table 1. Project Features; Approved and Revised MRER Plans, and Measures.

Project Feature	NO ACTION Previously Approved Plan 2006 MRER	PROPOSED ACTION Revised Plan Draft Revised 2013 MRER Supplement *	General Rationale	Environmental Assessment (EA) or Environmental Impact Statement (EIS)
Main Dam Embankment	Grout Curtain and Barrier Wall	Grout Curtain Constructed *Barrier Wall currently under construction*	No Revisions	2006 EA Supplement 1
Main Dam Embankment Left Groin	Grout Curtain	Grout Curtain Constructed	No Revisions	2008 EA Supplement 2
Left Rim	Complete Grout Curtain; Plug Left Rim Cave and Downstream Sinkholes	Partial Grout Curtain Constructed; No Cave and Sinkhole Plugging; Measure 1- Left Rim Stabilization 2- Sinkhole Repairs 3- Dam Safety Clearing 4- Spring Culvert and Weir Repairs	No Significant Life Loss or Credible Dam Failure Mode identified in RA; Seepage is a Water Loss Issue	2005 EA 2006 EA Supplement 1 2008 EA Supplement 2 2013 EA Supplement 3
Right Rim and Abutment	Install Grout Curtain Plug Upper and Lower Leaks	No Grout Curtain No Plugging of Upper and Lower Leaks; Measure: 5- Upper and Lower Leak Weir Repairs	No Significant Credible Dam Failure Mode identified in RA; Seepage is a Water Loss Issue	2005 EA 2006 EA Supplement 1 2013 EA Supplement 3
Saddle Dam Embankment	Grout Curtains, Barrier Wall, and Coffer Dam	Roller Compacted Concrete Berm (RCC Berm)	RCC Berm more reliable and most effective long-term solution; Addresses all dam failure modes; cost effective	2005 EA 2006 EA Supplement 1 2013 EA Supplement 3

* Revisions and Measures Noted in Blue Font

1.5 Existing Condition

The Center Hill Project (Project) is located in rolling to steep hilly karst terrain with numerous sinkholes, springs, and seeps. The project is covered with a mixed mesophytic deciduous forest dominated by oak-hickory interspersed with Eastern red cedar (*Juniperus virginiana*) stands. Tree species common to the area include oaks (*Quercus* spp.), hickories (*Carya* spp.), yellow poplar (*Liriodendron tulipifera*), black walnut (*Juglans nigra*), white ash (*Fraxinus americana*), hackberry (*Celtis occidentalis*), elms (*Ulmus* spp.), American beech (*Fagus grandifolia*), and blackgum (*Nyssa sylvatica*). Common understory species associated with this forest type include flowering dogwood (*Cornus florida*), black cherry (*Prunus serotina*), redbud (*Cercis canadensis*), and persimmon (*Diospyros virginiana*).

Moss Hollow Branch is an intermittent/perennial stream, and the left rim unnamed stream is an intermittent stream that flow predominantly in response to storm events The upper portion of Moss Hollow Branch and the unnamed left rim stream are normally dry during the summer and fall. The lower half of Moss Hollow Branch is perennial and is sustained by seeps and springs, but has dried during drought years. Stream substrates are dominated by bedrock interspersed with small pockets of clay, sand, gravel, cobble, and boulders.

Small pockets of wetlands develop around seeps. One 0.21 acre wetland is located adjacent to the streambed of Moss Hollow Branch. A 0.13 acre wetland, sustained by seasonal seeps, is located adjacent the access road to the bottom of the saddle dam. The left rim quarry supplied the stone to construct the concrete portion of the main dam. Permanent springs developed in the quarry and created a stream-wetland-pond complex within the quarry. The quarry contains a 0.47 acre wetland.

Table 2 provides a list of natural resources and permanent open space features (roads, grout lines, buildings, and dam footprints). Temporary open space was created by the existing fields and scrub brush and the disposal areas. Temporary open space would be allowed to revert to forest habitat via natural succession or planted with tree seedlings to replace forest habitat lost to construction of the RCC Berm alternative and left rim stabilization, sinkhole repairs, and dam safety clearing. In time, the project would look similar to pre-construction condition. Minor differences would include a permanent grassed area in the dam safety clearing zone, closed (filled then grassed) treatment ponds, and the RCC Berm. All other affected areas would eventually revert to forest. Affected resources are shown for the right and left rims in Figure 2and Figure 3.

1.6 Phased National Environmental Policy Act (NEPA) Coverage

The original Environmental Assessment (EA) limited construction activities to existing haul roads, grout lines, and disturbed disposal, parking, and staging areas for the entire project (232 acres). During design, new seepage repairs not previously considered under NEPA were developed. With each new seepage repair alternative, supplemental EAs (Supplement 1, 2, and 3) were written to cover the new alternative and added environmental impacts. The original EA and EA Supplement 1 covered the entire project. EA Supplement 2 covered new alternatives for the left rim, and EA Supplement 3 covered the new right rim RCC Berm alternative and left rim measures. For all actions, impacts were avoided, minimized, compensated, or replaced.

2.0 ASSESSMENT METHODS

2.1 Wetland and Stream Delineations

On the right rim, wetland and stream delineations were performed 2012 by Matthew Granstaff, Corps Biologist, certified as a state qualified hydrologic professional, as part of the Project's ecological survey. Stream delineation followed protocols outlined in state regulations Chapter 0400-40-17 Certification of Qualified Hydrologic Professionals. On the left rim, stream delineations were conducted in 2008 by Rob Howard, Manager, Tennessee Department of

Table 2. Existing Condition and Combined Left and Right Rim Maximum Future Impacts.

Feature	Permanent Open (Acres)	Temporary Open (Acres)	Wetlands (Acres)	Intermittent Stream (Linear Feet)	Forest (Acres)
Right Rim (68 acre footprint)					
Saddle Dam	7				
Staging Area – Top of Saddle Dam	1				
Haul Road to Top of Saddle Dam and Radio Tower	1				
Haul Road to Bottom of Saddle Dam	1				
Corps Storage Building and road	1				
Saddle Dam Disposal Area		7			
Open field/scrub brush		6			
Wetland Loss[+]			**(0.13)**		
Wetlands – Avoided			0.21		
Moss Hollow Branch – Permanent Crossing				**(50)**	
Moss Hollow Branch – Temporary Spanning/Covering[++]				**450**	
Moss Hollow Branch – Avoided				4,800	
Forest – Temporary Removal					**25**
Forest – Permanent Removal					**(5)**
Forest – Avoided					14
Right Rim Totals	**11**	**13**	**0.34**	**5,300**	**44♦**
Left Rim (167 acre footprint)					
Main Dam (Earthen &Concrete) & Work Platform	11				
Mowed and Graveled Areas	15				
Access road and Established Grout Line	6				
Logging Road	1				
Left Rim Access Road Disposal Area		2.0			
Left Rim Work Platform Disposal Area		5.0			
Wetlands (Quarry) – Avoided			0.47		
Unnamed Intermittent Stream – Avoided				4,500	
Forest – Past Permanent Removal					**(4)**
Forest – Temporary Past Temporary Removal					**30**
Forest – Temporary Removal (Left Rim Cut Stabilization)					**11**
Forest – Temporary Removal (Sinkhole Repairs)					**2**
Forest – Permanent Removal					**(2)**
Forest – Avoided					88
Left Rim Totals	**33**	**7**	**0.47**	**4,500**	**137**
Project Totals (235 acres)	**44**	**20**	**0.81**	**9,800**	**181**

[+] **Amount of Permanent Impact ()**
(Permanent forest acreage lost can be replaced in Temporary Open Areas at other locations on the Project.)

[++] **Amount of Temporary Impact ()**

♦ **Approximately 21 acres of forest is on Park Property; 23 acres of forest is on Corps Property.**

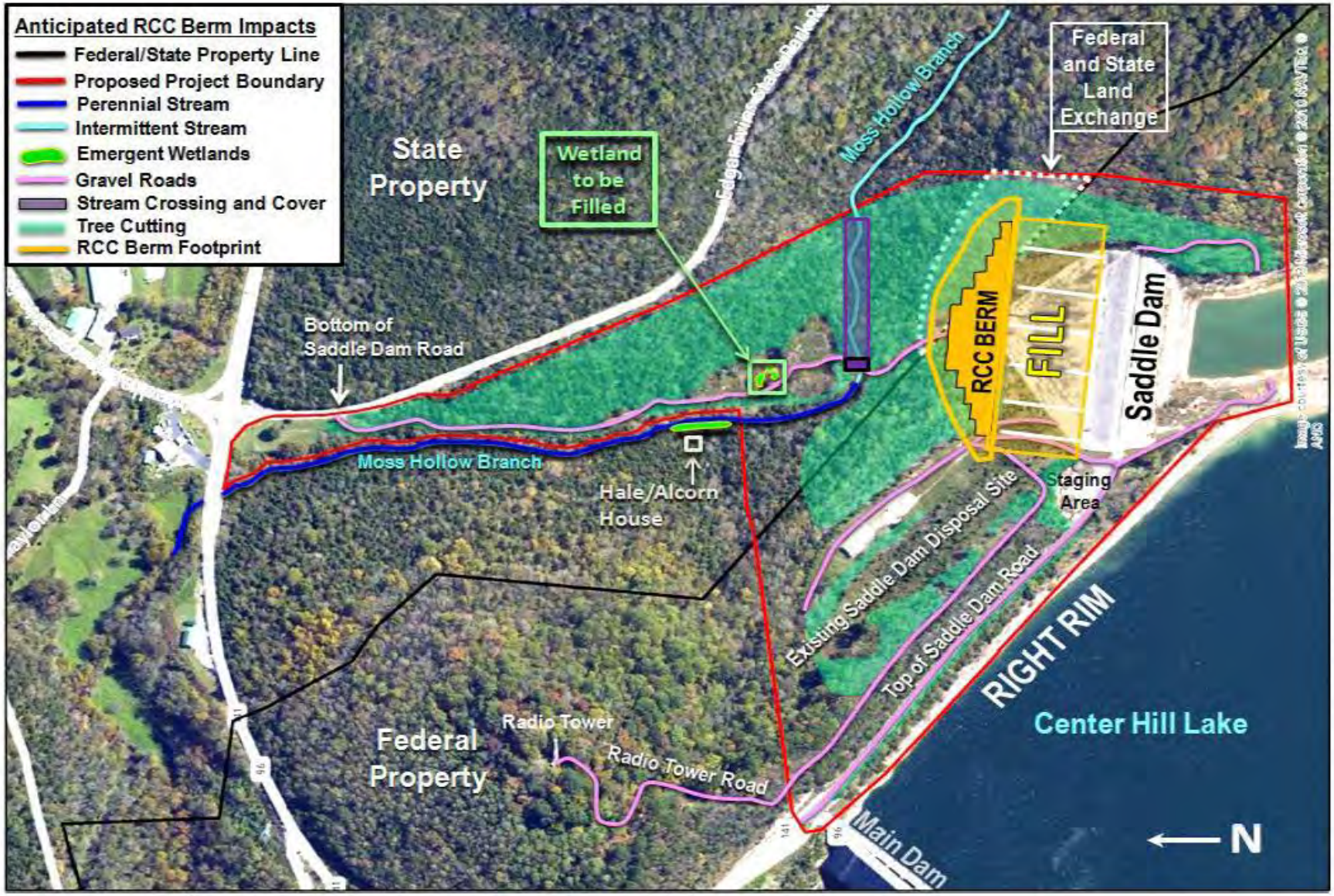

Figure 2. Right Rim Resources and Proposed Construction Features.

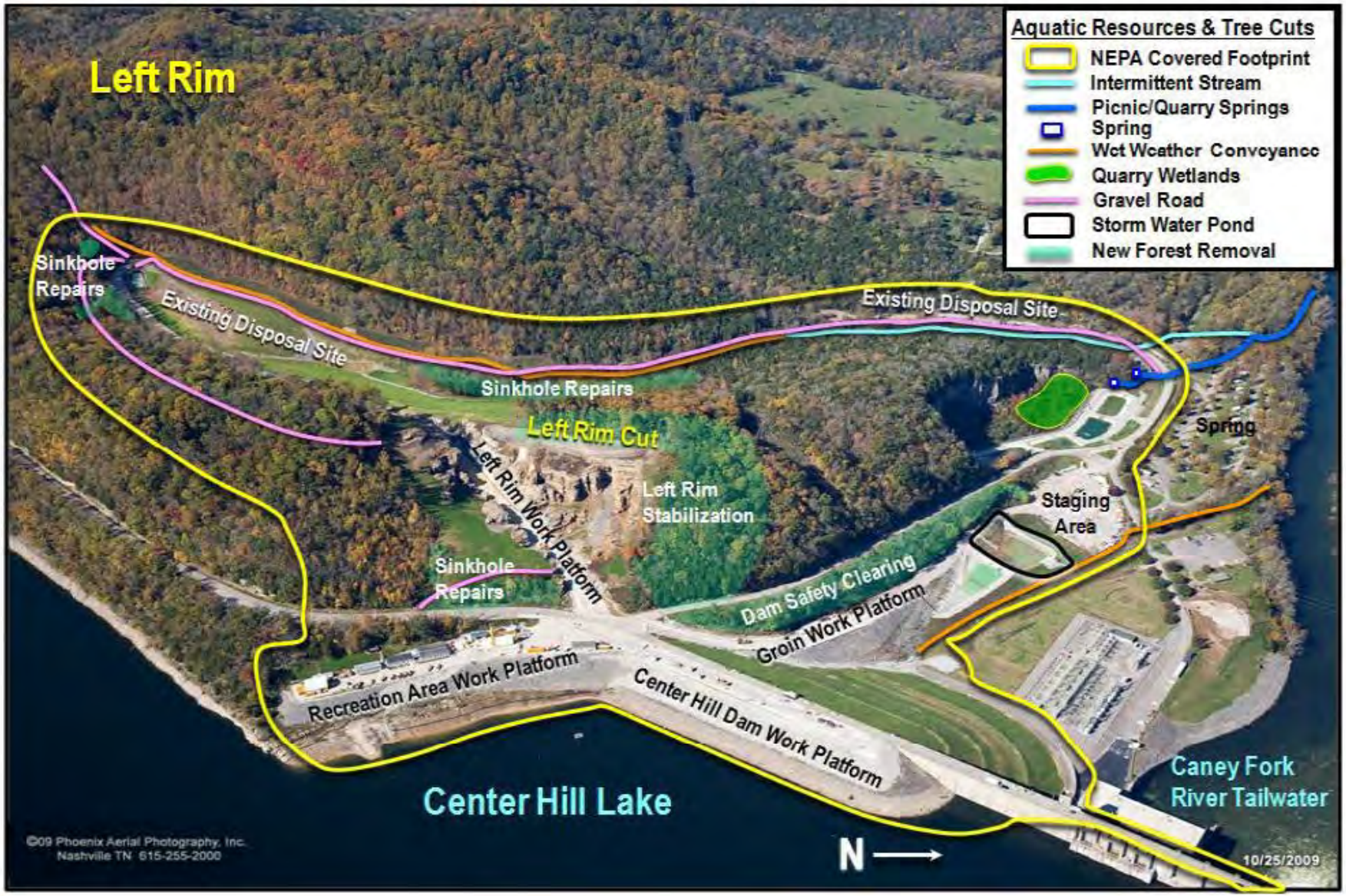

Figure 3. Left Rim Resources and Proposed Construction Features.

Environment and Conservation, Division of Water Resources (formerly Division of Water Pollution Control), Cookeville Field Office. The Quarry wetlands were delineated in 2008 by Scott Fanning and Kathleen Kuna, Biologists with the Corps Regulatory Office. All wetland delineations were conducted in accordance with the 1987 Corps of Engineers Delineation Manual (Environmental Laboratory 1987) and Regional Supplement to the Corps of Engineers Wetland Delinetation Manual: Eastern Mountains and Piedmont Region (Version 2.0). Wetland classification followed Cowardin et al. (1979). Right rim stream and wetland delineations, and left rim wetland delineations are found in Appendix A.

2.2 Forest Habitat Assessments

Forest habitat was assessed in 2012 by Matthew Granstaff, Corps Biologist using the U.S. Fish and Wildlife Service (USFWS) Habitat Evaluation Procedures (HEP). The HEP used the habitat suitability index (HSI) model for the gray squirrel (*Sciurus carolinensis*), which is a Corps approved model. Results of the upland forest habitat evaluation are found in Appendix B.

3.0 MITIGATION

3.1 Summary of Mitigation Objectives

The goal of mitigation is to provide compensatory mitigation for wetlands, and replacement of lost forest habitat for wildlife. The objectives of mitigation are to compensate for loss of a 0.13 acre of wetland on the right rim, and replacement for the loss of 6 acres of upland forest habitat on the left and right rims.

3.2 Summary of Aquatic and Forest Resources, Functions, and Impacts

The Project is not expected to result in any substantial adverse impacts to the overall quality, function, and value of surface waters (streams and wetlands) and forest. The Project is not expected to result in a lowering of the existing use for any of the affected resources.

Wetland: The unavoidable impact to a 0.13 acre wetland is located on the right rim on the Edgar Evins State Park (Park) property. The wetland is a palustrine emergent wetland that is sustained by seeps. The wetland periodically dries up. The wetland has been repeatedly disturbed. It had been excavated to create a farm pond when the property was farmed. The Park used the area to stockpile discarded treated lumber and placed lumber piles on top of the wetland. The timbers have been removed; however, the wetland remains in poor condition. The project would not have a noticeable effect on wetland functions such as flood attenuation, sediment retention, ground water recharge/retention, nutrient retention and reduction, or water quality filtration as it provides limited aquatic value due to periodic drying. The loss of habitat and wetland functions in the project area is considered minimal and would not be expected to have a substantial impact on water quality or the overall availability of wetland habitat within the Caney Fork River watershed. The wetland would be compensated at a minimum 2:1 ratio resulting in the purchase of wetland credits via an approved mitigation bank, in-lieu fee program, and/or permittee responsible mitigation. Compensation would ensure no net loss of wetlands. Compensatory mitigation for wetland impacts would be conducted in accordance with Corps and State requirements.

Stream: The Moss Hollow Branch watershed is located on the Right Rim. The access road to the bottom of the saddle dam is located adjacent Moss Hollow Branch and parallels its

perennial reach. Moss Hollow Branch above this point where it turns 90 degrees to the east is classified as an intermittent stream. Moss Hollow Branch is located entirely on Park property. The impacted stream segment is intermittent and has aquatic life of typical intermittent streams (does not support fish or freshwater mussels). About 1,200 linear feet of Moss Branch is located within the project footprint. Its floodplain forms the only near level area within the valley. This area is needed during construction as an equipment and aggregate storage area. To maximize storage space, 450 feet of the intermittent portion of Moss Hollow Branch would be temporarily spanned or covered with a bottomless culvert or equivalent to prevent disturbance of the natural stream substrate. This portion of Moss Hollow Branch, being intermittent, is dry some times of the year. Up to a 50-ft wide permanent stream bridge crossing (no stream substrate disturbance) would be constructed over Moss Hollow Branch to allow heavy equipment to travel on the new widened road to the saddle dam. Selective tree removal would occur as the access road is widened. Riparian habitat would be cleared in the aggregate storage and equipment laydown area where approximately 450 linear feet of the intermittent segment of Moss Hollow Branch would be covered to allow construction. Water quality certification and an ARAP permit (NRS12.227) for the road widening, stream bridge crossing and stream covering has been issued by the state for this Project. As per the water quality certification, the 450-ft of covered stream would be restored, and a 50-ft wide riparian buffer on both sides of the stream would be restored. Stream restoration would be conducted in accordance with Corps and State requirements. The 50-ft stream bridge crossing is permanent. Currently the road crosses a ford in the stream over limestone bedrock and gravel. A bridge crossing would protect the stream substrate from repeated damage by traffic crossing the existing ford. Physical impact to Moss Hollow Branch would be localized and would be limited to the impacted segment. No adverse effects to stream function (flow pattern, velocity and sediment carrying capabilities), drainage area, or aquatic community are expected. The bridge crossing would affect about 0.01% of entire Moss Hollow Branch. The stream bridge crossing would have negligible effect on Moss Hollow Branch and would not disturb the stream substrate and is not likely impact water quality or stream morphology. The stream bridge crossing, both temporary and permanent, fits a Nationwide Permit (and State General Permit) and would not require mitigation for stream loss. On project completion, the spanned and covered portion of Moss Hollow Branch would be day-lighted and a 50-foot riparian buffer restored with tree plantings. Only the 50-foot stream bridge crossing would remain.

Forest: On the left and right footprints, a total of 137 acres of forest is located in the Project footprints. The area is covered with a mixed mesophytic deciduous forest dominated by oak-hickory interspersed with Eastern red cedar stands. This forest type is typical for the region. Approximately 102 forest acres would be avoided. Approximately 68 forest acres (past and future tree removal) would be temporarily impacted and 11 forest acres (past and future tree removal) would be permanently lost. The 68 acres of temporarily impacted forest would be stabilized with native warm season grasses and planted with native tree seedlings. Reforestation would occur through natural succession. During succession, the open meadows would provide foraging and cover habitat for birds, grazers, and small mammals.

About a total of 11 acres of forest (past and future loss) would be permanently lost.
Eleven acres of disposal area that has been reused as disposal area would be closed and converted to forest habitat with native tree seedlings to ensure replacement of permanently lost forest habitat. Native tree seedling planting is good engineering practice to jump start natural succession and ensure successful replacement of the 11 lost forest acres.

The Park has nearly 6,000 acres of equitable forest habitat along the shores of Center Hill Lake in the vicinity of Center Hill Dam. The Corps has about 21,000 acres of equitable forest habitat on the Project surrounding Center Hill Lake at, and some distance from Center Hill Dam. The permanent loss of 11 acre of forest would constitute a loss of 0.04% of equitable forest habitat provided by a total of 27,000 acres (State and Corps) of forest habitat. The impact of this forest habitat loss would be imperceptible. However, planting a variety of native tree seedlings would accelerate forest regeneration, and conversion of 11 acres of disposal area to forest would over time result in the same amount of forest habitat that existed prior to construction activities.

4.0 MITIGATION REQUIREMENTS AND SITE SELECTION

4.1 Mitigation Requirements

Wetland mitigation is established on a project by project basis. Compensatory mitigation for the loss of the 0.13 acre wetland would be required. Compensation would result in no net loss of wetlands.

Stream restoration is determined by both Corps (2008 Mitigation Rule 33 C.F.R. 332) and State requirements. Approximately 450 linear feet of temporary impact to Moss Hollow Branch would be restored onsite.

Forest replacement would rectify the permanent loss of 6 acres of forest habitat on the left and right rims due to construction activities. This forest loss constitutes a small fraction of the same forest type on Corps and Park property (0.02% of 27,000 acres).

4.2 Mitigation, Restoration, and Replacement Site Selection

Compensatory mitigation for the loss of the 0.13 acre wetland would be made at a 2:1 ratio via an approved mitigation bank, in-lieu fee fund, and/or permittee responsible mitigation. The methods of compensatory mitigation cover the Project area.

Approximately 450 linear feet of Moss Hollow Branch would be temporarily spanned or covered for up to four years (2018) to allow use of the aggregate and equipment storage laydown area through project completion. The stream substrate would not be disturbed. On project completion, the stream would be day-lighted and restored at its current location and condition within the Moss Hollow Branch watershed.

Left Rim: Seepage repair work on the left rim is on-going. Approximately 34 acres of forest was removed to accommodate past left rim construction activities. In 2010, 30 acres of temporarily impacted forest acres were stabilized with only warm season grasses. The surrounding forest functioned as a seed bed and now the area is covered with volunteer tree seedlings. Approximately 4 acres of forest habitat was permanently lost due to road improvements and the left rim work platform. This left rim contains two disposal areas (total 7 acres) that have been used and re-used since installation of the 1993 historic grout line. As a result, the disposal areas, while grassed, natural succession had not developed (a few scattered saplings). The disposal areas would be re-used for disposal as long as there is a need to disposal excavated materials from all construction activities for up to four years (2018). When the disposal sites are no longer needed, they can be stabilized with warm season grasses to allow future disposal

use. Acreage in the disposal sites that have been planted with tree seedlings would be converted to forest habitat to replace forest acres that have been permanently lost.

An additional 15 acres of forest would be removed on the left rim for left rim stabilization (11 acres), sinkhole repairs (2 acres), and dam safety clearing (2 acres) measures. Removal of 13 acres of forest would be temporary. When the left rim and sinkhole measures are complete, the area would be stabilized with warm season grasses, planted with native tree seedlings, and allowed to reforest via natural succession. Two acres of forest habitat would be permanently lost to clearing the dam safety area. To replace the lost 2 acres, 2 acres of a disposal site would be planted with native tree seedlings and converted to permanent forest habitat. In summary, forest replacement of the total of 6 lost forest acres would result in the same amount of forest habitat that existed prior to construction activities.

Right Rim: Up to 30 acres of forest would be removed on the right rim to accommodate road improvements, construction of a laydown and aggregate area, and construction of the RCC Berm. Removal of up to 25 acres would be temporary. Five acres of forest would be permanently lost to road improvements and within the RCC Berm footprint. After construction, 25 acres of cleared forest would be stabilized with warm season grasses, planted with native tree seedlings, and allowed to regenerate via natural succession. To replace the 5 acres of permanently lost forest habitat, 5 acres in the saddle dam disposal area would be planted with native tree seedlings and converted to permanent forest habitat. In summary, forest replacement of the total of 6 lost forest acres would result in the same amount of forest habitat that existed prior to construction activities.

5.0 SUSTAINABILITY, MANAGEMENT, PERFORMANCE, AND MAINTENANCE

Wetland: Either an approved mitigation bank, in-lieu fee program and/or permittee responsible mitigation would be used to mitigate the loss of 0.13 acre of wetlands at a 2:1 ratio within the Caney Fork watershed (HUC8). The purpose of wetland mitigation is to preserve wetland quality and function in perpetuity. At this time the Corps has not determined which mitigation method will be used. However, if an approved mitigation bank and/or in-lieu fee program is chosen, monitoring of the mitigation site will be the responsibility of the bank/in-lieu fee program. Likewise if permittee responsible mitigation is chosen it will be the Corps responsibility to monitor the mitigation area to insure it meets the Corps and states performance standards.

Stream: Approximately 450 linear feet of Moss Hollow Branch would be spanned or covered to prevent substrate disturbance while the area is temporarily used as a laydown and aggregate storage area. When construction activities are complete, Moss Hollow Branch would be day-lighted. Since the substrate would be protected from disturbance, it is anticipated that the restored segment would look no different than undisturbed up and downstream segments. A successful restoration would not require maintenance. The stream would be self-sustaining. Performance would be documented by the monitoring plan. The stream would be sustained and protected on state property.

A 50-foot buffer on each side of the covered stream is to be restored. The restored riparian corridor and stream banks would be stabilized with native warm season grasses and planted in native trees at 200 stems per acre. Performance of riparian development would be documented by the monitoring plan. The riparian buffer would be sustained and protected on State property.

Forest: Up to 45 acres of forest habitat (30 acres – right rim; 15 acres – left rim) would be impacted by revisions to the draft 2013 MRER plan, including measures. A total of up to 38 acres would be temporarily impacted. A total of 11 acres (past loss of 4 acres; future loss of 7 acres) would be permanently lost; however these acres would be replaced with acreage in disposal sites. All impacted forest acres would be stabilized with native warm season grasses and planted with native tree seedlings.

Over time, these actions would result in the same acreage of forest habitat that existed prior to construction activities. Volunteer seedlings would fill in areas around planted native seedlings because the surrounding forest would act as a seedbed as the area transition to forested habitat via natural succession. Performance of forest development would be documented by the monitoring plan. The forests would be sustained and protected on Corps and Park property.

6.0 MONITORING PLAN

Wetland: At this time the Corps has not determined which mitigation method will be used. However, if an approved mitigation bank and/or in-lieu fee program is chosen, monitoring of the mitigation site will be the responsibility of the bank/in-lieu fee program.

Likewise if permittee responsible mitigation is chosen it will be the Corps responsibility to monitor the mitigation area for five consecutive years to insure the mitigation site meets the criteria of a wetland (dominated by hydrophytic vegetation, hydrology, hydric soils) in addition to the Corps and states performance standards.

Stream: The state water quality certification and ARAP NRS12.227 requires monitoring the restoration success of the restored stream segment and restored riparian corridor of Moss Hollow Branch. Stream monitoring would be initiated within 60 days of project completion. The Corps would be responsible for conducting the monitoring on an annual basis for 5 years. The contractor would be required to monitor for 1 year post-day-lighting. An annual report of monitoring results would be submitted to the state. Restoration success of the day-lighted segment of Moss Hollow Branch and riparian corridor would be evaluated by the following:

Stream:

- Construction of natural channel morphology (if the channel and stream substrate is disturbed) and use of suitable materials for the stream's substrate.
- Verification of pre-channel morphology condition using an upstream undisturbed reference reach as a guide
- Establishment of a vegetated riparian corridor extending at least 50 feet from the stream centerline

Monitoring Success Criteria:

- Perform a State Qualitative Habitat Assessment using the State Rapid Bioassessment Protocols (RBP) A successful Habitat Assessment score would be greater than 75% of the median ecoregion reference score at the end of the monitoring period
- A minimum of 200 stems per acre comprised of both planted and desirable seedlings from natural regeneration shall remain growing at the end of the monitoring period. Vegetative species must be on State approved native species planting list (*Landscaping with Natives; hhtp://tneppc.org/pages/landscaping#native_plants)*

- A Channel Stability Rating (CSR) of at least “Good” must be achieved during every monitoring year

Recording of Results:
Monitoring would be conducted during the growing season to assess tree survival.
1. For each measurement taken, the report would include the following information:
- The exact place, date, and time of sampling
- The person(s) collecting the samples
- The dates and times the analyses were performed
- The person(s) or laboratory who performed the analyses
- The analytical techniques or methods used
- The results of the required analyses
- Narrative descriptions, photo-documentation, riparian vegetation surveys, channel morphology surveys, stability assessments, and hydrology surveys or documentation
2. A habitat assessment using EPA Rapid Bioassessment Protocols will be conducted and submitted in Year 5.

Forest: The Corps would monitor the success of reforestation via visual inspection of the areas planted with native tree seedlings. A minimum of 200 stems per acre comprised of both planted and desirable seedlings from natural regeneration shall remain growing at the end of the monitoring period. Monitoring would be conducted annually for 5 years during the growing season to assess tree survival. An annual report would.

A report of monitoring results would be maintained with the Corps’ project files. The report would include the following information:
- The place, date, and time of sampling
- The person(s) collecting the data
- The methods used to perform the assessment
- The results of the analyses
- Erosion inspections
- Narrative descriptions, photo-documentation, riparian vegetation surveys, channel morphology surveys, stability assessments, and hydrology surveys or documentation

7.0 ADAPTIVE MANAGEMENT PLAN

Wetland: If an approved mitigation bank or in-lieu fee program is chosen it will be the responsibility of the bank/in-lieu fee program to develop an adaptive management plan. If permittee responsible mitigation is chosen it will be the responsibility of the Corp to develop an adaptive management plan. Unforeseen changes in site conditions could result in needed alterations to the mitigation plan. If the mitigation plan is not meeting success criteria based on monitoring results, corrective actions would need to be identified and implemented. A revised plan would be prepared that would include proposed actions, a time schedule for activities, and any changes to the monitoring plan. A report of these changes would be submitted to the state.

Stream: Unforeseen changes in site conditions could result in changing, or adapting, a revised mitigation plan to the changed condition. If the mitigation plan is not meeting success criteria based on monitoring results, corrective actions would need to be identified and implemented.

A revised plan would be prepared that would include proposed actions, a time schedule for activities, and any changes to the monitoring plan. A report of these changes would be submitted to the state.

Forest: Unforeseen changes in site conditions could result in adapting this plan. Revisions would include proposed actions, a schedule, and a report of changes that would be documented by the Corps and placed with Project files.

8.0 FINANCIAL ASSURANCES

Funding for this mitigation plan would come from Center Hill Dam Seepage and Rehabilitation Project funds.

9.0 LITERATURE CITED

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Appendix A

Upland Forest
Habitat Evaluation Procedures

Habitat Suitability Index
Gray Squirrel (*Sciurus carolinensis*)

INTRODUCTION

In 1980 the USFWS published a habitat-based evaluation methodology called the Habitat Evaluation Procedures (HEP) for assessing impacts of proposed water and land resource projects on fish and wildlife habitats. These procedures provide a way to predict changes in habitat quality and quantity over time. HEP measures habitat gains and losses caused by a proposed project and the amount of compensation needed to offset any losses. HEP uses several species models using basic life history information and is based on the assumption that habitat quality for selected wildlife species can be described by a Habitat Suitability Index (HSI). This index value ranges from 0 (no habitat value) to 1 (optimum habitat value). Optimum habitat conditions are associated with the highest potential for the habitat to support the highest densities of a selected species within a specific area. Basically, the HSI value becomes an index of carrying capacity. The HSI value is multiplied by the area of available habitat to obtain Habitat Units (HUs) which are used in comparisons. HEP measures the quantity times the quality of habitat to calculate HUs using the following formula:

Habitat Unit (HU)	=	Area	X	Habitat Suitability Index (HSI)
(Habitat Value)	=	*(Habitat Quantity)*	*(times)*	*(Habitat Quality)*

PROJECT USE

The HSI model for the gray squirrel (*Sciurus carolinensis*) is authored by the U. S. Fish and Wildlife Service (USFWS) and is a Corps approved model. This model was used to evaluate potential impact to upland habitat resulting from construction activities associated with seepage rehabilitation at the Center Hill Dam Project (Project). The gray squirrel model was considered applicable for this project because the gray squirrel has an extensive range throughout the eastern United States and is found in deciduous and mixed deciduous-coniferous forests. Approximately 27,000 acres of continuous deciduous and deciduous-coniferous forest is owned by the Edgar Evins State Park (Park) (6,000 acres) and the Corps (21,000 acres at summer pool elevation 648). The forest surrounds Center Hill Lake, except for developed recreation areas and commercial marinas.

SAMPLING METHODS

The proposed right rim footprint for the proposed RCC Berm alternative is representative of the 27,000 acres of forest owned by the Corps and the Park. The right rim footprint covers approximately 68 acres. An 800-ft buffer was placed around the project boundary. Random sampling plots were generated using the random point generating tool in a Geographic Information Systems (GIS) program. A minimum distance was set between plots to prevent over-lapping and to provide a wide sampling pattern representative of the available forest habitat. GIS randomly selected points within the buffer and project boundaries. Points that landed in an open area or on the saddle dam were eliminated. Six sampling sites were generated and are shown in Figure 1. Each sampling site covered an area of 30 square meters (approximately 323 square feet). The sample area was converted to acres resulting in six 0.007 acre plots. Within each plot, tree species, size (diameter at breast height – DBH), and canopy cover information used by the gray squirrel model were collected. Table 1 shows tree species

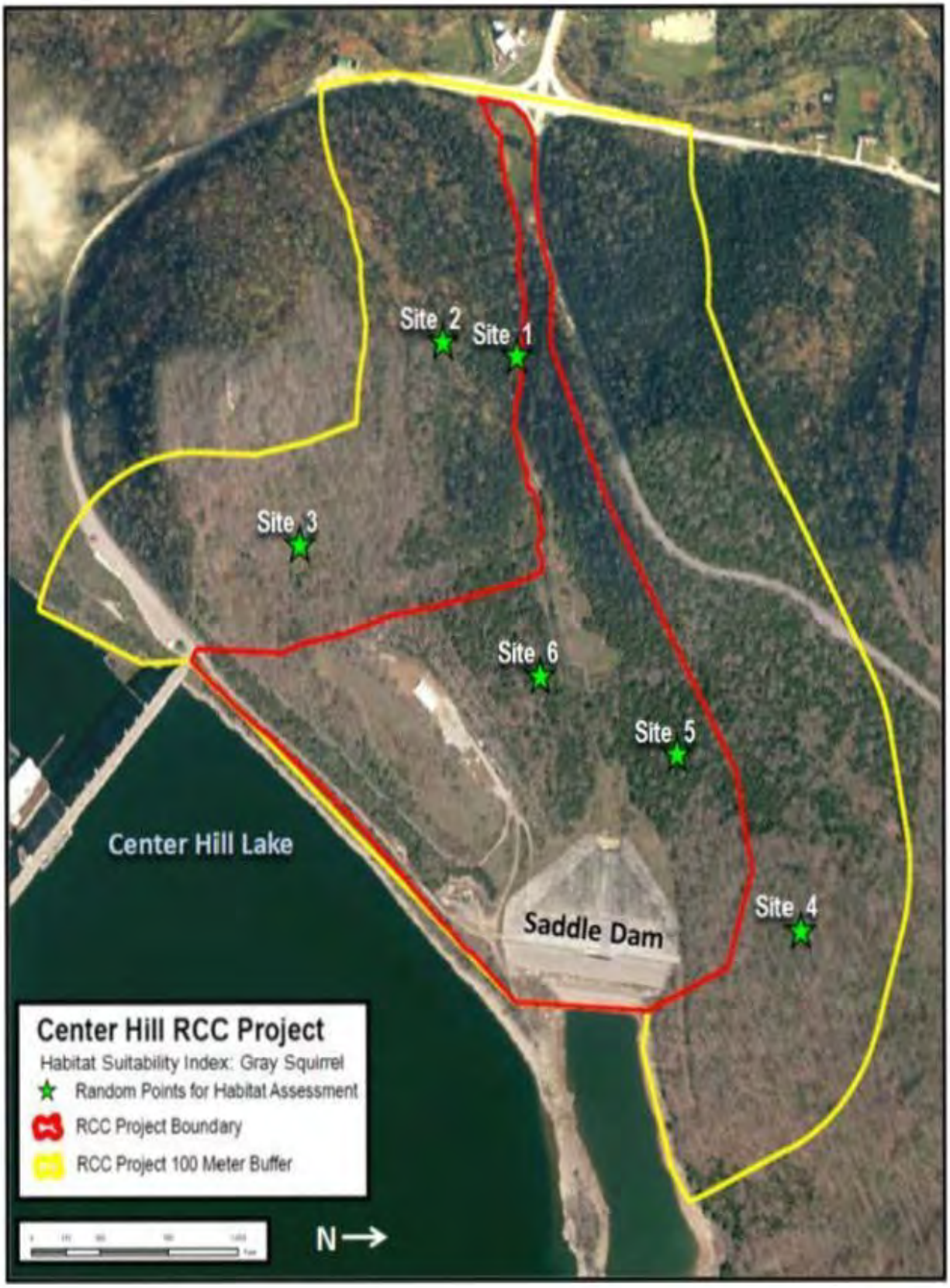


Figure 1. Random Sampling Points for Habitat Evaluation.

Table 1. Tree species and DBH in inches within each site plot.

Site 1		Site 2		Site 3		Site 4		Site 5		Site 6	
Species	Inches	Species	Inches	Species	Inches	Species	Inches	Species	Inches	Species	Inches
JUVI	10.00	LITU	10.50	ACNE	2.50	FRAM	11.80	JUVI	8.00	JUVI	10.50
JUVI	9.50	QURU	10.40	ACNE	9.40	FRAM	11.10	JUVI	8.20	JUVI	10.00
JUVI	11.70	QURU	9.80	ACNE	5.90	LITU	12.20	JUVI	3.50	JUVI	8.60
JUVI	4.20	QURU	7.10	ACNE	6.30	ULRU	8.10	JUVI	7.60	JUVI	11.20
JUVI	19.20	CELA	5.20	TIAM	8.50	CASP	16.50	JUVI	10.40	JUVI	12.60
JUVI	6.30	JUVI	4.40	TIAM	7.60	CASP	7.50	JUVI	6.80	JUVI	6.80
JUVI	6.80	JUVI	3.50	TIAM	7.20	QUVE	24.70	JUVI	5.70	JUVI	12.50
JUVI	11.80	JUVI	6.00	TIAM	13.00	QUVE	9.40	JUVI	4.10	JUVI	12.60
JUVI	3.60	JUVI	10.40	TIAM	10.40	QUAL	13.70	JUVI	5.50	JUVI	11.90
ULRU	5.00	JUVI	7.50	TIAM	8.20	QUAL	18.40	JUVI	7.90	JUVI	10.50
MAPO	4.50	JUVI	18.50	QUAL	9.60	QURU	13.10	JUVI	9.60	JUVI	11.10
MAPO	8.10	JUVI	6.80	LITU	17.60	QURU	6.10	JUVI	4.70	JUVI	14.20
MAPO	3.20	JUVI	13.10	JUVI	8.40	QURU	18.20	JUVI	4.60	JUVI	8.10
PRSE	8.00	JUVI	6.50	JUVI	8.30	ACRU	9.40	JUVI	3.10	JUVI	5.20
PAPE	3.40	MAPO	7.20	JUVI	5.20	ACRU	9.20	JUVI	10.60	ULRU	6.80
DIVI	3.20	MAPO	4.30	JUVI	3.50	ACRU	9.10	JUVI	17.20	ULRU	3.10
		QUVE	9.00	JUVI	9.80			FRAM	6.70	ULRU	4.70
		QUVE	9.40	PRSE	5.20			FRAM	4.10	ULRU	9.90
		QUVE	10.60	CELA	5.40			FRAM	6.10	ACRU	5.40
		QUVE	3.80	CELA	7.20			FRAM	7.90	TIAM	5.40
		ULRU	5.00	CELA	5.20			FRAM	4.70	LITU	10.80
		ULRU	8.40	SNAG	20.10						
		ULRU	7.00	CEOC	7.40						
		SNAG	7.00	CEOC	6.80						
		SNAG	3.50	ULRU	3.60						
		SNAG	3.00	ULRU	6.30						
		COFL	5.10	ULRU	3.20						
				ULRU	3.40						
	AVERAGE DBH PER STAND										
	7.41		7.52		7.69		12.41		7.00		9.14
	NUMBER OF MAST PRODUCING TREE SPEICIES										
0		2		1		4		0		0	

Code	Scientific Name	Common Name
JUVI	Juniperus virginiana	Eastern Red Cedar
ULRU	Ulmus rubra	Slippery Elm
MAPO	Maclura pomifera	Osage Orange
PRSE	Prunus serotina	Black Cherry
PAPE	Parrotia persica	Ironwood
DIVI	Diospyros virginiana	Persimmon
LITU	Lirodendron tulipifera	Tulip Popular
CELA	Celtis laevigata	Sugarberry
QUVE	Quercus velutina	Black Oak
SNAG	Snag	Snag
COFL	Cornus florida	Flowering Dogwood
ACNE	Acer negundo	Boxelder
TIAM	Tilia americana	Basswood
QUAL	Quercus alba	White Oak
CEOC	Celtis occidentalis	Hackberry
FRAM	Fraxinus americana	White Ash
QURU	Quercus rubra	Red Oak
ACRU	Acer rubrum	Red Maple
CASP	Hickory spp.	Hickory spp.

and size (DBH) per plot. Sampling plots are similar. The left rim forest consists of an equitable forest type and tree species.

MODEL CALCULATIONS

This model provides quantitative relationships between key life requisites and habitat suitability for the gray squirrel. The model assumes that winter food, and den site availability (for cover and reproduction), are the two key life requirements for gray squirrel habitat quality. Each life requisite considers additional forest characteristics in determining habitat quality.

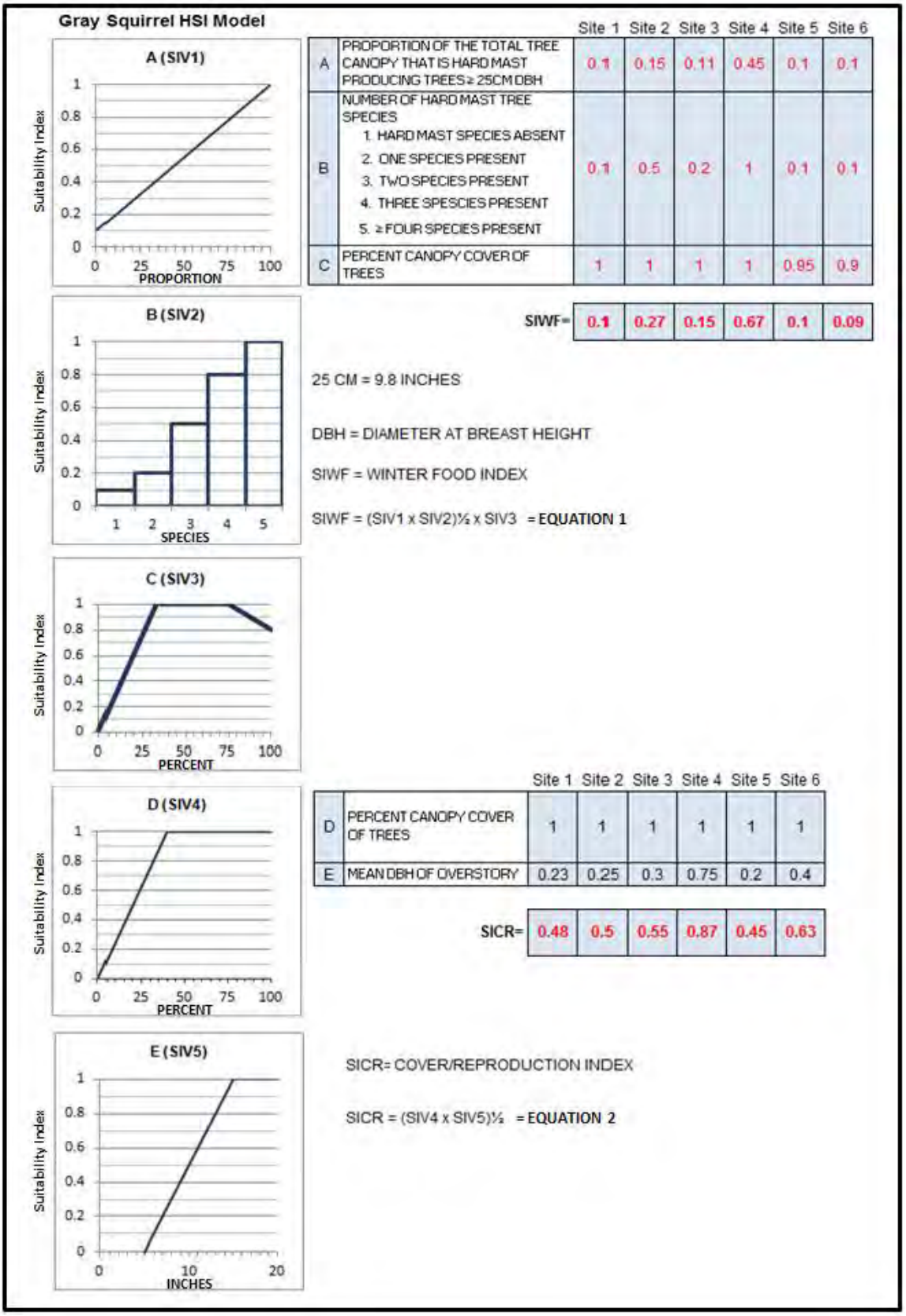
Tree species are important because winter food consists of hard mast (nuts) produced by oak (acorns), hickory (hickory nuts), black walnut (walnuts) and beech (beechnuts) trees. Trees considered large enough to produce mast are approximately greater than 25 centimeters (9.8 inches) DBH. The abundance and density of large mast trees would be expected to provide near total canopy closure. The calculation for the suitability index for winter food (SIWF) is based on three suitability index variables (SIV) in this model – the portion of the tree canopy that is mast producing trees (SIV1); the number of hard mast tree species (SIV2); and the percent of canopy cover of trees (SIV3).

Tree size and canopy are important because these factors affect cover and reproduction. Large trees with a dense canopy cover are assumed to correlate with a large number of den sites. The calculation for the suitability index for cover/reproduction (SICR) is based on two suitability index variables (SIV) in this model – percent of canopy cover of trees (SIV4); and mean DBH of overstory trees (SIV5).

Winter food and cover/reproduction are life requisites equally important in defining gray squirrel habitat quality. The model compares the SIWF and SICR values and uses the lowest value to calculate the HSI for the gray squirrel. The model is scaled to produce an index value between 0.0 (unsuitable habitat) and 1.0 (optimum habitat). Areas with low HSI values are assumed to be unsuitable to poor habitat. Areas with high HSI values assume that the area contains suitable habitat and that the area can support (carrying capacity) a large number of gray squirrels.

The six 0.007 acre plots were used to calculate HSI for the gray squirrel. Calculations are based on the variables and formulas provided in the USFWS model for the gray squirrel. Figure 2 provides results for the SIWF and SICR equations. Based on these equations, the overall weighed HSI score for the forest habitat affected by this Project is 0.23 (Figure 3). The relationships between the suitability indices for winter food, cover/reproduction, and the associated habitat variables are shown in Figure 4 which is copied directly from the USFWS HSI model for the gray squirrel.

Table 2 is a summary of total forest impacts (past and proposed future; temporary and permanent) on Corps property, Park property, and total government property. The totals come from Table 1. The magnitude of forest impact is relative to the footprint of available forest habitat not impacted. Magnitude scenarios (A, B, and C) are considered and show available forest habitat under “Acres/HUs Available”



		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
A	PROPORTION OF THE TOTAL TREE CANOPY THAT IS HARD MAST PRODUCING TREES ≥ 25CM DBH	0.1	0.15	0.11	0.45	0.1	0.1
B	NUMBER OF HARD MAST TREE SPECIES 1. HARD MAST SPECIES ABSENT 2. ONE SPECIES PRESENT 3. TWO SPECIES PRESENT 4. THREE SPESCIES PRESENT 5. ≥ FOUR SPECIES PRESENT	0.1	0.5	0.2	1	0.1	0.1
C	PERCENT CANOPY COVER OF TREES	1	1	1	1	0.95	0.9
	SIWF=	**0.1**	**0.27**	**0.15**	**0.67**	**0.1**	**0.09**

25 CM = 9.8 INCHES

DBH = DIAMETER AT BREAST HEIGHT

SIWF = WINTER FOOD INDEX

SIWF = (SIV1 x SIV2)½ x SIV3 = **EQUATION 1**

		Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
D	PERCENT CANOPY COVER OF TREES	1	1	1	1	1	1
E	MEAN DBH OF OVERSTORY	0.23	0.25	0.3	0.75	0.2	0.4
	SICR=	**0.48**	**0.5**	**0.55**	**0.87**	**0.45**	**0.63**

SICR= COVER/REPRODUCTION INDEX

SICR = (SIV4 x SIV5)½ = **EQUATION 2**

Figure 2 . Suitability Index for Winter Food and Cover/Reproduction.

To determine an overall weighted HSI (weighed by area) perform the following steps:

HSI SCORE:

1. Stratify the forest area into individual stands
2. Determine the area of each stand and the total area of the forest cover type
3. Determine an HSI value for each stand using EQUATION 1 and EQUATION 2.
4. Multiply the area of each stand by its respective HSI score
5. Add all products calculated in step 4 and divide the sum by the total area of all stands to obtain a weighted HSI value

USE THE LOWEST SCORE ABOVE (SIWF or SICR)

CALCULATION FOR HSI SCORE:	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6
1. Number of Stands	1.000	1.000	1.000	1.000	1.000	1.000
2. Area of each Stand (stands convert to acres/stands 30 meter squared)	0.007	0.007	0.007	0.007	0.007	0.007
3. Use the lowest SIWF or SICR	0.10	0.27	0.15	0.67	0.10	0.09
4. Stands multiplied by HSI Values	0.0007	0.0019	0.0011	0.0047	0.0007	0.0006

(0.0007 + 0.0019 + 0.0011 + 0.0047 + 0.0007 + 0.0006) / 0.042 =

5. HSI FINAL SCORE FOR AREA	0.2300

Habitat Suitability Index Value Range between 0.0 = Unsitable Habitat and 1.0 = Optimum Habitat

Figure 3. HSI Summary per plot and overall condition of the forest habitat.

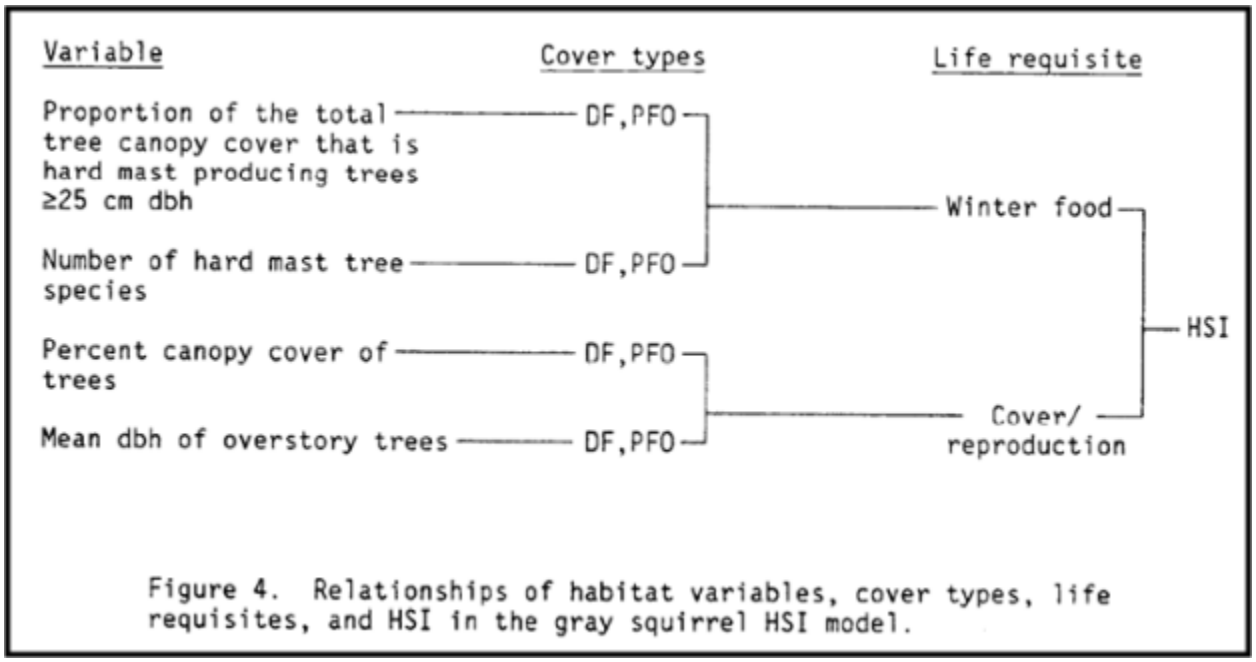


Figure 4. Relationships of habitat variables, cover types, life requisites, and HSI in the gray squirrel HSI model.

Figure 4. Relationships between the Suitability Indices and associated variables.

Under scenario A, only forest habitat within the left and right rim footprints is available. On Project completion, the estimated total amount of tree removal is shown under the "Acres/HUs Available". At this scale, the percent of trees removed is large. Under scenario B, a 5-mile radius centered on the saddle dam considers available forest on Corps and Park properties within the 5 mile radius. On Project completion, the estimated total amount of tree removal is shown under the "Acres/HUs Available". At this scale, the percent of trees removed is barely noticeable when compared to the amount of available forest habitat available within 5 miles on Corps and Park properties. Under scenario C, All available forest habitats on Corps and Park property surrounding Center Hill Lake is considered and is shown under the "Acres/HUs Available". At this scale the effect of cut forest is nearly imperceptible.

What these scenarios imply, is that for slow moving animal species, with small ranges, visual clearing (walk-through) surveys would be beneficial to minimize impact to wildlife. But when considering species with great mobility and range (squirrels, migratory birds, bats, and large mammals) there is a large amount of equitable habitat available. Displacement is highly localized and temporary. These animals would be expected to return on project completion.

Table 2. Comparison of HUs Impacted Due to All Forest Removal on Government Property.

Magnitude of Impact Scenarios A, B, C	**Acres/HUs Impacted**			**Acres/HUs Available**			**% Change ***
A. Within Left and Right Rim Footprints	**Acres**	**HSI**	**HUs**	**Acres**	**HSI**	**HUs**	**Acres/HUs**
Corps**	64	0.23	14.72	160	0.23	36.8	40%
Park Property***	15	0.23	3.45	21	0.23	4.83	75%
Total (Corps and Park)	79	0.23	18.17	181	0.23	41.63	44%
B. Within 5 mile radius	**Acres**	**HSI**	**HUs**	**Acres**	**HSI**	**HUs**	**Acres/HUs**
Corps	64	0.23	14.72	2,193	0.23	504.39	2.92%
Park	15	0.23	3.45	3,366	0.23	774.18	0.45%
Total (Corps and Park)	79	0.23	18.17	5,559	0.23	1278.57	1.42%
C. All Available Acreage	**Acres**	**HSI**	**HUs**	**Acres**	**HSI**	**HUs**	**Acres/HUs**
Corps	64	0.23	14.72	21,000	0.23	4830	0.30%
Park	15	0.23	3.45	6,000	0.23	1380	0.25%
Total (Corps and Park)	79	0.23	18.17	27,000	0.23	6210	0.29%

* Calculations are rounded to the nearest 0.01%

** Corps forest losses - left and right rims – 64 acres
*** Park forest loss – 15 acres

SUMMARY

The HSI is a combined score of the amount of winter food available (SIWF) in terms of mast production (acorns and nuts) and number of trees large enough to produce cover and cavities for reproduction (SICR). Based on this data, the forest provides fair cover. The SICR ranged

between 0.45 – 0.87 and averaged 0.58. A score of 0 is considered poor, and a score of 1 is considered optimal cover.

The availability of winter food would be considered marginal. The SIWF ranged from 0.09 – 0.67 and averaged 0.23. A score of 0 is considered poor, and a score of 1 is considered optimal mast production. Trees that are large enough to produce adequate mast need to be 9.8 DBH or larger. As Table 1 shows for all plots, half of the mast-producing trees are smaller than 9.8 DBH. This would imply that the forest is young. The Corps and Park property was logged nearly 70 years ago. Only time would allow the mast-producing trees to grow large enough to provide adequate amounts of winter food.

The Corps (21,000) and the Park (6,000 acres) own a combined 27,000 acres of abundant and continuous mixed deciduous and deciduous-coniferous forest. Past and planned forest removal for Project construction activities would impact a total of 96 acres of forest habitat (Table 2). As can be seen in Table 2, the overall amount of temporary forest loss on the combined Park and Corps acreage (27,000 acres) would be imperceptible (0.36% change) considering the continuous acres of equable forest habitat surrounding Center Hill Lake. In other words, 99.64% of the total available forest habitat would remain undisturbed. The amount of forest habitat impacted by Project construction activities would be negligible.

Since the limiting factor for squirrel abundance is the lack of a reliable winter food supply, planting a variety of mast producing tree seedlings would provide a future winter food source for the gray squirrel. Improving the forest quality with a reliable future winter food source would also benefit associated species that rely on hard mast as winter food, such as deer and turkey.

WETLANDS ASSESSMENT
AND DELINEATION REPORT
CENTER HILL DAM
ABANDONED QUARRY AREA
DEKALB COUNTY, TENNESSEE

File No. 2008-00408

U.S. ARMY CORPS OF ENGINEERS
Nashville District, Regulatory Branch

Prepared by:

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14 March 2008

1.0 Project Information

The project area consists of an abandoned rock quarry used during the construction of Center Hill Dam. The footprint of the quarry is estimated to be 6.5 acres. A site location map is attached as Figure 1. The approximate project area boundaries are indicated on the attached aerial image, Figure 2. This area encompasses the rock quarry containing at least three seeps feeding one stream that is impounded less than 900 feet downstream by a weir dam. The impounded pond, covering less than 0.2 acres, along with its upstream and downstream watercourses totaling approximately 1,100 linear feet will be referred to in this report as the seep/stream/pond complex.

The proposed work involves the excavation and/or filling within the project area in order to create detention/treatment ponds. These ponds would serve the purpose of mitigating the water quality impacts due to lost grout originating from Center Hill Dam rehabilitation construction. It is expected that some of the grout used to create a grout curtain in the left rim of the dam area will seep through the existing quarry bluff walls and impact water quality in the Caney Fork River watershed. The proposed detention/treatment pond construction would impact most or all of the wetlands within the project area.

The purpose of this report is to professionally identify within the project area the presence and approximate boundaries of wetlands. The opinions provided in this report may be used by agencies to assist them in their decision-making processes.

2.0 Hydrologic Determination and Wetlands Assessment

The purpose for this report is not to determine whether jurisdictional waters exist on this property, but rather to determine the limits of such water resources that might be deemed ecologically and hydrologically important. The scope of this report is due to the project area being located entirely on federally owned property under the jurisdiction of the U.S. Army Corps of Engineers (the Corps) and because the proposed work would be done under the direction and authority of the Corps. Since, according to 33 CFR §335.2, the Corps does not issue itself a Department of the Army permit authorizing discharges of fill material into waters of the U.S., a determination of such waters is not necessary. However, the Corps does apply the Clean Water Act's section 404(b)(1) guidelines and other substantive requirements of the Act and other environmental laws to its decision making process. Policies such as a full review of the public interest, the proposed work's effects on wetlands, water quality, and fish and wildlife considerations all must be considered. State and local requirements also must be considered

prior to approval of the proposed work. This report does not attempt to address all of the aforementioned guidelines, requirements, and policies. It serves to identify and document potentially important waters within the identified project area and to assist interested agencies in their decision-making. However, guidelines, requirements, and policies will be addressed in a separate Environmental Assessment and Statement of Findings prepared by the Project Planning Branch.

2.1 Methods

For the purpose of this report, wetlands were identified and delineated using the criteria defined by the 1987 Corps of Engineers Wetlands Delineation Manual (the Manual). The Manual generally requires that in order to make a wetland determination, one must observe three criteria: hydrophytic vegetation, hydric soils, and wetland hydrology.

The survey for potential occurrences of wetlands in the project area consisted of using a combination of in-house research and field investigations. In-house research included a review of the U.S. Geological Survey's (USGS) Center Hill Dam topographical quadrangle (Quad) map (photo-revised 1986, scale 1:24,000), the USGS's digital Ortho aerial photo (1997), the U.S. Fish and Wildlife National Wetlands Inventory (NWI), the Natural Resources Conservation Service soil survey for DeKalb County, Tennessee, and the Corps' digital satellite image (2006). Copies of each are attached as Figures 1 - 5.

2.2 Results

The USGS Quad (Figure 1) shows that the area was formerly a quarry immediately downstream of Center Hill Dam. There are no mapped water features on the site. The project area drains to an unnamed stream mapped as intermittent approximately 200 feet northwest of the site. The stream is known locally as Picnic Springs and its behavior is perennial. The NWI information (Figure 3) indicates the presence of a permanently flooded excavated feature within the project area (pond). The soil survey (Figure 4) indicates the quarry area as "Mines and Pits" and falsely identifies an area of shadow as "Water". This area is under a shadow for much of the year due to the tall quarry bluff wall. From aerial photography, the shadow does resemble water area. Much of the area immediately surrounding the site is either Made Land (the Center Hill Dam project area) or Rockland. Also in the vicinity are Arrington Silt Loam, Bodine Cherty Silt Loam, Mimosa Very Rocky, Mimosa Cherty Silt Loam, and Mimosa Silt Loam. None of these soils is listed as hydric. The aerial photo

and satellite image (Figures 2 and 5) both indicate a small area within the site as permanently inundated (pond).
On site inspection was conducted by Corps employees 6 March 2008. Inspecting the project area were Scott Fanning (the undersigned) and Kathleen Kuná, biologists with the Corps' Regulatory Office, and Joy Broach representing the Project Planning Branch. Also present during the inspection were Center Hill Lake employees, Tim Dunn, Resource Manager; Michael Adcock, Conservation Biologist; and Terry Martin, Environmental Protection Specialist. The field wetland survey utilized the routine determination methods described in the Manual. Photographs and data forms documenting conditions at collection points are attached. The approximate locations of the collection points are shown on Figure 2.

Vegetation: Vegetation over much of the project location consists of cattail (*Typha sp.*), grasses including fescue (*Festuca spp.*), eastern red cedar (*Juniperus virginiana*), and black willow (*Salix nigra*). These species helped inspectors distinguish between two clearly distinct areas of vegetation: one dominated by wetland species (primarily cattail and black willow), and one dominated by upland species (primarily cedar). Fescue occurred in both areas. To a lesser extent, there were specimens of sedge (*Carex sp.*), dock (*Rumex sp.*), green ash (*Fraxinus pennsylvanica*), sycamore (*Platanus occidentalis*), hackberry (*Celti sp.*), etc. There were also varieties of invasive exotics within the project area including privet (*Ligustrum sp.*) and Japanese honeysuckle (*Lonicera japonica*).

Soils: Soil pits were excavated to an approximate depth of 16 inches where possible to observe soil conditions in several locations in the project area. Small diameter probe holes 12 - 16 inches were also utilized to observe soils. One soil pit (data point #1, Figure 2) was excavated outside of the quarry boundaries but within the project location. This point was excavated near Picnic Springs in a low area with some indications of regular inundation. Even so, it revealed soils that were not observed to be hydric and that were not saturated. The presence of earthworms in the pit demonstrated the aerobic nature of the soil. At data point #2, hydric soils were present, but because of its elevation and proximity to the pond and the evidence (including scour and lack of vegetation) of regular inundation, this small area was considered by inspectors as an integral part of the seep/stream/pond complex. Soils observed at data point #3 had characteristics very similar to those at #1 and were deemed not hydric. Data points 4 and 5 revealed hydric soils, wetland vegetation (almost exclusively cattail and black willow), and saturation to the surface with standing water at 6" - 3". Data points 6, 7 and 8 revealed decomposing organics only 3 -6" deep.

Saturation and standing water was superficial and bedrock lay just inches from the surface.

Hydrology: Primary wetland hydrology indicators included visual observation of inundation and soil saturation. Secondary indicators observed in suspected wetland areas were water stained leaves and oxidized root channels. The main source of water is from three or more seeps originating in the quarry bluff walls. The origin of the water is likely to be the Center Hill Reservoir.

2.3 Wetlands Identified and Delineated

Apparent wetlands were identified and delineated on the project area with pink pin flagging and GPS coordinates. The wetlands follow the seep/spring/pond complex to the upstream end of the pond. No wetlands were observed beyond the southern (upstream) end of the pond. No wetlands were observed downstream of the weir dam along the stream or proximal to Picnic Springs. The two small wetland areas that were identified were contiguous with the pond and the stream feeding the pond. They generally had shallow hydric soils or shallower organic materials and were dominated by cattail and black willow. Standing water was at or near the surface throughout both wetland areas. The areas delineated totaled approximately 0.45 acre.

3.0 Conclusions and Recommendations

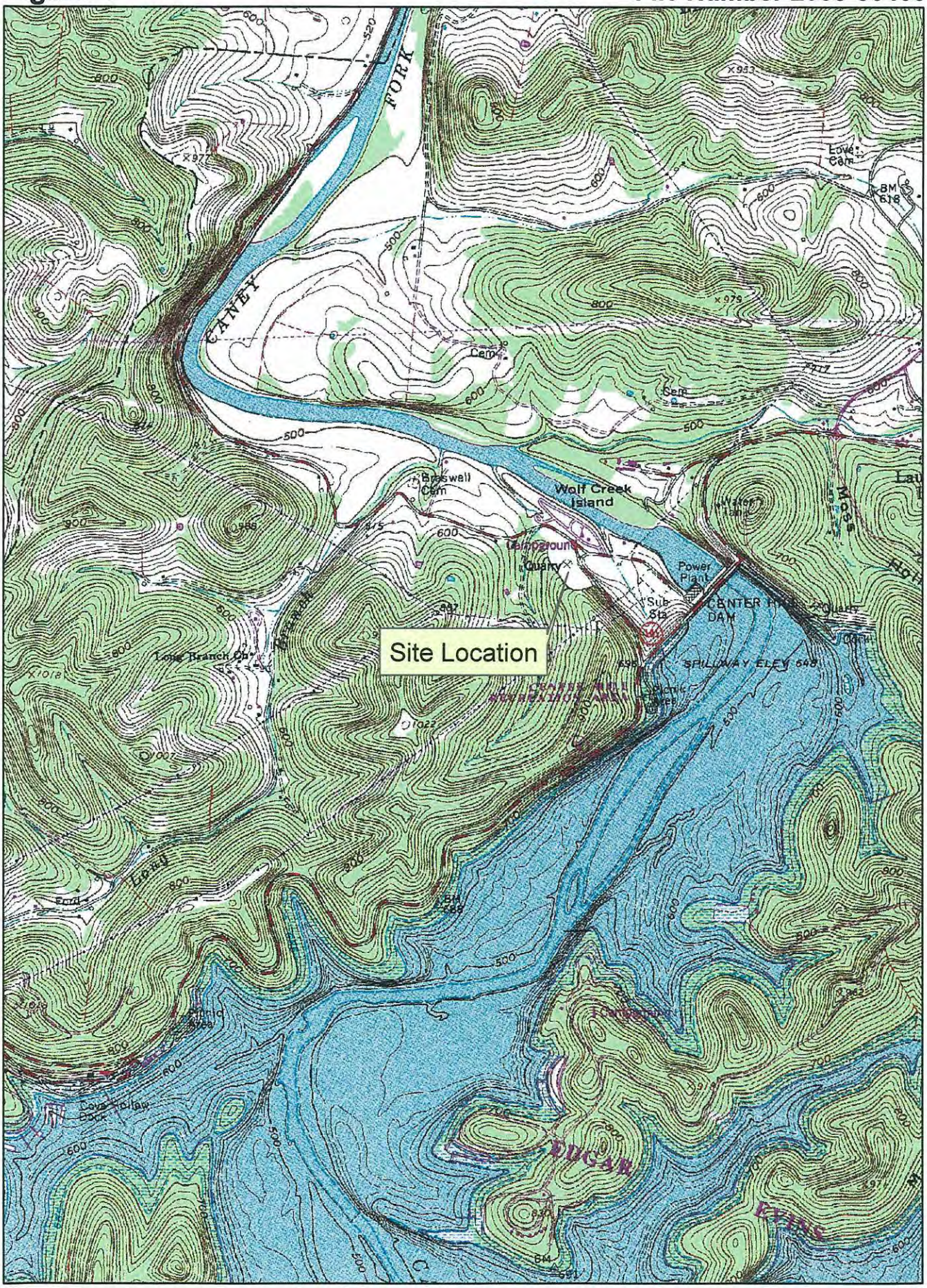
We have completed the wetlands assessment on the referenced property. Based on our findings, two small wetland areas (less than ½ acre combined) are present along the southern portion of the seep/stream/pond complex. This finding is the opinion of the undersigned and is based on the review of published information and our field observations. This report may be submitted to interested agencies through the Corps' Project Planning Branch, Joy Broach.

G. Scott Fanning
Regulatory Specialist

Enclosures

Distribution:
Joy Broach, PM-P
Tim Dunn, CEN/R

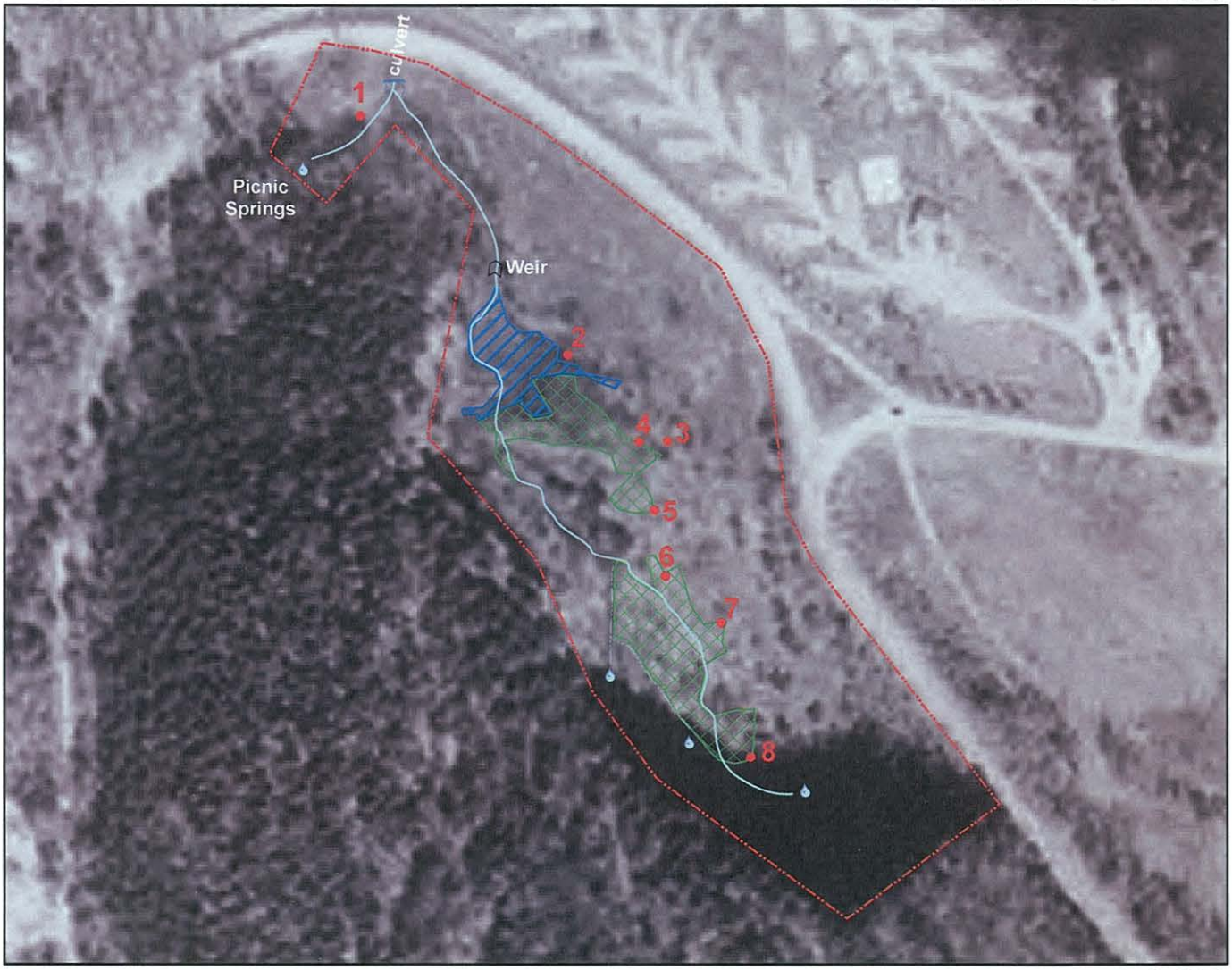
Figure 1 **File Number 2008-00408**



1:24,000

Figure 2

File Number 2008-00408

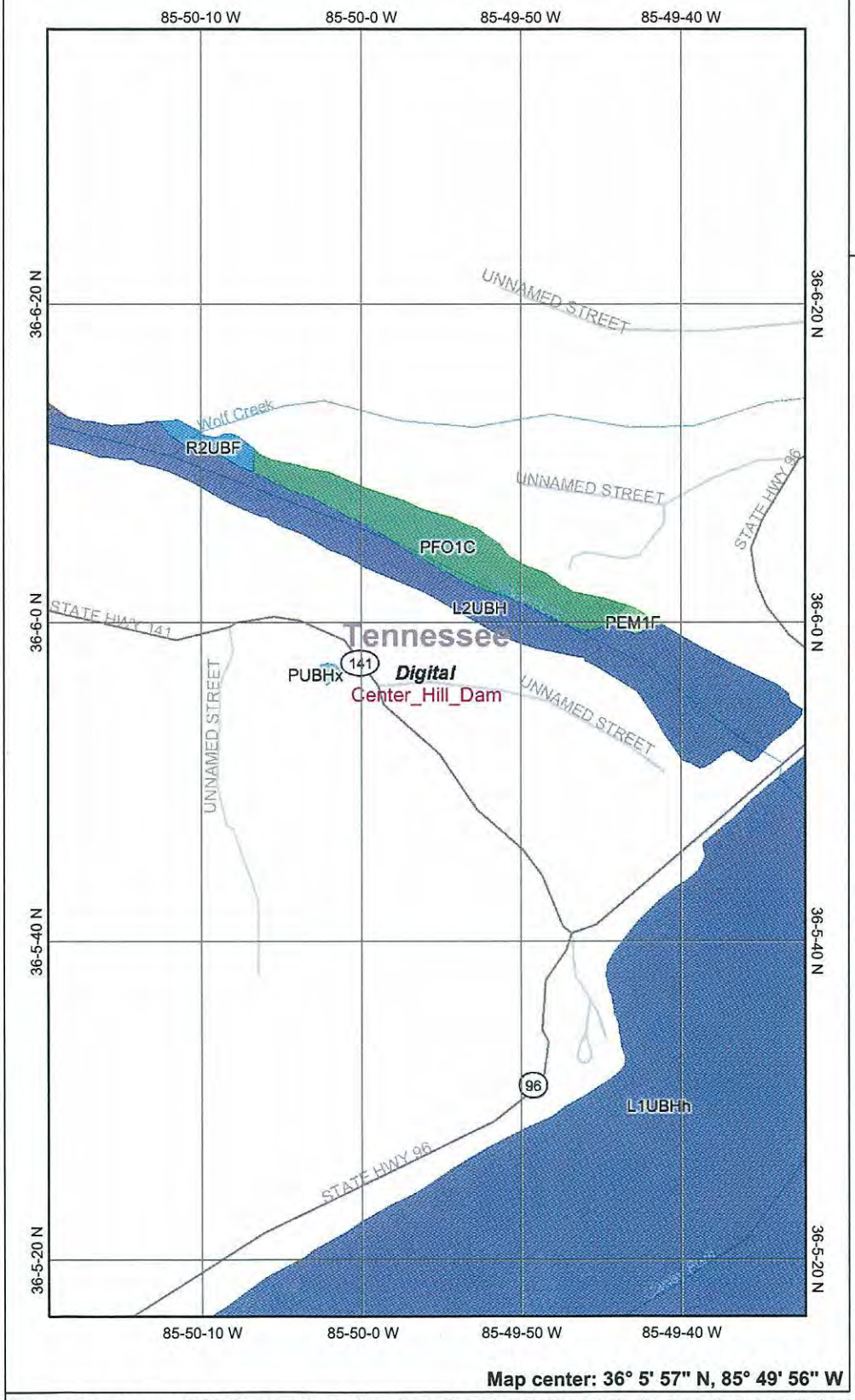


1:2,400

- Approximate Site Boundary
- Data Collection Point
- Approximate Stream Location
- Approximate Pond Area
- Approximate Wetland Area
- Seep or Spring

Wetland Delineation, 06 March 2008
Center Hill Dam Quarry Area
Lancaster, DeKalb County,Tennessee

Figure 3 FWS NWI



Map center: 36° 5' 57" N, 85° 49' 56" W

Legend

CONUS_wet_scan
- 0
- 1
- Out of range

Interstate
Major Roads
- Other Road
- Interstate
- State highway
- US highway

Roads
Cities
USGS Quad Index 24K
Lower 48 Wetland Polygons
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

Lower 48 Available Wetland Data
- Non-Digital
- Digital
- No Data
- Scan

NHD Streams
Counties 100K
States 100K
South America
North America

N

Scale: 1:12,000

PUBHx: P_UB_____H____x_____
[P] Palustrine, [UB] Unconsolidated Bottom, [H] Permanently Flooded, [x] Excavated

[P] Palustrine - The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is below 0.5 ppt. Wetlands lacking such vegetation are also included if they exhibit all of the following characteristics:

1. are less than 8 hectares (20 acres);
2. do not have an active wave-formed or bedrock shoreline feature;
3. have at low water a depth less than 2 meters (6.6 feet) in the deepest part of the basin;
4. have a salinity due to ocean-derived salts of less than 0.5 ppt.

[UB] Unconsolidated Bottom - Includes all wetlands and deepwater habitats with at least 25% cover of particles smaller than stones (less than 6-7 cm), and a vegetative cover less than 30%.

[H] Permanently Flooded - Water covers the land surface throughout the year in all years.

[x] Excavated - Lies within a basin or channel excavated by man.

Soil Map–Dekalb County, Tennessee
(Figure 4)

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 16N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Dekalb County, Tennessee
Survey Area Data: Version 7, Jun 15, 2007

Date(s) aerial images were photographed: 1997

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Dekalb County, Tennessee (TN041)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
At	ARRINGTON SILT LOAM	2.7	4.1%
BoF	BODINE CHERTY SILT LOAM, 20 TO 50 PERCENT SLOPES	2.0	3.1%
ML	MADE LAND	15.9	24.6%
MmF	MIMOSA VERY ROCKY SOILS, 20 TO 40 PERCENT SLOPES	18.9	29.1%
MnD2	MIMOSA CHERTY SILT LOAM, 12 TO 20 PERCENT SLOPES, ERODED	1.6	2.5%
MoD2	MIMOSA SILT LOAM, 12 TO 20 PERCENT SLOPES, ERODED	1.1	1.7%
MP	Mines and pits	4.2	6.4%
Ro	ROCKLAND	16.3	25.2%
W	WATER	2.1	3.3%
Totals for Area of Interest (AOI)		64.8	100.0%

Figure 5 - Satellite Image (2006)

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Center Hill Dam Quarry Area	Date:	6 March 2008
Applicant/Owner:	US Army Corps of Engineers	County:	DeKalb
Investigator:	Scott Fanning	State:	TN

			Community ID:	
Do Normal Circumstances exist on the site?	☒ Yes	☐ No	Transect ID:	
Is the site significantly disturbed (Atypical Situation)?	☐ Yes	☒ No	Plot ID:	1
Is Area a Potential Problem Area? *(if needed, explain on reverse)*	☐ Yes	☒ No		

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	*Festuca sp.*	Grass	FAC-	8			
2	*Ligustrum sp.*	Shrub	FACU	9			
3	*Platanus occidentalis*	Tree	FACW-	10			
4				11			
5				12			
6				13			
7				14			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 10%

Remarks:

HYDROLOGY

☐ Recorded Data (describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☒ No recorded data available

Field Observations:
- Depth of Surface Water: n/a (In.)
- Depth to Free Water in Pit: 14" (In.)
- Depth to Saturated Soil: 14" (In.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in Upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized Root Channels in Upper 12"
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in remarks)

Remarks: Soils are well drained and not saturated in upper 12". Ground water level is at the same elevation as the nearby stream. Earthworms in soil 10"+ indicating aerobic nature of soil.

SOILS

Map Unit Name (Series and Phase): Arrington Silt Loam
Taxonomy (Subgroup):

Drainage Class: Well Drained
Field Observations Confirm Mapped Type? *Circle* (Yes) ~~No~~

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
12-14"	A/B	10YR 4/3			

Hydric Soil Indicators:
- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ Organic Streaking in Sandy Soils
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Listed on National Hydric Soils List
- ☐ Listed on Local Hydric Soils List
- ☐ Other (explain in remarks)

Remarks: Soils not saturated or gleyed. Earthworms present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☐ Yes	☒ No	Is this Sampling Point Within a Wetland? ☐ Yes ☒ No
Wetland Hydrology Present?	☐ Yes	☒ No	
Hydric Soils Present?	☐ Yes	☒ No	

Remarks: Data Collection Point N 36° 06' 00.2" W 85° 50' 05.1"

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Center Hill Dam Quarry Area	Date:	6 March 2008
Applicant/Owner:	US Army Corps of Engineers	County:	DeKalb
Investigator:	Scott Fanning	State:	TN

Do Normal Circumstances exist on the site?	☒	Yes	☐	No	Community ID:
Is the site significantly disturbed (Atypical Situation)?	☐	Yes	☒	No	Transect ID:
Is Area a Potential Problem Area? *(if needed, explain on reverse)*	☐	Yes	☒	No	Plot ID: 2

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1				8			
2				9			
3				10			
4				11			
5				12			
6				13			
7				14			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks: The closest plant specimens were observed growing on the slope up from the data sampling site. The sampling site was devoid of vegetation and had other characteristics of a regularly inundated pond bottom including its elevation in comparison to permanent water, scour, surface water, etc (see below).

HYDROLOGY

☐ Recorded Data (describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☒ No recorded data available

Field Observations:
- Depth of Surface Water: 0-2" (In.)
- Depth to Free Water in Pit: 0-1" (In.)
- Depth to Saturated Soil: surface (In.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☒ Inundated
- ☒ Saturated in Upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized Root Channels in Upper 12"
- ☒ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in remarks)

Remarks:

SOILS

Map Unit Name (Series and Phase): Mine/Pit
Taxonomy (Subgroup):

Drainage Class: N/A
Field Observations Confirm Mapped Type? (Yes) ~~No~~ *Circle*

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
12-14"	A/B	7.5YR 3/1			

Hydric Soil Indicators:
- ☒ Histosol
- ☐ Histic Epipedon
- ☒ Sulfidic Odor
- ☒ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ Organic Streaking in Sandy Soils
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Listed on National Hydric Soils List
- ☐ Listed on Local Hydric Soils List
- ☐ Other (explain in remarks)

Remarks: Soils have a high organic content and are saturated at or near the surface.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☐	Yes	☒	No	Is this Sampling Point Within a Wetland?	☐	Yes	☒ No
Wetland Hydrology Present?	☐	Yes	☒	No				
Hydric Soils Present?	☒	Yes	☐	No				

Remarks: This sampling point has some characteristics of a wetland, but is considered a contiguous part of the pond (seep/stream/pond complex). This is due to its elevation in relationship with the pond, its appearance of regular inundation, and other indicators such as scour, lack of vegetation, etc.
Data Collection Point N 36° 05' 57.4" W 85° 50' 02.2"

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Center Hill Dam Quarry Area	Date:	6 March 2008
Applicant/Owner:	US Army Corps of Engineers	County:	DeKalb
Investigator:	Scott Fanning	State:	TN

Do Normal Circumstances exist on the site?	☒	Yes	☐	No	Community ID:
Is the site significantly disturbed (Atypical Situation)?	☐	Yes	☒	No	Transect ID:
Is Area a Potential Problem Area? *(if needed, explain on reverse)*	☐	Yes	☒	No	Plot ID: 3

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	*Juniperus virginiana*	Tree	FACU-	8			
2	*Ligustrum sp.*	Shrub	FACU	9			
3	*Festuca sp.*	Grass	FAC-	10			
4				11			
5				12			
6				13			
7				14			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 0%

Remarks:

HYDROLOGY

☐ Recorded Data (describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☒ No recorded data available

Field Observations:
- Depth of Surface Water: n/a (In.)
- Depth to Free Water in Pit: n/a (In.)
- Depth to Saturated Soil: n/a (In.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☐ Inundated
- ☐ Saturated in Upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☐ Oxidized Root Channels in Upper 12"
- ☐ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in remarks)

Remarks: Soils not saturated. Earthworms in soil 12"+ indicating aerobic nature of soil.

SOILS

Map Unit Name (Series and Phase): Mine/Pit
Taxonomy (Subgroup):

Drainage Class: N/A
Field Observations Confirm Mapped Type? *Circle* (Yes) ~~No~~

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
12-14"	A/B	10YR 4/3			

Hydric Soil Indicators:
- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☐ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ Organic Streaking in Sandy Soils
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Listed on National Hydric Soils List
- ☐ Listed on Local Hydric Soils List
- ☐ Other (explain in remarks)

Remarks: Soils not saturated or gleyed. Earthworms present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☐	Yes	☒	No	Is this Sampling Point Within a Wetland?	☐	Yes ☒ No
Wetland Hydrology Present?	☐	Yes	☒	No			
Hydric Soils Present?	☐	Yes	☒	No			

Remarks: Data Collection Point N 36° 05' 56.4" W 85° 50' 00.8"

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Center Hill Dam Quarry Area	Date:	6 March 2008
Applicant/Owner:	US Army Corps of Engineers	County:	DeKalb
Investigator:	Scott Fanning	State:	TN

Do Normal Circumstances exist on the site?	☒	Yes	☐	No	Community ID:
Is the site significantly disturbed (Atypical Situation)?	☐	Yes	☒	No	Transect ID:
Is Area a Potential Problem Area? *(if needed, explain on reverse)*	☐	Yes	☒	No	Plot ID: 4

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	*Typha sp.*	Forb	OBL	8			
2	*Salix nigra*	Tree	OBL	9			
3	*Festuca sp.*	Grass	FAC-	10			
4	*Carex sp.*	GL	FACW	11			
5	*Rumex sp.*	Forb	FACW	12			
6				13			
7				14			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 90%

Remarks:

HYDROLOGY

☐ Recorded Data (describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☒ No recorded data available

Field Observations:
- Depth of Surface Water: n/a (In.)
- Depth to Free Water in Pit: 6" (In.)
- Depth to Saturated Soil: Surface (In.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☐ Inundated
- ☒ Saturated in Upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☒ Oxidized Root Channels in Upper 12"
- ☒ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in remarks)

Remarks: Soils saturated at surface. Standing water at 6". Water stained leaves and oxidized root channels observed.

SOILS

Map Unit Name (Series and Phase): Mine/Pit
Taxonomy (Subgroup):

Drainage Class: N/A
Field Observations Confirm Mapped Type? (Yes) ~~No~~ *Circle*

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
12-14"	A/B	10YR 4/2			

Hydric Soil Indicators:
- ☐ Histosol
- ☐ Histic Epipedon
- ☒ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☒ Concretions
- ☐ Organic Streaking in Sandy Soils
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Listed on National Hydric Soils List
- ☐ Listed on Local Hydric Soils List
- ☐ Other (explain in remarks)

Remarks: Low-chroma soils saturated. Sulfidic odors present. Some concretions and mottling observed.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☒	Yes	☐	No	Is this Sampling Point Within a Wetland?	☒	Yes ☐ No
Wetland Hydrology Present?	☒	Yes	☐	No			
Hydric Soils Present?	☒	Yes	☐	No			

Remarks: Data Collection Point N 36° 05' 56.4" W 85° 50' 01.2"

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Center Hill Dam Quarry Area	Date:	6 March 2008
Applicant/Owner:	US Army Corps of Engineers	County:	DeKalb
Investigator:	Scott Fanning	State:	TN

Do Normal Circumstances exist on the site?	☒	Yes	☐	No	Community ID:
Is the site significantly disturbed (Atypical Situation)?	☐	Yes	☒	No	Transect ID:
Is Area a Potential Problem Area? *(if needed, explain on reverse)*	☐	Yes	☒	No	Plot ID: 5

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	*Typha sp.*	Forb	OBL	8			
2	*Salix nigra*	Tree	OBL	9			
3	*Festuca sp.*	Grass	FAC-	10			
4				11			
5				12			
6				13			
7				14			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 90%

Remarks:

HYDROLOGY

☐ Recorded Data (describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☒ No recorded data available

Field Observations:
- Depth of Surface Water: n/a (In.)
- Depth to Free Water in Pit: 3" (In.)
- Depth to Saturated Soil: Surface (In.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☐ Inundated
- ☒ Saturated in Upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☒ Oxidized Root Channels in Upper 12"
- ☒ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in remarks)

Remarks: Soils saturated at surface. Standing water at 3". Bedrock at 4".

SOILS

Map Unit Name (Series and Phase): Mine/Pit
Taxonomy (Subgroup):

Drainage Class: N/A
Field Observations Confirm Mapped Type? *Circle* (Yes) ~~No~~

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
4"	O/A/B	10YR 2/2			

Hydric Soil Indicators:
- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☒ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ Organic Streaking in Sandy Soils
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Listed on National Hydric Soils List
- ☐ Listed on Local Hydric Soils List
- ☐ Other (explain in remarks)

Remarks: Low-chroma soils saturated.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☒	Yes	☐	No	Is this Sampling Point Within a Wetland?	☒	Yes ☐ No
Wetland Hydrology Present?	☒	Yes	☐	No			
Hydric Soils Present?	☒	Yes	☐	No			

Remarks: Data Collection Point N 36° 05' 55.6" W 85° 50' 01.0"

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Center Hill Dam Quarry Area	Date:	6 March 2008
Applicant/Owner:	US Army Corps of Engineers	County:	DeKalb
Investigator:	Scott Fanning	State:	TN

			Community ID:	
Do Normal Circumstances exist on the site?	☒ Yes	☐ No	Transect ID:	
Is the site significantly disturbed (Atypical Situation)?	☐ Yes	☒ No	Plot ID:	6
Is Area a Potential Problem Area? *(if needed, explain on reverse)*	☐ Yes	☒ No		

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	*Salix nigra*	Tree	OBL	8			
2	*Typha sp.*	Forb	OBL	9			
3	*Festuca sp.*	Grass	FAC-	10			
4				11			
5				12			
6				13			
7				14			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 95%

Remarks:

HYDROLOGY

☐ Recorded Data (describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☒ No recorded data available

Field Observations:
- Depth of Surface Water: 0-1" (In.)
- Depth to Free Water in Pit: 1" (In.)
- Depth to Saturated Soil: Surface (In.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☐ Inundated
- ☒ Saturated in Upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☒ Oxidized Root Channels in Upper 12"
- ☒ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in remarks)

Remarks: Very shallow soils composed mostly of decomposed/decomposing organic materials saturated at surface. Standing water at surface. Bedrock 1 - 3" below surface.

SOILS

Map Unit Name (Series and Phase): Mine/Pit
Taxonomy (Subgroup):

Drainage Class: N/A
Field Observations Confirm Mapped Type? *Circle* (Yes) ~~No~~

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
3"	O	N/A*			Organic content

Hydric Soil Indicators:
- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ Organic Streaking in Sandy Soils
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Listed on National Hydric Soils List
- ☐ Listed on Local Hydric Soils List
- ☐ Other (explain in remarks)

Remarks: * Soils composed almost entirely of decomposed/decomposing organic materials saturated at surface.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☒ Yes	☐ No	Is this Sampling Point Within a Wetland?	☒ Yes ☐ No
Wetland Hydrology Present?	☒ Yes	☐ No		
Hydric Soils Present?	☒ Yes	☐ No		

Remarks: Data Collection Point N 36° 05' 54.9" W 85° 50' 00.9"

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Center Hill Dam Quarry Area	Date:	6 March 2008
Applicant/Owner:	US Army Corps of Engineers	County:	DeKalb
Investigator:	Scott Fanning	State:	TN

			Community ID:	
Do Normal Circumstances exist on the site?	☒ Yes	☐ No	Transect ID:	
Is the site significantly disturbed (Atypical Situation)?	☐ Yes	☒ No	Plot ID:	7
Is Area a Potential Problem Area? *(if needed, explain on reverse)*	☐ Yes	☒ No		

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	*Salix nigra*	Tree	OBL	8			
2	*Typha sp.*	Forb	OBL	9			
3	*Festuca sp.*	Grass	FAC-	10			
4				11			
5				12			
6				13			
7				14			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 95%

Remarks:

HYDROLOGY

☐ Recorded Data (describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☒ No recorded data available

Field Observations:
- Depth of Surface Water: 1" (In.)
- Depth to Free Water in Pit: 0 (In.)
- Depth to Saturated Soil: Surface (In.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☒ Inundated
- ☒ Saturated in Upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☒ Oxidized Root Channels in Upper 12"
- ☒ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in remarks)

Remarks: Very shallow soils composed mostly of decomposed/decomposing organic materials saturated/inundated at surface. Standing water at surface. Bedrock 1 - 3" below surface.

SOILS

Map Unit Name (Series and Phase): Mine/Pit
Taxonomy (Subgroup):

Drainage Class: N/A
Field Observations Confirm Mapped Type? (Yes) ~~No~~ *Circle*

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
3"	O	N/A*			Organic content

Hydric Soil Indicators:
- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ Organic Streaking in Sandy Soils
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Listed on National Hydric Soils List
- ☐ Listed on Local Hydric Soils List
- ☐ Other (explain in remarks)

Remarks: * Soils composed almost entirely of decomposed/decomposing organic materials saturated/inundated at surface.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	☒ Yes	☐ No	Is this Sampling Point Within a Wetland?	☒ Yes ☐ No
Wetland Hydrology Present?	☒ Yes	☐ No		
Hydric Soils Present?	☒ Yes	☐ No		

Remarks: Data Collection Point N 36° 05' 54.3" W 85° 50' 00.1"

Form Content Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project Site:	Center Hill Dam Quarry Area	Date:	6 March 2008
Applicant/Owner:	US Army Corps of Engineers	County:	DeKalb
Investigator:	Scott Fanning	State:	TN

					Community ID:	
Do Normal Circumstances exist on the site?	☒	Yes	☐	No	Transect ID:	
Is the site significantly disturbed (Atypical Situation)?	☐	Yes	☒	No	Plot ID:	8
Is Area a Potential Problem Area? *(if needed, explain on reverse)*	☐	Yes	☒	No		

VEGETATION

	Dominant Plant Species	Stratum	Indicator		Dominant Plant Species	Stratum	Indicator
1	*Salix nigra*	Tree	OBL	8			
2	*Typha sp.*	Forb	OBL	9			
3	*Festuca sp.*	Grass	FAC-	10			
4				11			
5				12			
6				13			
7				14			

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-): 95%

Remarks:

HYDROLOGY

☐ Recorded Data (describe in Remarks)
- ☐ Stream, Lake, or Tide Gauge
- ☐ Aerial Photographs
- ☐ Other

☒ No recorded data available

Field Observations:
- Depth of Surface Water: 1-2" (In.)
- Depth to Free Water in Pit: 0" (In.)
- Depth to Saturated Soil: Surface (In.)

Wetland Hydrology Indicators:

Primary Indicators:
- ☒ Inundated
- ☒ Saturated in Upper 12 inches
- ☐ Water Marks
- ☐ Drift Lines
- ☐ Sediment Deposits
- ☐ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ☒ Oxidized Root Channels in Upper 12"
- ☒ Water-Stained Leaves
- ☐ Local Soil Survey Data
- ☐ FAC-Neutral Test
- ☐ Other (explain in remarks)

Remarks: Very shallow soils composed entirely of decomposed/decomposing organic materials saturated/inundated at surface. Standing water at surface. Bedrock 1 - 2" below surface.

SOILS

Map Unit Name (Series and Phase): Water
Taxonomy (Subgroup):

Drainage Class: N/A
Field Observations Confirm Mapped Type? ~~Yes~~ (No) *Circle*

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
2"	O	N/A*			Organic content

Hydric Soil Indicators:
- ☐ Histosol
- ☐ Histic Epipedon
- ☐ Sulfidic Odor
- ☐ Aquic Moisture Regime
- ☒ Reducing Conditions
- ☐ Gleyed or Low-Chroma Colors
- ☐ Concretions
- ☐ Organic Streaking in Sandy Soils
- ☐ High Organic Content in Surface Layer in Sandy Soils
- ☐ Listed on National Hydric Soils List
- ☐ Listed on Local Hydric Soils List
- ☐ Other (explain in remarks)

Remarks: * Soils composed entirely of decomposed/decomposing organic materials saturated/inundated at surface.

WETLAND DETERMINATION

					Is this Sampling Point Within a Wetland?		
Hydrophytic Vegetation Present?	☒	Yes	☐	No		☒	Yes ☐ No
Wetland Hydrology Present?	☒	Yes	☐	No			
Hydric Soils Present?	☒	Yes	☐	No			

Remarks: Data Collection Point N 36° 05' 52.7" W 85° 49' 59.7"

Form Content Approved by HQUSACE 3/92

Photo 1
Pond looking upstream (south) from weir

Photo 2
Data Point #2 is located immediately left of standing water (pond)

Photo 3
Probe of soils at Data Point #2

Photo 4
Soil well excavated at #2

Photo 5
Downstream limit of delineated wetland contiguous with upstream limit of pond, looking southwest

Photo 6
Soil well excavated at Data Point #4

Photo 7
Delineation of wetlands between Data Points #4 & 5 - Notice clear break between cedars and willows

Photo 8
Near Data Point #6

Photo 9
Vicinity of data point #7

Photo 10
Near Data Point #8 showing wetland near two seeps and along base of quarry bluff side (western) wall

Photo 11
Near #8, showing eastern portion of upstream wetland extent

Construction of Roller Compacted Concrete Reinforcement Berm Downstream of Center Hill Saddle Dam

The U.S. Army Corps of Engineers (Corps) is proposing a new repair alternative to remediate seepage at the Center Hill (CEN) saddle dam. The proposed alternative is to construct a Roller Compacted Concrete Reinforcement Berm (RCC Berm) at the landside base of the current saddle dam. A topographical map depicting the project footprint can be found in Figure 1.

Description: The CEN saddle dam is located within the Caney watershed (05130108) and is approximately 1500 linear feet from the CEN dam. The saddle dam is an earthen embankment that is 100 feet (ft) tall and 780 ft long. The top of dam is 35 ft wide and the base is approximately 600 ft wide. The saddle dam earthen embankment is constructed of high quality, well-compacted clay. The top of the fuse plug is at elevation 692 and the top of the saddle dam is at elevation 658.

The saddle dam fuse plug is an 8-ft thick clay core covered with filter sand, erodible sands, and gravels. Riprap was placed on the lake side for erosion protection and a sheet pile wall was installed into the riprap to discourage wave during flood water storage. Concrete panels, 20 ft long, by 20 ft wide and 1.5 ft thick, were cast in place on the land side to protect the earthen embankment. Clean white sand was placed beneath the concrete panels across the entire embankment and abutments. The fuse plug is designed to protect the main dam by eroding away when it is over-topped during a catastrophic flood. The concrete panels allow the saddle dam to function as an emergency spillway until the lake reaches elevation 658.0. This action preserves most of the lake and prevents disastrous flooding and loss of most of the lake should the main or saddle dam collapse (Figure 2).

The site geology is characterized by numerous springs, sinks, and seeps. These features are typical of soluble limestone of the region and indicative of a well-developed karst terrain. Since construction in 1949, CEN saddle dam has had seepage troubles. Known seepage around the left and right rims are inherent given the underlying karst geology of the area. However, due to recent foundation investigations a detailed analysis of the saddle dam was conducted. Study results led to the determination that seepage from the saddle dam had increase. As mentioned previously, clean sand was placed beneath the concrete panels atop the saddle dam. Sand has been flowing out of drain holes at the bottom of the spillway chute. Several cubic yards of sand has been removed from the bottom of the spillway floor (Figure 3). Excessive loss of sand implies the presence of large voids and piping underneath the concrete panels. Based on these conditions, if the saddle dam is overtopped, cascading water could undercut and dislodge the panels and erode the earthen saddle dam resulting in loss of most of the lake. An RCC Berm, constructed below the saddle dam, has been recommended. The RCC Berm would not correct current seepage issues with the saddle dam but in the event of a saddle dam failure it would preserve the lake at an elevation of 658 feet.

Conceptual Design: Preliminary design of an RCC Berm is shown in Figure 4. The RCC berm would be approximately 100 ft tall and 900 ft long with the base being 160 ft wide and the top crest approximately 30 ft wide at elevation 658.

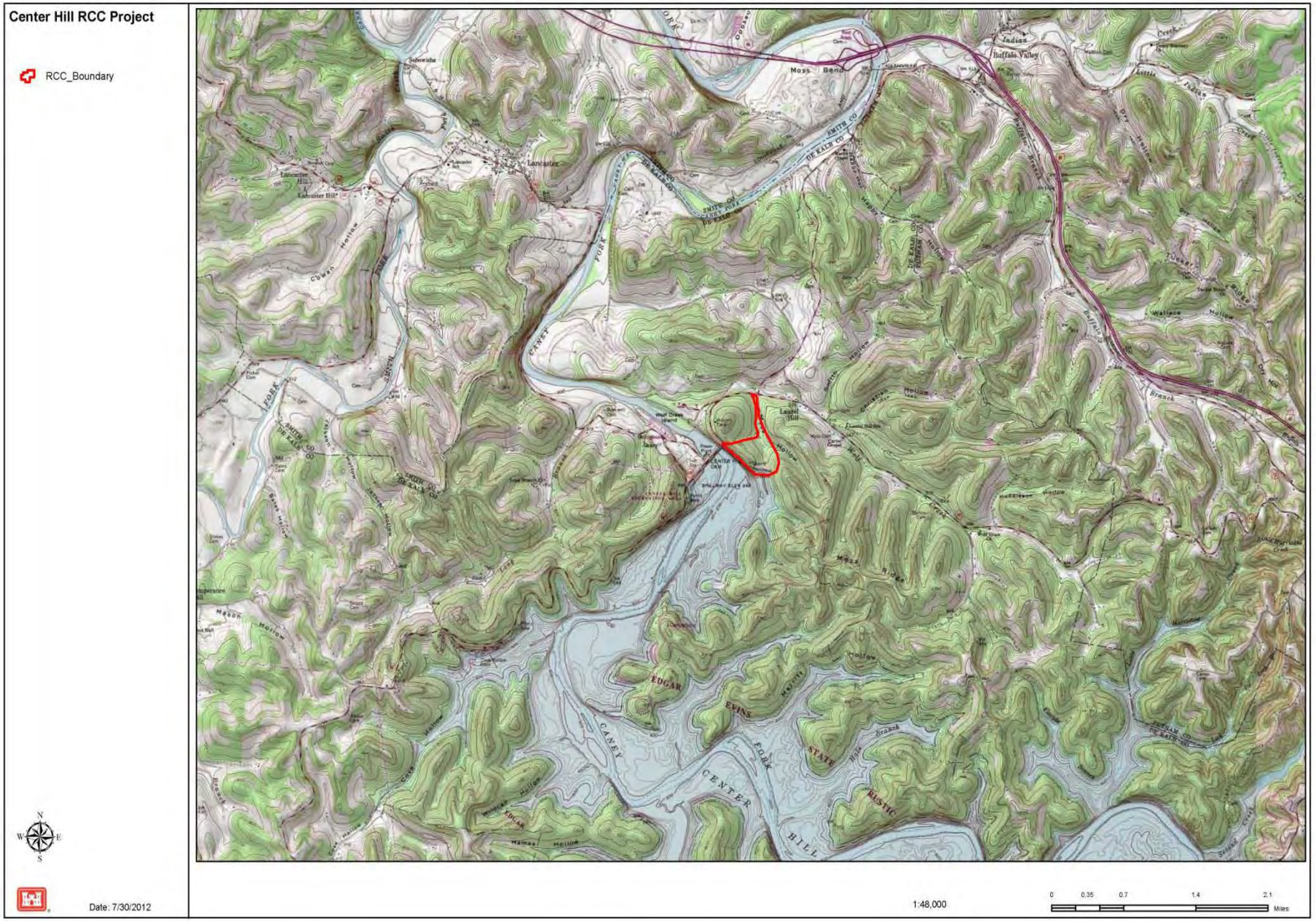


Figure 1. Topographical Map showing Vicinity of Proposed Project Location

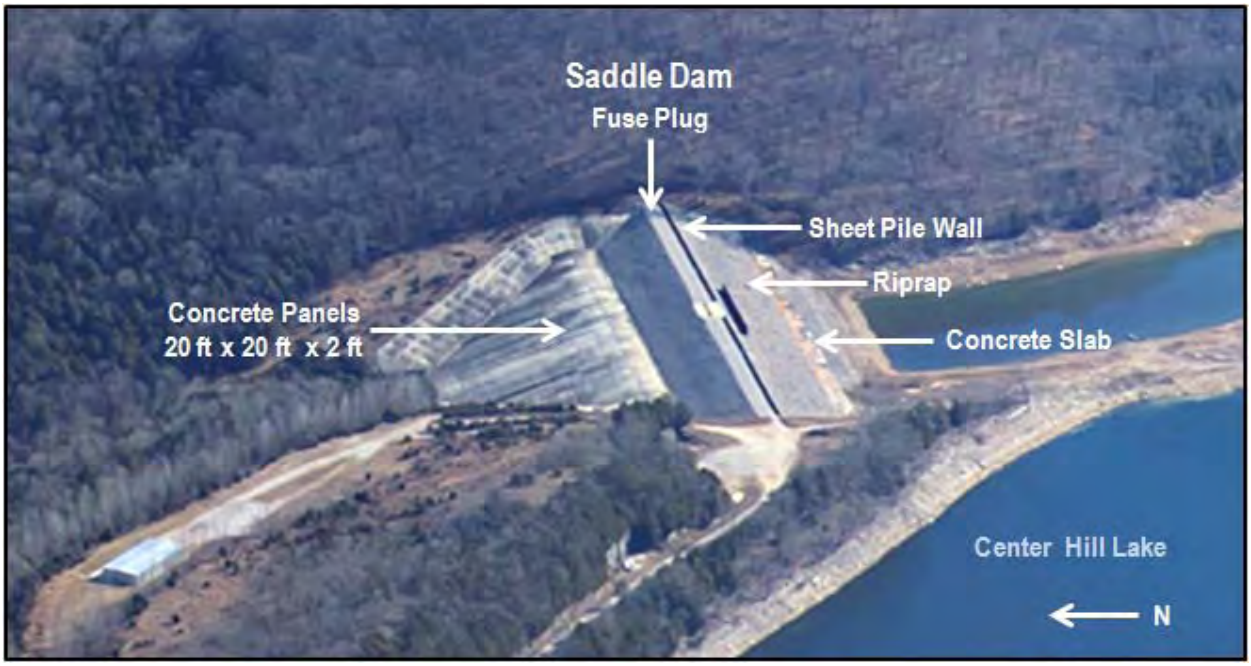


Figure 2. Exisitng Saddle Dam Layout at Center Hill Dam

It would be a solid concrete structure constructed with layers of compacted concrete. A 3 ft by 3 ft culvert would be constructed into the base of the RCC Berm to drain water that collects between the saddle dam and RCC Berm.

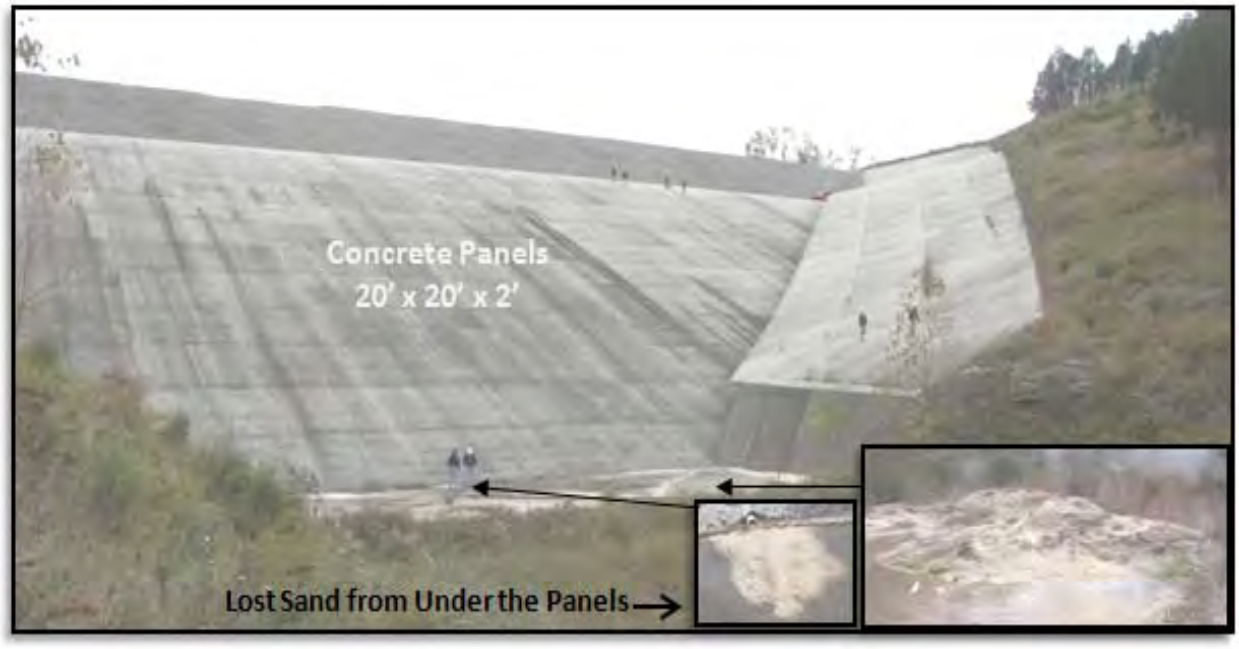


Figure 3. Picture depicting sand for the existing Saddle Dam.

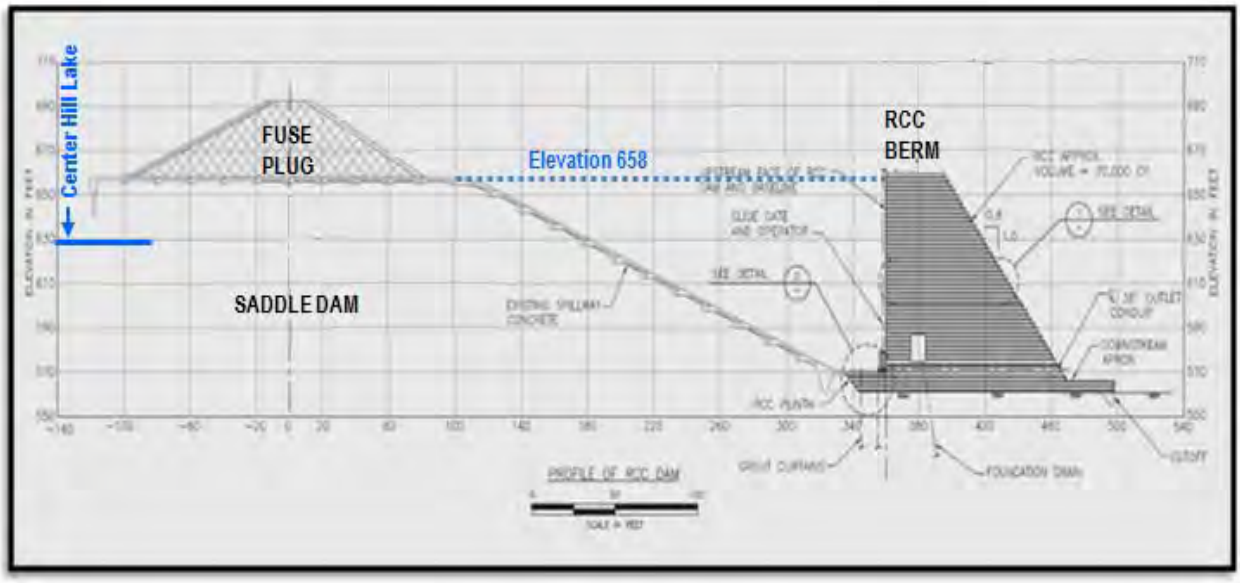


Figure 4. Conceptual Design – Cross-section of the Saddle Dam and RCC Berm Alternative.

Project: The proposed project footprint is approximately 55 acres. The proposed project footprint is composed of approximately 31 acres of mature deciduous/evergreen forest. The remaining 24 acres includes the saddle dam and old fields in different stages of growth (Figure 5). Within the project footprint approximately 3595 linear feet of stream, 558 linear feet of wet weather conveyance, and 0.34 acres of wetland areas have been identified. Streams and WWC were delineated by a Qualified Hydrologic Professional In -Training using Tennessee's Hydrologic Determination. Wetland areas were delineated using the Interim regional supplement to the Corps wetland delineation manual: Eastern Mountains and Piedmont Region.

An access road to the bottom of the saddle dam, approximately 3,000 ft long, would be widened from the existing 15 ft to 30 ft to accommodate large equipment. Pull-overs may be considered if the road narrows at some locations along the road. The access road would be widened into the hillside to avoid disturbing the adjacent intermittent stream – Moss Hollow Branch. Road improvements would likely include one stream crossing and would be constructed to meet the limitations of TDEC's General Permit for Construction and Removal of Minor Road Crossings.

Construction of the proposed RCC Berm would require excavation. The base of the RCC Berm is approximately 780 ft long and 160 ft wide. The proposed RCC Berm would be excavated 50 ft deep so the berm foundation can be notched into the bedrock. Additional improvements to existing roads could consist of installing a guard rail, removing selected trees, and scarifying the bluff to remove loose rock to prevent rock from falling onto vehicles and equipment using the road.

Concrete batch plants may be located on-site or off-site, permitted batch plants may be used. Sand and gravel stockpiles may be stockpiled on site in the level areas in the valley floor below the saddle dam or in the disposal area at the top of the saddle dam. These materials may be stored off-site and/or in a previously disturbed area.

Figure 5. Aerial View of Proposed Project Site.

Borrow material would come from an approved commercial source or an approved permitted site. Previously disturbed disposal sites are located on the Center Hill Dam and Lake Project. Rock, soil, cured concrete, and rock chips may be a source for access road building or fill for a lay down area. If an off-site disposal site is used, the material should be recycled for beneficial use or placed in an approved commercial or permitted site. Any disposal that would be placed in another location would require further National Environmental Policy Act review by the Corps (wetlands, Cultural Resources, Floodplain Management, etc). All actions would be conducted using best management practices.

Wetland, Wet Weather Conveyance, and Stream Descriptions

Two wetland areas (0.34 total acres) are located within the proposed project footprint (Figure 6). One of the wetland areas (WET-001) is classified as a slope wetland under the HGM classification system (HGM) and a PSS1E/PEM1E using the Cowardin Classification system (Cowardin) and is appoximately 0.21 acres. WET-001 is located on the edge of the project border and is surrounded by Moss Creek. WET-001 would not be impacted due to the construction of the RCC Berm, road improvements and/or timber removals. The other wetland area (WET-002) is classified as a depression by HGM and a PEM1C using Cowardin and is approximately 0.13 acres in size. Hydrology for WET-002 is influenced by two springs located at the toe of the slope. The areas surrounding WET-002 has been used for storage by Edgar Evins State Park. WET-002 would be filled and used as a lay down area (See Figure 7).

Approximately 5867 linear feet of streams and 2372 linear feet of wet weather conveyances (wwc) are located within/surrounding the project boundary (Figure 8). Within the project boundary there are five wet weather conveyances (558 linear feet) and three streams (3595 linear feet). Table 1 shows the approximate lengths and classification of each stream/wwc within the proposed project boundary.

Table 1. Stream and WWC Lengths

NAME	**LENGTH** (ft)
STR-001	2807
STR-002	688
STR-003	100 *
WWC-001	10 *
WWC-002	20 *
WWC-003	10 *
WWC-004	76
WWC-005	472

* Section continues off of proposed project boundary.

Impacts

Approximately 0.13 acres of WET-002 are proposed to be filled within the proposed project footprint. An erosion control blanket and rock are to be placed over the site to contain any erosion from leaving the site. This would include WET-002. Additionally, this area is to be used

Figure 6. Wetland Locations within the Proposed Project Footprint.

Figure 7. Proposed Fill of WET-002.

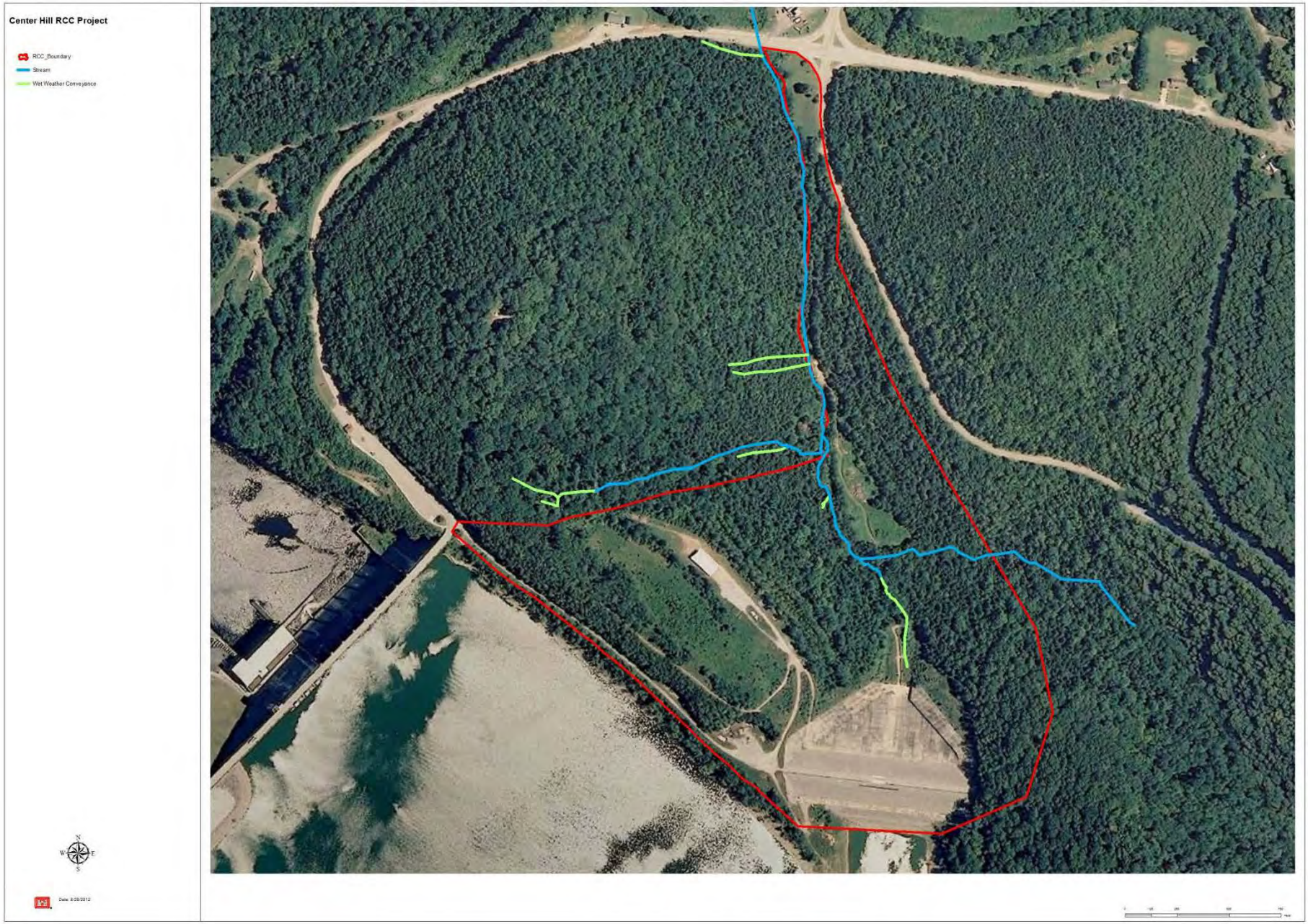


Figure 8. Stream and WWC Locations within and surrounding the Proposed Project Footprint.

as a lay down area/storage during the construction phase of the RCC Berm. After the proposed RCC Berm is constructed soil would be placed on top of the rock and the area would be planted with native vegetation.

WWC-005 and STR-003 are the only streams/wwc that would be impacted during the construction of the RRC Berm, road improvements, and timber removal. STR-003 would have one permanent stream crossing, approximately 50 linear feet, and temporary encapsation of 450 linear feet of stream. WWC-005 (472 linear feet) would be completely excavated due to the construction of the RCC Berm. Project plans can be found in Appendix A.

Photographs, photograph location map, and starting/ending points of proposed impacted areas can be found in Appendix B.

Pictures, Hydrologic Determination Datasheet, and Wetland Delineation Datasheets can be found in Appendix C.

Mitigation

Mitigation would be required for the loss of wetland habitat. The Corps is proposing that mitigation be at a 2:1 ratio (0.26 acres). Since there is a proposed wetland mitigation bank, Baker's Crossroads Mitigation Bank, within the same HUC 8 watershed credits would be purchased to mitigate for the loss of wetland habitat prior to construction.

The temporary encapsation and permanent road crossing for STR-003 would require mitigation. The Corps is proposing credit be purchased for the Stream In-lieu fee program to mitigate for the loss of stream habitat. The section of STR-003 which was temporary encapsated during the construction of the RCC Berm would be restored to its original state.

WWC-005 would require no mitigation since it is classified as a wwc. However, a stream channel would be constructed to "reconnect" the hydrology/flow to STR-001 once the RCC Berm construction is completed.

Appendix A

Project Plans

Center Hill RCC Project

- RCC_Boundary
- Gravel Road
- Main Road
- Building
- Out Building
- Radio Tower
- "NEW" Road
- Stream
- Wet Weather Conveyance
- wetland
- Stream_Crossing
- Temp_Stream_Encapsation
- Stream_Buffer
- Timber_Cuts

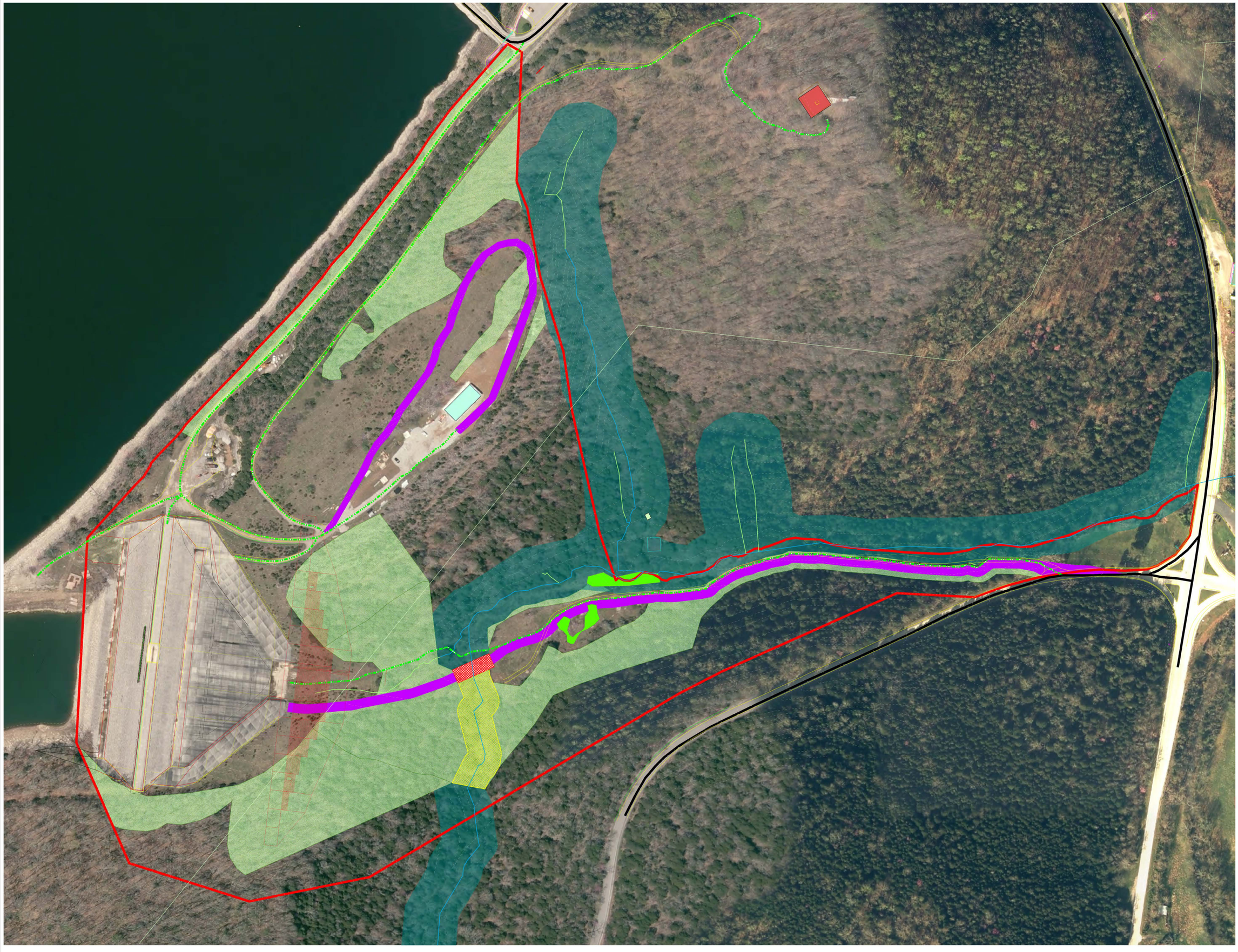
W
S
N
E

Date: 10/16/2012

0 100 200 400 600
Feet

Center Hill RCC Project

- RCC_Boundary
- Gravel Road
- Main Road
- Building
- Out Building
- Radio Tower
- "NEW" Road
- Stream
- Wet Weather Conveyance
- wetland
- Stream_Crossing
- Temp_Stream_Encapsation
- Stream_Buffer
- Timber_Cuts



Date: 10/16/2012

0 100 200 400 600
Feet

Appendix B

Photographs of Wetland, Stream, and Wet Weather Conveyance Proposed to be Alter

Figure 9. Picture Locations

SEGMENT	STARTING POINT		ENDING POINT	
	LAT	LONG	LAT	LONG
STR-003	36.097715	-85.815845	36.098424	-85.819455
WWC-005	36.097276	-85.818826	36.09821	-85.819162

All Pictures were taken April 19, 2012

Picture 1. WET – 002. Lat 36.099337 Long -85.81965

Picture 2. WET – 002. Lat 36.099133 Long -85.819443

Picture 3. STR - 003. Lat 36.098425 Long -85.819359

Picture 4. STR - 003. Lat 36.098505 Long -85.818825

Picture 5. STR – 003. Lat 36.098488 Long -85.818532

Picture 6. WWC – 005. Lat 36.098019 Long -85.819049

Picture 8. WWC – 005. Lat 36.097739 Long -85.818833

Appendix C

Datasheets

HYDROLOGIC DETERMINATION FIELD DATA SHEET

Tennessee Division of Water Pollution Control, Version 1.4

County: Dekalb	Named Waterbody: Moss Creek	Date/Time: 4/17/2012
Assessors/Affiliation: Matthew Granstaff		ProjectID: STR-001
Site Name/Description: Center Hill Dam Rehabilitation Project		
Site Location: Center Hill Dam Saddle Dam		
USGS quad: Center-Hill Dam	HUC (12 digit): 051301080903 051301080905	Latitude: 36.09821
		Longitude: -85.819162
Previous Rainfall (7-days):		
Precipitation this Season vs Normal: average	Watershed Size:	
Soil Type(s)/Geology: At, MmF, MoD2, MmD, Ro, DAM	Source: USGS Soils Data	Photos: yes
Surrounding Land Use: Deciduous/Evergreen Forest, Developed, Barren Lands, Pasture/Hay, Wetland, and Open Water		
Degree of historical alteration: Moderate *Describe fully in Notes*		

Primary Field Indicators Observed

1.	Hydrologic feature exists soley due to a process discharge	no
2.	Defined bed and bank absent, dominated by upland vegetation / grass	no
3.	Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	no
4.	Daily flow and precipitation records showing feature only flows in direct responce to rainfall	no
5.	Presence of multiple populations of obligate lotic organisms with > 2 month aquatic phase	no
6.	Presence of fish (except *Gambusia*)	no
7.	Presence of naturally occuring ground water table connection	yes - Stream
8.	Flowing water in channel and 7 days since last precipitation in local watershed	yes - Stream
9.	Evidence watercourse has been used as a supply of drinking water	no

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absenct directly contradictory evidence, determination is complete

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary secondary indicators is provided in

TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4

Overall Hydrologic Determination =	**Stream**
Secondary Indicator Score (if applicable) =	

Justification/ Notes:

Site previously disturbed during the construction of Center Hill Dam and Saddle Dam. An access road to bottom of saddle dam runs parallel to STR-001.

Secondary Field Indicators Evaluation

A. Geomorphology

		Absent	Weak	Moderate	Strong
1.	Continuous bed and bank	0	1	2	3
2.	Sinuous channel	0	1	2	3
3.	In-channel structure: riffle-pool sequences	0	1	2	3
4.	Sorting of soil textures or other substrate	0	1	2	3
5.	Active/relic floodplain	0	1	2	3
6.	Depostional bars or benches	0	1	2	3
7.	Braided channel	0	1	2	3
8.	Recent alluvial deposits	0	0.5	1	1.5
9.	Natural leeves	0	1	2	3
10.	Headcuts	0	1	2	3
11.	Grade controls	0	0.5	1	1.5
12.	Natural valley or drainageway	0	0.5	1	1.5
13.	At least second order channel on existing USGS or NRCS map	No = 0		Yes = 3	

B. Hydrology

		Absent	Weak	Moderate	Strong
14.	Subsurface flow/discharge into channel	0	1	2	3
15.	Water in channel and > 48 hours since sig. rain	0	1	2	3
16.	Leaf litter in channel (January - September)	1.5	1	0.5	0
17.	Sediment on plants or on debris	0	0.5	1	1.5
18.	Organic debris lines or piles (wrack lines)	0	0.5	1	1.5
19.	Hydric soils in stream bed or sides of channel	No = 0		Yes = 3	

C. Biology

		Absent	Weak	Moderate	Strong
20.	Fibrous roots in channel	3	2	1	0
21.	Rooted plants in channel	3	2	1	0
22.	Crayfish in stream (exclude in fllodplain)	0	0.5	1	1.5
23.	Bivalves/mussels	0	1	2	3
24.	Amphibians	0	0.5	1	1.5
25.	Macrobenthos (record type abundance)	0	1	2	3
26.	Filamentous algae; periphyton	0	1	2	3
27.	Iron oxidizing bacteria/fungus	0	0.5	1	1.5
28.	Wetland plants in channel	0	0.5	1	2

Total Points =

Under Normal Conditions, Watercourse is a Wet Weather Conveyance is Secondary Indicators Score < 19 points

Notes:

Two channels come together at road crossing. Stream segment is fed by several seeps/springs. Caddis fly casings and larvae, stoneflies, mayflies, beetles, crayfish, and two lined salamaders (larvae/juvenile) present.

ProjectID:	STR-001		
Site Name/Description:	Center Hill Dam Rehabilitation	Latitude:	36.09821
Site_Location	Center Hill Dam Saddle Dam	Longitude:	-85.819162

HYDROLOGIC DETERMINATION FIELD DATA SHEET

Tennessee Division of Water Pollution Control, Version 1.4

County: Dekalb	Named Waterbody: Unnamed Tributary	Date/Time: 4/17/2012
Assessors/Affiliation: Matthew Granstaff		ProjectID: STR-002
Site Name/Description: Center Hill Dam Rehabilitation Project		
Site Location: Center Hill Dam Saddle Dam		
USGS quad: Center-Hill Dam	HUC (12 digit): 051301080903 051301080905	Latitude: 36.099142
		Longitude: -85.822921
Previous Rainfall (7-days):		
Precipitation this Season vs Normal: average	Watershed Size:	
Soil Type(s)/Geology: At, MmF, MoD2, MmD, Ro, DAM	Source: USGS Soils Data	Photos: yes
Surrounding Land Use: Deciduous/Evergreen Forest, Developed, Barren Lands, Pasture/Hay, Wetland, and Open Water		
Degree of historical alteration: Slight *Describe fully in Notes*		

Primary Field Indicators Observed

1.	Hydrologic feature exists soley due to a process discharge	no
2.	Defined bed and bank absent, dominated by upland vegetation / grass	no
3.	Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	no
4.	Daily flow and precipitation records showing feature only flows in direct responce to rainfall	no
5.	Presence of multiple populations of obligate lotic organisms with > 2 month aquatic phase	no
6.	Presence of fish (except *Gambusia*)	no
7.	Presence of naturally occuring ground water table connection	no
8.	Flowing water in channel and 7 days since last precipitation in local watershed	no
9.	Evidence watercourse has been used as a supply of drinking water	no

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absenct directly contradictory evidence, determination is complete

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary secondary indicators is provided in

TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4

Overall Hydrologic Determination =	**Stream**
Secondary Indicator Score (if applicable) =	**21.50**

Justification/ Notes:

Site previously disturbed during the construction of Center Hill Dam and Saddle Dam. Historic home place is next to STR-002. Two sections, very short, are influenced by spring/seeps. Since sections were so short number 7 of primary field indicators was not checked.

Secondary Field Indicators Evaluation

A. Geomorphology

			Absent	Weak	Moderate	Strong
1.	Continuous bed and bank	2	0	1	2	3
2.	Sinuous channel	2	0	1	2	3
3.	In-channel structure: riffle-pool sequences	2	0	1	2	3
4.	Sorting of soil textures or other substrate	1	0	1	2	3
5.	Active/relic floodplain	1	0	1	2	3
6.	Depostional bars or benches	1	0	1	2	3
7.	Braided channel	0	0	1	2	3
8.	Recent alluvial deposits	0	0	0.5	1	1.5
9.	Natural leeves	0	0	1	2	3
10.	Headcuts	1	0	1	2	3
11.	Grade controls	1	0	0.5	1	1.5
12.	Natural valley or drainageway	1.5	0	0.5	1	1.5
13.	At least second order channel on existing USGS or NRCS map	0	No = 0		Yes = 3	

B. Hydrology

			Absent	Weak	Moderate	Strong
14.	Subsurface flow/discharge into channel	1	0	1	2	3
15.	Water in channel and > 48 hours since sig. rain	0	0	1	2	3
16.	Leaf litter in channel (January - September)	1.5	1.5	1	0.5	0
17.	Sediment on plants or on debris	0	0	0.5	1	1.5
18.	Organic debris lines or piles (wrack lines)	0.5	0	0.5	1	1.5
19.	Hydric soils in stream bed or sides of channel	0	No = 0		Yes = 3	

C. Biology

			Absent	Weak	Moderate	Strong
20.	Fibrous roots in channel	1	3	2	1	0
21.	Rooted plants in channel	3	3	2	1	0
22.	Crayfish in stream (exclude in fllodplain)	0.5	0	0.5	1	1.5
23.	Bivalves/mussels	0	0	1	2	3
24.	Amphibians	0.5	0	0.5	1	1.5
25.	Macrobenthos (record type abundance)	1	0	1	2	3
26.	Filamentous algae; periphyton	0	0	1	2	3
27.	Iron oxidizing bacteria/fungus	0	0	0.5	1	1.5
28.	Wetland plants in channel	0	0	0.5	1	2

Total Points = 21.50

Under Normal Conditions, Watercourse is a Wet Weather Conveyance is Secondary Indicators Score < 19 points

Notes:

Channel splits at this point. Dusky Salamander (juvenile), caddisfly casings and larvae, and stonefly larvae present in sections. Sections of stream have seeps/springs which add hydrology to stream. Also, areas are dry.

ProjectID:	STR-002
Site Name/Description:	Center Hill Dam Rehabilitation
Site_Location	Center Hill Dam Saddle Dam

Latitude: 36.099142

Longitude: -85.822921

HYDROLOGIC DETERMINATION FIELD DATA SHEET

Tennessee Division of Water Pollution Control, Version 1.4

County: Dekalb	Named Waterbody: Moss Creek		Date/Time: 4/17/2012
Assessors/Affiliation: Matthew Granstaff			ProjectID: STR-003
Site Name/Description: Center Hill Dam Rehabilitation Project			
Site Location: Center Hill Dam Saddle Dam			
USGS quad: Center-Hill Dam	HUC (12 digit): 051301080903 051301080905		Latitude: 36.097715
			Longitude: -85.815845
Previous Rainfall (7-days):			
Precipitation this Season vs Normal: average		Watershed Size:	
Soil Type(s)/Geology: At, MmF, MoD2, MmD, Ro, DAM		Source: USGS Soils Data	Photos: yes
Surrounding Land Use: Deciduous/Evergreen Forest, Developed, Barren Lands, Pasture/Hay, Wetland, and Open Water			
Degree of historical alteration: Moderate *Describe fully in Notes*			

Primary Field Indicators Observed

1.	Hydrologic feature exists soley due to a process discharge	no
2.	Defined bed and bank absent, dominated by upland vegetation / grass	no
3.	Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	no
4.	Daily flow and precipitation records showing feature only flows in direct responce to rainfall	no
5.	Presence of multiple populations of obligate lotic organisms with > 2 month aquatic phase	no
6.	Presence of fish (except *Gambusia*)	no
7.	Presence of naturally occuring ground water table connection	no
8.	Flowing water in channel and 7 days since last precipitation in local watershed	no
9.	Evidence watercourse has been used as a supply of drinking water	no

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absenct directly contradictory evidence, determination is complete

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary secondary indicators is provided in

TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4

Overall Hydrologic Determination =	**Stream**
Secondary Indicator Score (if applicable) =	**29.00**

Justification/ Notes:

Site previously disturbed during the construction of Center Hill Dam and Saddle Dam. Two segments, short, are influenced by spring/seeps. Since sections were so short number 7 of primary field indicators was no selected. An access road crosses STR-003. Along with a dirt road which runs parellel to STR-003.

Secondary Field Indicators Evaluation

A. Geomorphology

			Absent	Weak	Moderate	Strong
1.	Continuous bed and bank	2	0	1	2	3
2.	Sinuous channel	2	0	1	2	3
3.	In-channel structure: riffle-pool sequences	2	0	1	2	3
4.	Sorting of soil textures or other substrate	2	0	1	2	3
5.	Active/relic floodplain	1	0	1	2	3
6.	Depostional bars or benches	1	0	1	2	3
7.	Braided channel	1	0	1	2	3
8.	Recent alluvial deposits	0.5	0	0.5	1	1.5
9.	Natural leeves	0	0	1	2	3
10.	Headcuts	2	0	1	2	3
11.	Grade controls	0.5	0	0.5	1	1.5
12.	Natural valley or drainageway	1.5	0	0.5	1	1.5
13.	At least second order channel on existing USGS or NRCS map	0	No = 0		Yes = 3	

B. Hydrology

			Absent	Weak	Moderate	Strong
14.	Subsurface flow/discharge into channel	1	0	1	2	3
15.	Water in channel and > 48 hours since sig. rain	2	0	1	2	3
16.	Leaf litter in channel (January - September)	1	1.5	1	0.5	0
17.	Sediment on plants or on debris	0.5	0	0.5	1	1.5
18.	Organic debris lines or piles (wrack lines)	1	0	0.5	1	1.5
19.	Hydric soils in stream bed or sides of channel	3	No = 0		Yes = 3	

C. Biology

			Absent	Weak	Moderate	Strong
20.	Fibrous roots in channel	1	3	2	1	0
21.	Rooted plants in channel	2	3	2	1	0
22.	Crayfish in stream (exclude in fllodplain)	0.5	0	0.5	1	1.5
23.	Bivalves/mussels	0	0	1	2	3
24.	Amphibians	0.5	0	0.5	1	1.5
25.	Macrobenthos (record type abundance)	1	0	1	2	3
26.	Filamentous algae; periphyton	0	0	1	2	3
27.	Iron oxidizing bacteria/fungus	0	0	0.5	1	1.5
28.	Wetland plants in channel	0	0	0.5	1	2

Total Points = 29.00

Under Normal Conditions, Watercourse is a Wet Weather Conveyance is Secondary Indicators Score < 19 points

Notes:

Springs found throughout and have sections between that are dry. Bedrock/Limestone channel for most of stream length. Caddis fly casings and larvae, stoneflies, mayflies, and two lined salamaders (larvae/juvenile) present.

ProjectID:	STR-003
Site Name/Description:	Center Hill Dam Rehabilitation
Site_Location	Center Hill Dam Saddle Dam

Latitude: 36.097715

Longitude: -85.815845

HYDROLOGIC DETERMINATION FIELD DATA SHEET

Tennessee Division of Water Pollution Control, Version 1.4

County: Dekalb	Named Waterbody: Unnamed Tributary		Date/Time: 4/17/2012
Assessors/Affiliation: Matthew Granstaff			ProjectID: WWC-001
Site Name/Description: Center Hill Dam Rehabilitation Project			
Site Location: Center Hill Dam Saddle Dam			
USGS quad: Center-Hill Dam	HUC (12 digit): 051301080903 051301080905		Latitude: 36.103767
			Longitude: -85.82073
Previous Rainfall (7-days):			
Precipitation this Season vs Normal: average	Watershed Size:		
Soil Type(s)/Geology: At, MmF, MoD2, MmD, Ro, DAM	Source: USGS Soils Data	Photos: yes	
Surrounding Land Use: Deciduous/Evergreen Forest, Developed, Barren Lands, Pasture/Hay, Wetland, and Open Water			
Degree of historical alteration: *Describe fully in Notes*			

Primary Field Indicators Observed

1.	Hydrologic feature exists soley due to a process discharge	no
2.	Defined bed and bank absent, dominated by upland vegetation / grass	no
3.	Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	no
4.	Daily flow and precipitation records showing feature only flows in direct responce to rainfall	no
5.	Presence of multiple populations of obligate lotic organisms with > 2 month aquatic phase	no
6.	Presence of fish (except *Gambusia*)	no
7.	Presence of naturally occuring ground water table connection	no
8.	Flowing water in channel and 7 days since last precipitation in local watershed	no
9.	Evidence watercourse has been used as a supply of drinking water	no

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absenct directly contradictory evidence, determination is complete

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary secondary indicators is provided in

TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4

Overall Hydrologic Determination =	**Wet Weather Conveyance**
Secondary Indicator Score (if applicable) =	**15.50**

Justification/ Notes:

Secondary Field Indicators Evaluation

A. Geomorphology

			Absent	Weak	Moderate	Strong
1.	Continuous bed and bank	2	0	1	2	3
2.	Sinuous channel	1	0	1	2	3
3.	In-channel structure: riffle-pool sequences	1	0	1	2	3
4.	Sorting of soil textures or other substrate	1	0	1	2	3
5.	Active/relic floodplain	1	0	1	2	3
6.	Depostional bars or benches	0	0	1	2	3
7.	Braided channel	1	0	1	2	3
8.	Recent alluvial deposits	0	0	0.5	1	1.5
9.	Natural leeves	0	0	1	2	3
10.	Headcuts	1	0	1	2	3
11.	Grade controls	0.5	0	0.5	1	1.5
12.	Natural valley or drainageway	1.5	0	0.5	1	1.5
13.	At least second order channel on existing USGS or NRCS map	0	No = 0		Yes = 3	

B. Hydrology

			Absent	Weak	Moderate	Strong
14.	Subsurface flow/discharge into channel	0	0	1	2	3
15.	Water in channel and > 48 hours since sig. rain	0	0	1	2	3
16.	Leaf litter in channel (January - September)	0.5	1.5	1	0.5	0
17.	Sediment on plants or on debris	1	0	0.5	1	1.5
18.	Organic debris lines or piles (wrack lines)	1	0	0.5	1	1.5
19.	Hydric soils in stream bed or sides of channel	0	No = 0		Yes = 3	

C. Biology

			Absent	Weak	Moderate	Strong
20.	Fibrous roots in channel	2	3	2	1	0
21.	Rooted plants in channel	1	3	2	1	0
22.	Crayfish in stream (exclude in fllodplain)	0	0	0.5	1	1.5
23.	Bivalves/mussels	0	0	1	2	3
24.	Amphibians	0	0	0.5	1	1.5
25.	Macrobenthos (record type abundance)	0	0	1	2	3
26.	Filamentous algae; periphyton	0	0	1	2	3
27.	Iron oxidizing bacteria/fungus	0	0	0.5	1	1.5
28.	Wetland plants in channel	0	0	0.5	1	2

Total Points = 15.50

Under Normal Conditions, Watercourse is a Wet Weather Conveyance is Secondary Indicators Score < 19 points

Notes:

ProjectID:	WWC-001		
Site Name/Description:	Center Hill Dam Rehabilitation	Latitude:	36.103767
Site_Location	Center Hill Dam Saddle Dam	Longitude:	-85.82073

HYDROLOGIC DETERMINATION FIELD DATA SHEET

Tennessee Division of Water Pollution Control, Version 1.4

County: Dekalb	Named Waterbody: Unnamed Tributary	Date/Time: 4/17/2012
Assessors/Affiliation: Matthew Granstaff		ProjectID: WWC-002
Site Name/Description: Center Hill Dam Rehabilitation Project		
Site Location: Center Hill Dam Saddle Dam		
USGS quad: Center-Hill Dam	HUC (12 digit): 051301080903 051301080905	Latitude: 36.100585
		Longitude: -85.820133
Previous Rainfall (7-days):		
Precipitation this Season vs Normal: average	Watershed Size:	
Soil Type(s)/Geology: At, MmF, MoD2, MmD, Ro, DAM	Source: USGS Soils Data	Photos: yes
Surrounding Land Use: Deciduous/Evergreen Forest, Developed, Barren Lands, Pasture/Hay, Wetland, and Open Water		
Degree of historical alteration: *Describe fully in Notes*		

Primary Field Indicators Observed

1.	Hydrologic feature exists soley due to a process discharge	no
2.	Defined bed and bank absent, dominated by upland vegetation / grass	no
3.	Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	no
4.	Daily flow and precipitation records showing feature only flows in direct responce to rainfall	no
5.	Presence of multiple populations of obligate lotic organisms with > 2 month aquatic phase	no
6.	Presence of fish (except *Gambusia*)	no
7.	Presence of naturally occuring ground water table connection	no
8.	Flowing water in channel and 7 days since last precipitation in local watershed	no
9.	Evidence watercourse has been used as a supply of drinking water	no

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absenct directly contradictory evidence, determination is complete

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary secondary indicators is provided in

TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4

Overall Hydrologic Determination =	**Wet Weather Conveyance**
Secondary Indicator Score (if applicable) =	**11.50**

Justification/ Notes:

Secondary Field Indicators Evaluation

A. Geomorphology

			Absent	Weak	Moderate	Strong
1.	Continuous bed and bank	2	0	1	2	3
2.	Sinuous channel	1	0	1	2	3
3.	In-channel structure: riffle-pool sequences	1	0	1	2	3
4.	Sorting of soil textures or other substrate	0	0	1	2	3
5.	Active/relic floodplain	1	0	1	2	3
6.	Depostional bars or benches	0	0	1	2	3
7.	Braided channel	0	0	1	2	3
8.	Recent alluvial deposits	0	0	0.5	1	1.5
9.	Natural leeves	0	0	1	2	3
10.	Headcuts	1	0	1	2	3
11.	Grade controls	0.5	0	0.5	1	1.5
12.	Natural valley or drainageway	1.5	0	0.5	1	1.5
13.	At least second order channel on existing USGS or NRCS map	0	No = 0		Yes = 3	

B. Hydrology

			Absent	Weak	Moderate	Strong
14.	Subsurface flow/discharge into channel	0	0	1	2	3
15.	Water in channel and > 48 hours since sig. rain	0	0	1	2	3
16.	Leaf litter in channel (January - September)	0.5	1.5	1	0.5	0
17.	Sediment on plants or on debris	0.5	0	0.5	1	1.5
18.	Organic debris lines or piles (wrack lines)	0.5	0	0.5	1	1.5
19.	Hydric soils in stream bed or sides of channel	0	No = 0		Yes = 3	

C. Biology

			Absent	Weak	Moderate	Strong
20.	Fibrous roots in channel	1	3	2	1	0
21.	Rooted plants in channel	1	3	2	1	0
22.	Crayfish in stream (exclude in fllodplain)	0	0	0.5	1	1.5
23.	Bivalves/mussels	0	0	1	2	3
24.	Amphibians	0	0	0.5	1	1.5
25.	Macrobenthos (record type abundance)	0	0	1	2	3
26.	Filamentous algae; periphyton	0	0	1	2	3
27.	Iron oxidizing bacteria/fungus	0	0	0.5	1	1.5
28.	Wetland plants in channel	0	0	0.5	1	2

Total Points = 11.50

Under Normal Conditions, Watercourse is a Wet Weather Conveyance is Secondary Indicators Score < 19 points

Notes:

ProjectID:	WWC-002
Site Name/Description:	Center Hill Dam Rehabilitation
Site_Location	Center Hill Dam Saddle Dam

Latitude: 36.100585

Longitude: -85.820133

HYDROLOGIC DETERMINATION FIELD DATA SHEET

Tennessee Division of Water Pollution Control, Version 1.4

County: Dekalb	Named Waterbody: Unnamed Tributary	Date/Time: 4/17/2012
Assessors/Affiliation: Matthew Granstaff		ProjectID: WWC-003
Site Name/Description: Center Hill Dam Rehabilitation Project		
Site Location: Center Hill Dam Saddle Dam		
USGS quad: Center-Hill Dam	HUC (12 digit): 051301080903 051301080905	Latitude: 36.100402
		Longitude: -85.82111
Previous Rainfall (7-days):		
Precipitation this Season vs Normal: average	Watershed Size:	
Soil Type(s)/Geology: At, MmF, MoD2, MmD, Ro, DAM	Source: USGS Soils Data	Photos: yes
Surrounding Land Use: Deciduous/Evergreen Forest, Developed, Barren Lands, Pasture/Hay, Wetland, and Open Water		
Degree of historical alteration: *Describe fully in Notes*		

Primary Field Indicators Observed

1.	Hydrologic feature exists soley due to a process discharge	no
2.	Defined bed and bank absent, dominated by upland vegetation / grass	no
3.	Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	no
4.	Daily flow and precipitation records showing feature only flows in direct responce to rainfall	no
5.	Presence of multiple populations of obligate lotic organisms with > 2 month aquatic phase	no
6.	Presence of fish (except *Gambusia*)	no
7.	Presence of naturally occuring ground water table connection	no
8.	Flowing water in channel and 7 days since last precipitation in local watershed	no
9.	Evidence watercourse has been used as a supply of drinking water	no

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absenct directly contradictory evidence, determination is complete

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary secondary indicators is provided in

TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4

Overall Hydrologic Determination =	**Wet Weather Conveyance**
Secondary Indicator Score (if applicable) =	**13.5**

Justification/ Notes:

Secondary Field Indicators Evaluation

A. Geomorphology

			Absent	Weak	Moderate	Strong
1.	Continuous bed and bank	2	0	1	2	3
2.	Sinuous channel	1	0	1	2	3
3.	In-channel structure: riffle-pool sequences	0	0	1	2	3
4.	Sorting of soil textures or other substrate	1	0	1	2	3
5.	Active/relic floodplain	1	0	1	2	3
6.	Depostional bars or benches	0	0	1	2	3
7.	Braided channel	0	0	1	2	3
8.	Recent alluvial deposits	0	0	0.5	1	1.5
9.	Natural leeves	0	0	1	2	3
10.	Headcuts	1	0	1	2	3
11.	Grade controls	1	0	0.5	1	1.5
12.	Natural valley or drainageway	1.5	0	0.5	1	1.5
13.	At least second order channel on existing USGS or NRCS map	0	No = 0		Yes = 3	

B. Hydrology

			Absent	Weak	Moderate	Strong
14.	Subsurface flow/discharge into channel	0	0	1	2	3
15.	Water in channel and > 48 hours since sig. rain	0	0	1	2	3
16.	Leaf litter in channel (January - September)	0.5	1.5	1	0.5	0
17.	Sediment on plants or on debris	0.5	0	0.5	1	1.5
18.	Organic debris lines or piles (wrack lines)	1	0	0.5	1	1.5
19.	Hydric soils in stream bed or sides of channel	0	No = 0		Yes = 3	

C. Biology

			Absent	Weak	Moderate	Strong
20.	Fibrous roots in channel	1	3	2	1	0
21.	Rooted plants in channel	2	3	2	1	0
22.	Crayfish in stream (exclude in fllodplain)	0	0	0.5	1	1.5
23.	Bivalves/mussels	0	0	1	2	3
24.	Amphibians	0	0	0.5	1	1.5
25.	Macrobenthos (record type abundance)	0	0	1	2	3
26.	Filamentous algae; periphyton	0	0	1	2	3
27.	Iron oxidizing bacteria/fungus	0	0	0.5	1	1.5
28.	Wetland plants in channel	0	0	0.5	1	2

Total Points = 13.5

Under Normal Conditions, Watercourse is a Wet Weather Conveyance is Secondary Indicators Score < 19 points

Notes:

ProjectID:	WWC-003
Site Name/Description:	Center Hill Dam Rehabilitation
Site_Location	Center Hill Dam Saddle Dam

Latitude: 36.100402

Longitude: -85.82111

HYDROLOGIC DETERMINATION FIELD DATA SHEET

Tennessee Division of Water Pollution Control, Version 1.4

County: Dekalb	Named Waterbody: Unnamed Tributary	Date/Time: 4/17/2012
Assessors/Affiliation: Matthew Granstaff		ProjectID: WWC-004
Site Name/Description: Center Hill Dam Rehabilitation Project		
Site Location: Center Hill Dam Saddle Dam		
USGS quad: Center-Hill Dam	HUC (12 digit): 051301080903 051301080905	Latitude: 36.099098
		Longitude: -85.819842
Previous Rainfall (7-days):		
Precipitation this Season vs Normal: average	Watershed Size:	
Soil Type(s)/Geology: At, MmF, MoD2, MmD, Ro, DAM	Source: USGS Soils Data	Photos: yes
Surrounding Land Use: Deciduous/Evergreen Forest, Developed, Barren Lands, Pasture/Hay, Wetland, and Open Water		
Degree of historical alteration: Severe *Describe fully in Notes*		

Primary Field Indicators Observed

1.	Hydrologic feature exists soley due to a process discharge	no
2.	Defined bed and bank absent, dominated by upland vegetation / grass	no
3.	Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	no
4.	Daily flow and precipitation records showing feature only flows in direct responce to rainfall	no
5.	Presence of multiple populations of obligate lotic organisms with > 2 month aquatic phase	no
6.	Presence of fish (except *Gambusia*)	no
7.	Presence of naturally occuring ground water table connection	no
8.	Flowing water in channel and 7 days since last precipitation in local watershed	no
9.	Evidence watercourse has been used as a supply of drinking water	no

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absenct directly contradictory evidence, determination is complete

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary secondary indicators is provided in

TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4

Overall Hydrologic Determination =	**Wet Weather Conveyance**
Secondary Indicator Score (if applicable) =	**12**

Justification/ Notes:

Secondary Field Indicators Evaluation

A. Geomorphology

			Absent	Weak	Moderate	Strong
1.	Continuous bed and bank	1	0	1	2	3
2.	Sinuous channel	0	0	1	2	3
3.	In-channel structure: riffle-pool sequences	0	0	1	2	3
4.	Sorting of soil textures or other substrate	0	0	1	2	3
5.	Active/relic floodplain	2	0	1	2	3
6.	Depostional bars or benches	0	0	1	2	3
7.	Braided channel	0	0	1	2	3
8.	Recent alluvial deposits	0.5	0	0.5	1	1.5
9.	Natural leeves	0	0	1	2	3
10.	Headcuts	0	0	1	2	3
11.	Grade controls	0.5	0	0.5	1	1.5
12.	Natural valley or drainageway	1.5	0	0.5	1	1.5
13.	At least second order channel on existing USGS or NRCS map	0	No = 0		Yes = 3	

B. Hydrology

			Absent	Weak	Moderate	Strong
14.	Subsurface flow/discharge into channel	0	0	1	2	3
15.	Water in channel and > 48 hours since sig. rain	0	0	1	2	3
16.	Leaf litter in channel (January - September)	1.5	1.5	1	0.5	0
17.	Sediment on plants or on debris	1	0	0.5	1	1.5
18.	Organic debris lines or piles (wrack lines)	0.5	0	0.5	1	1.5
19.	Hydric soils in stream bed or sides of channel	0	No = 0		Yes = 3	

C. Biology

			Absent	Weak	Moderate	Strong
20.	Fibrous roots in channel	2	3	2	1	0
21.	Rooted plants in channel	2	3	2	1	0
22.	Crayfish in stream (exclude in fllodplain)	0	0	0.5	1	1.5
23.	Bivalves/mussels	0	0	1	2	3
24.	Amphibians	0	0	0.5	1	1.5
25.	Macrobenthos (record type abundance)	0	0	1	2	3
26.	Filamentous algae; periphyton	0	0	1	2	3
27.	Iron oxidizing bacteria/fungus	0	0	0.5	1	1.5
28.	Wetland plants in channel	0	0	0.5	1	2

Total Points = 12

Under Normal Conditions, Watercourse is a Wet Weather Conveyance is Secondary Indicators Score < 19 points

Notes:

ProjectID:	WWC-004	Latitude:	36.099098
Site Name/Description:	Center Hill Dam Rehabilitation	Longitude:	-85.819842
Site_Location	Center Hill Dam Saddle Dam		

HYDROLOGIC DETERMINATION FIELD DATA SHEET

Tennessee Division of Water Pollution Control, Version 1.4

County: Dekalb	Named Waterbody: Unnamed Tributary	Date/Time: 4/17/2012
Assessors/Affiliation: Matthew Granstaff		ProjectID: WWC-005
Site Name/Description: Center Hill Dam Rehabilitation Project		
Site Location: Center Hill Dam Saddle Dam		
USGS quad: Center-Hill Dam	HUC (12 digit): 051301080903 051301080905	Latitude: 36.097276
		Longitude: -85.818826
Previous Rainfall (7-days):		
Precipitation this Season vs Normal: average	Watershed Size:	
Soil Type(s)/Geology: At, MmF, MoD2, MmD, Ro, DAM	Source: USGS Soils Data	Photos: yes
Surrounding Land Use: Deciduous/Evergreen Forest, Developed, Barren Lands, Pasture/Hay, Wetland, and Open Water		
Degree of historical alteration: Severe *Describe fully in Notes*		

Primary Field Indicators Observed

1.	Hydrologic feature exists soley due to a process discharge	no
2.	Defined bed and bank absent, dominated by upland vegetation / grass	no
3.	Watercourse dry anytime during February through April 15th, under normal precipitation / groundwater conditions	no
4.	Daily flow and precipitation records showing feature only flows in direct responce to rainfall	no
5.	Presence of multiple populations of obligate lotic organisms with > 2 month aquatic phase	no
6.	Presence of fish (except *Gambusia*)	no
7.	Presence of naturally occuring ground water table connection	no
8.	Flowing water in channel and 7 days since last precipitation in local watershed	no
9.	Evidence watercourse has been used as a supply of drinking water	no

NOTE: If any Primary Indicators 1-9 = "Yes", then STOP; absenct directly contradictory evidence, determination is complete

In the absence of a primary indicator, or other definitive evidence, complete the secondary indicator table on page 2 of this sheet, and provide score below.

Guidance for the interpretation and scoring of both the primary secondary indicators is provided in

TDEC-WPC Guidance For Making Hydrologic Determinations, Version 1.4

Overall Hydrologic Determination =	**Wet Weather Conveyance**
Secondary Indicator Score (if applicable) =	**14.00**

Justification/ Notes:

Secondary Field Indicators Evaluation

A. Geomorphology

			Absent	Weak	Moderate	Strong
1.	Continuous bed and bank	2	0	1	2	3
2.	Sinuous channel	1	0	1	2	3
3.	In-channel structure: riffle-pool sequences	1	0	1	2	3
4.	Sorting of soil textures or other substrate	1	0	1	2	3
5.	Active/relic floodplain	2	0	1	2	3
6.	Depostional bars or benches	1	0	1	2	3
7.	Braided channel	1	0	1	2	3
8.	Recent alluvial deposits	0	0	0.5	1	1.5
9.	Natural leeves	0	0	1	2	3
10.	Headcuts	1	0	1	2	3
11.	Grade controls	0.5	0	0.5	1	1.5
12.	Natural valley or drainageway	1	0	0.5	1	1.5
13.	At least second order channel on existing USGS or NRCS map	0	No = 0		Yes = 3	

B. Hydrology

			Absent	Weak	Moderate	Strong
14.	Subsurface flow/discharge into channel	0	0	1	2	3
15.	Water in channel and > 48 hours since sig. rain	0	0	1	2	3
16.	Leaf litter in channel (January - September)	0	1.5	1	0.5	0
17.	Sediment on plants or on debris	0.5	0	0.5	1	1.5
18.	Organic debris lines or piles (wrack lines)	0.5	0	0.5	1	1.5
19.	Hydric soils in stream bed or sides of channel	0	No = 0		Yes = 3	

C. Biology

			Absent	Weak	Moderate	Strong
20.	Fibrous roots in channel	1	3	2	1	0
21.	Rooted plants in channel	1	3	2	1	0
22.	Crayfish in stream (exclude in fllodplain)	0	0	0.5	1	1.5
23.	Bivalves/mussels	0	0	1	2	3
24.	Amphibians	0	0	0.5	1	1.5
25.	Macrobenthos (record type abundance)	0	0	1	2	3
26.	Filamentous algae; periphyton	0	0	1	2	3
27.	Iron oxidizing bacteria/fungus	0	0	0.5	1	1.5
28.	Wetland plants in channel	0.5	0	0.5	1	2

Total Points = 14.00

Under Normal Conditions, Watercourse is a Wet Weather Conveyance is Secondary Indicators Score < 19 points

Notes:

Earthworms, slugs, and two lined salamader (adults) present in wet weather channel. Segment channel is vegetated in sections with hydrophyitc and upland plant species (Deertongue, Fraxinus pennsylvanica, Polygnum spp.).

ProjectID:	WWC-005	Latitude:	36.097276
Site Name/Description:	Center Hill Dam Rehabilitation	Longitude:	-85.818826
Site_Location	Center Hill Dam Saddle Dam		

APPENDIX D
BIOLOGICAL ASSESSMENT

US Army Corps of Engineers

Nashville District

BIOLOGICAL ASSESSMENT

CENTER HILL LAKE AND DAM

DEKALB COUNTY, TENNESSEE

Proposed New Saddle Dam Repair Alternative

Roller Compacted Concrete Berm

US Army Corps of Engineers

October 2013

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Contents

1. INTRODUCTION AND BACKGROUND

The Center Hill Dam and Lake Project (Project) is located in DeKalb County, Tennessee, on the Caney Fork River Mile 26.6 upstream from the confluence at Cumberland River mile (CRM) 307. Authorized Project purposes include flood control, hydropower, recreation, fish and wildlife, water quality, and water supply. Center Hill main and saddle dams were completed in 1949. They were built on karst geology using accepted engineering practices of the day. Since the 1960's, seepage flows have been monitored under the main dam, right and left abutments, left and right rim walls, and under the saddle dam. Currently Center Hill Lake is maintained approximately 18 feet below summer pool elevation (648 mean sea level) while major ongoing seepage repairs are made at the Project.

Previous repairs have been made at various times at the main and saddle dams and left rim wall and have included installation of grout curtains. Past seepage repairs were effective; however recent increased seepage at the Project has become a concern. A comprehensive plan to repair both the main and saddle dams, left and right abutments, left groin, and left rim was approved and is ongoing, but repairs will take a number of years to complete.

2. PURPOSE AND NEED FOR ACTION

The purpose of this Biological Assessment (BA) is to address potential impacts to federally listed species below and adjacent to the saddle dam, main dam, and left rim (Figure 1). The Corps of Engineers, Nashville District (Corps), is preparing an Environmental Assessment (EA) to consider a new alternative to repair seepage problems at the saddle dam. The new proposed alternative is to construct a Roller Compacted Concrete Berm (RCC Berm) below (land-side) the saddle dam (Figure 2). This proposed alternative and impact footprint have not been considered in previous EAs. Previous EAs covered repair alternatives for the main dam, left groin, left rim, right rim access road to the saddle dam, and the lakeside of the saddle dam . The new area of potential impact to construct the proposed RCC Berm below the saddle dam covers approximately 68 areas.

2.1. PREVIOUS NEPA DOCUMENTS AND SECTION 7 CONSULTATIONS

The Project's seepage repair alternatives including No Action were covered under previous National Environmental Policy Act (NEPA) evaluations. Corps documents include: EA, Proposed Center Hill Dam Seepage Rehabilitation, July 2005; EA Supplement 1, Proposed Center Hill Dam Seepage Rehabilitation, April 2006; an EA Supplement 2, Center Hill Seepage Rehabilitation Study, January 2008. A Finding of No Significant Impact (FONSI) was signed for each of these documents. Dam seepage repairs affected Center Hill Lake operations. Changes to lake normal elevations were

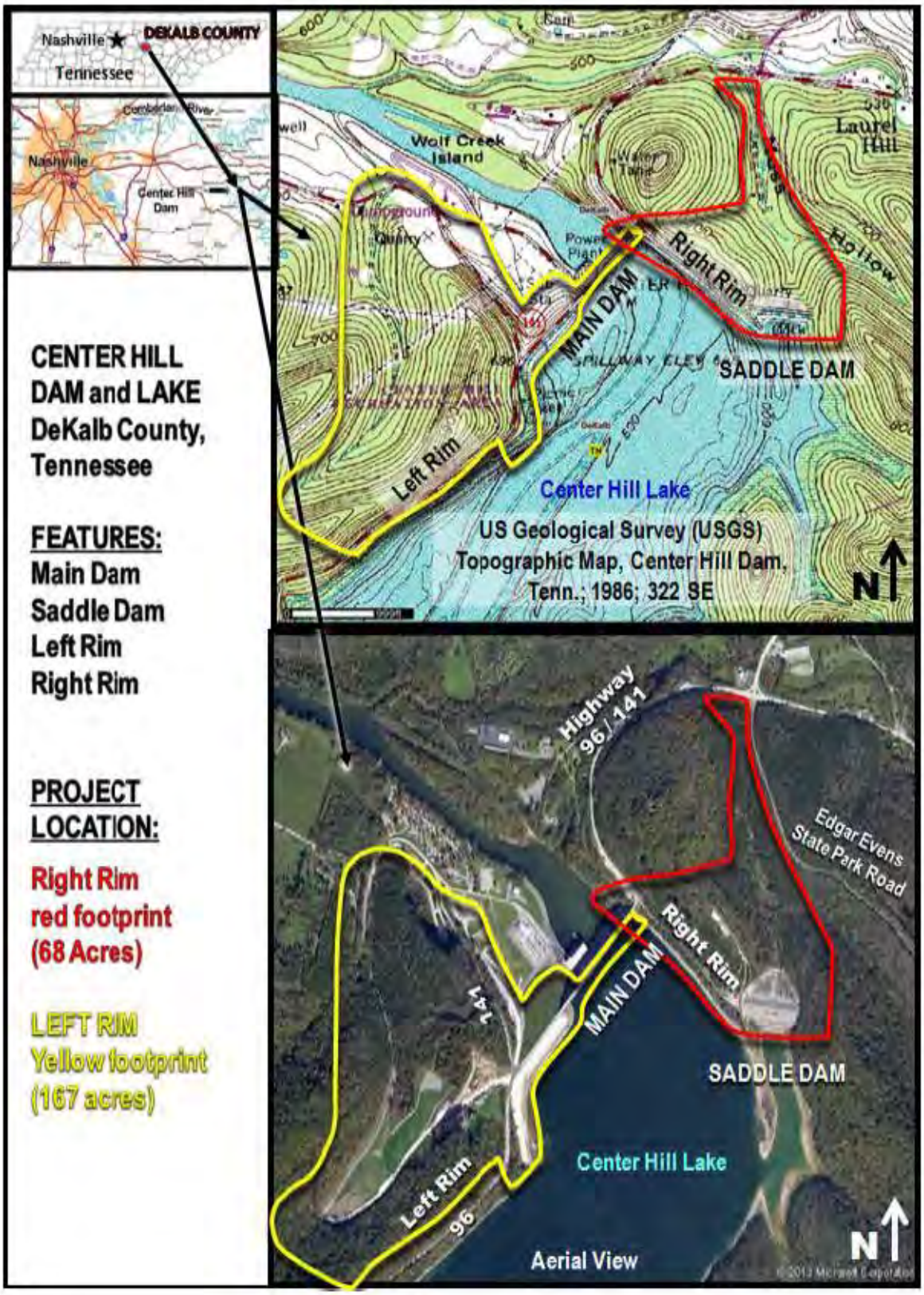


Figure 1. Center Hill Dam and Lake Project - Existing and New NEPA Coverage Areas.

Figure 2. Proposed RCC Berm Project Boundary.

covered under an Environmental Impact Statement (EIS) titled: Center Hill Dam and Lake, DeKalb County, Tennessee, Changes to Center Hill Lake Elevations completed November 2007, and a Record of Decision (ROD) was signed February 13, 2008. The EIS included a Biological Assessment (BA) and Biological Opinion (BO) (FWS #07-FA-0554) addressing potential impacts to federally listed and candidate species that could be affected by restricted pool elevations. The US Fish and Wildlife Service (USFWS) concurred with the findings. All these documents are incorporated by reference.

2.2. NEED FOR A BIOLOGICAL ASSESSMENT (BA)

A BA is necessary to provide a basis for informal or formal (if required) under Section 7 of the Endangered Species Act (ESA) consultation and NEPA compliance. The primary objective of this informal Section 7 consultation process is to determine if the new proposed alternative (RCC Berm) to repair the saddle dam may adversely affect federally listed species or designated critical habitat. If so, the Corps will enter formal consultation, and the USFWS will develop reasonable and prudent measures, incidental take, and terms and conditions while necessary repairs are implemented.

2.3. SCOPE

The Corps is committed to full compliance with the ESA regarding its operations and maintenance activities at the Project. The geographical area to be addressed in this BA and informal Section 7 consultation process covers the proposed RCC Berm and the potential impact footprint.

This BA examines impacts of the proposed RCC Berm, Left Rim, and subsequent construction activities at the saddle dam to determine whether these activities are likely to adversely affect federally listed species or designated critical habitat. .

3. DESCRIPTION OF ALTERNATIVE

3.1. BACKGROUND

The Project saddle dam is an earthen embankment that is approximately125 feet (ft) tall and 780 ft long. The top width of the saddle dam is 35 ft and the base width is 600 ft. The dam was constructed in a narrow valley along the right rim during construction of the main dam. Both the main and saddle dam embankments are constructed of high quality, well-compacted clay. The saddle dam is located about 1500 ft upstream of the main dam. The site geology is characterized by numerous caves, springs, and sinks. Under the pressure of the Center Hill Lake head, internal erosion of the cavity infilling material has created a phenomenon known as piping. Typically, piping progresses from the downstream (or outlet end) and propagates upstream until an open conduit is completed. As water erodes material from the karst features, the diameter of the opening conveying the water is ever increasing. This results in an increasing volume of water, a higher water velocity and higher erosive potential. Ultimately, this internal

erosion undercuts and erodes the overlying material, resulting in settlement and/or sinkholes in the overlying material. Seepage through the main and saddle dam embankment foundations is inherent from a combination of historic foundation data and current distress indicators such as abnormal piezometer levels, cold zones at depth, downstream wet spots, seepage springs, and abnormal settlement.

The proposed seepage repair alternative to arrest seepage at the saddle dam is to construct an RCC Berm below the saddle dam. The RCC Berm would be 900 ft in length and approximately 150 ft wide and would require a 100 ft open space buffer around the saddle dam, RCC Berm, and concrete apron for seepage monitoring and maintenance activities.

3.2. POTENTIAL IMPACT FOOTPRINT HABITAT

A perennial/intermittent stream, locally called Moss Hollow Branch, flows from the headwaters of Moss Hollow, down the valley below the saddle dam and under Highway 96/141 (Figure 3). From the highway, Moss Hollow Branch flows about 500 ft to its confluence with Wolf Creek. Wolf Creek flows approximately 1 mile (mi) to the confluence with the Caney Fork River below Center Hill Dam near river mi 25.9. Wolf Creek originates near the DeKalb and Putnam County border and is approximately 5 mi long. .

Moss Hollow Branch is a bedrock stream with scattered sections of bedrock and pieces of slab rock. There are small scattered pockets of gravel, sand and silt. No fish or freshwater mussels have been observed. During the summer months, upper sections of the stream dry up (Figure 4). Moss Hollow Branch flows through a small wetland that is approximately 0.21 acre in sizeVegetation surrounding Moss Hollow Branch consists of woods and small pockets of open area in the upper portion of the stream below the saddle dam (Figure 5).

3.1. DEFINING THE ACTION AREA

Definition of the potential impact footprint, or action area, was determined to be the access road to the top of the saddle dam, the saddle dam, left rim, and the area surrounding and downstream of the saddle dam to the Highway 96 / Wolf Creek Road.

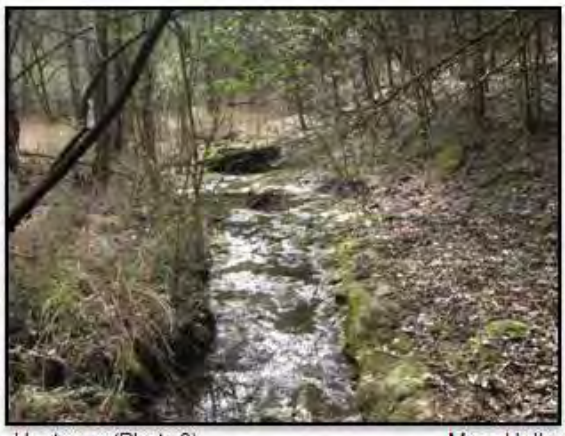
To ensure that all species of concern were included, the USFWS (Robbie Sykes, personal communications) and the State's Natural Heritage Program (NHP 2012) were contacted. Species within a 1 – mi radius (Figure 6) and 1 – 4 mi radius (Table 1) of the potential impact footprint were considered.

Figure 3. Streams within the Proposed RCC Berm Project Boundary.

Upstream (Photo 1)

Moss Hollow Branch /Seepage Confluence (Winter)

Downstream (Photo 2)



Upstream (Photo 3)

Moss Hollow Branch (Fall)

Downstream (Photo 4)

Upstream (Photo 5)

Moss Hollow Branch (Summer)

Downstream (Photo 6)

Figure 4. Streams and Wetlands Photographs located within Proposed RCC Berm Project Boundary.

Each species was then considered individually with regard to its physical location, habitat requirements, or foraging area. State species located in the potential impact footprint, or may use this area as nest and foraging habitat, were considered and described in the EA. All other state species were noted in the EA but not described because their location was not found within the proposed impact footprint and therefore no potential impact is anticipated. Species accounts were written for federally listed species that had potential habitat within the action area or could possibly be affected by project activities. Species accounts were not written for federally listed species where no viable habitat exists for them within the action area (freshwater mussels).

Table 1 is a list of state and federally listed species found with a 4-mi radius of the potential impact footprint and provides a summary of Effect Determinations.

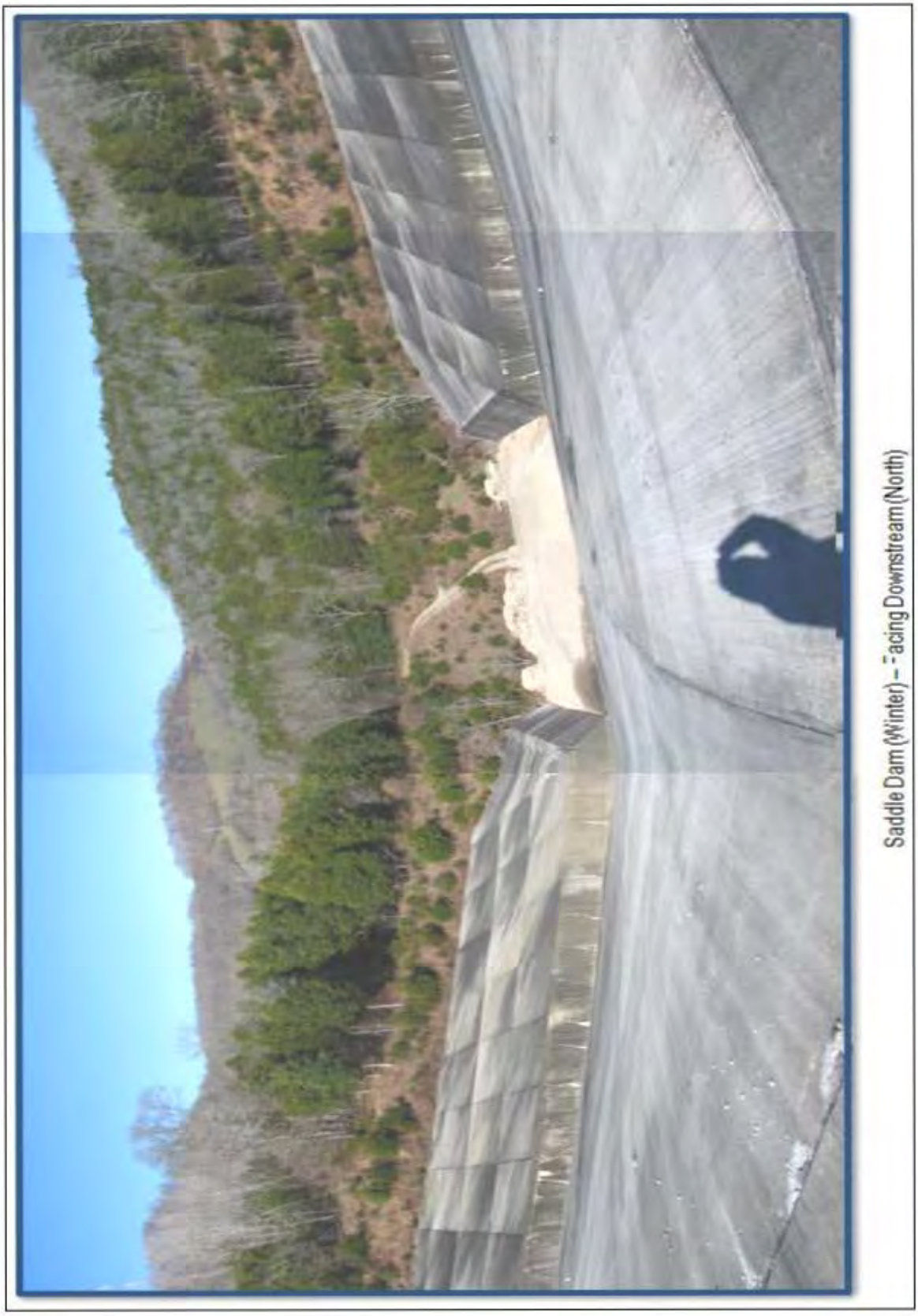


Figure 5. Winter View below Current Saddle Dam.

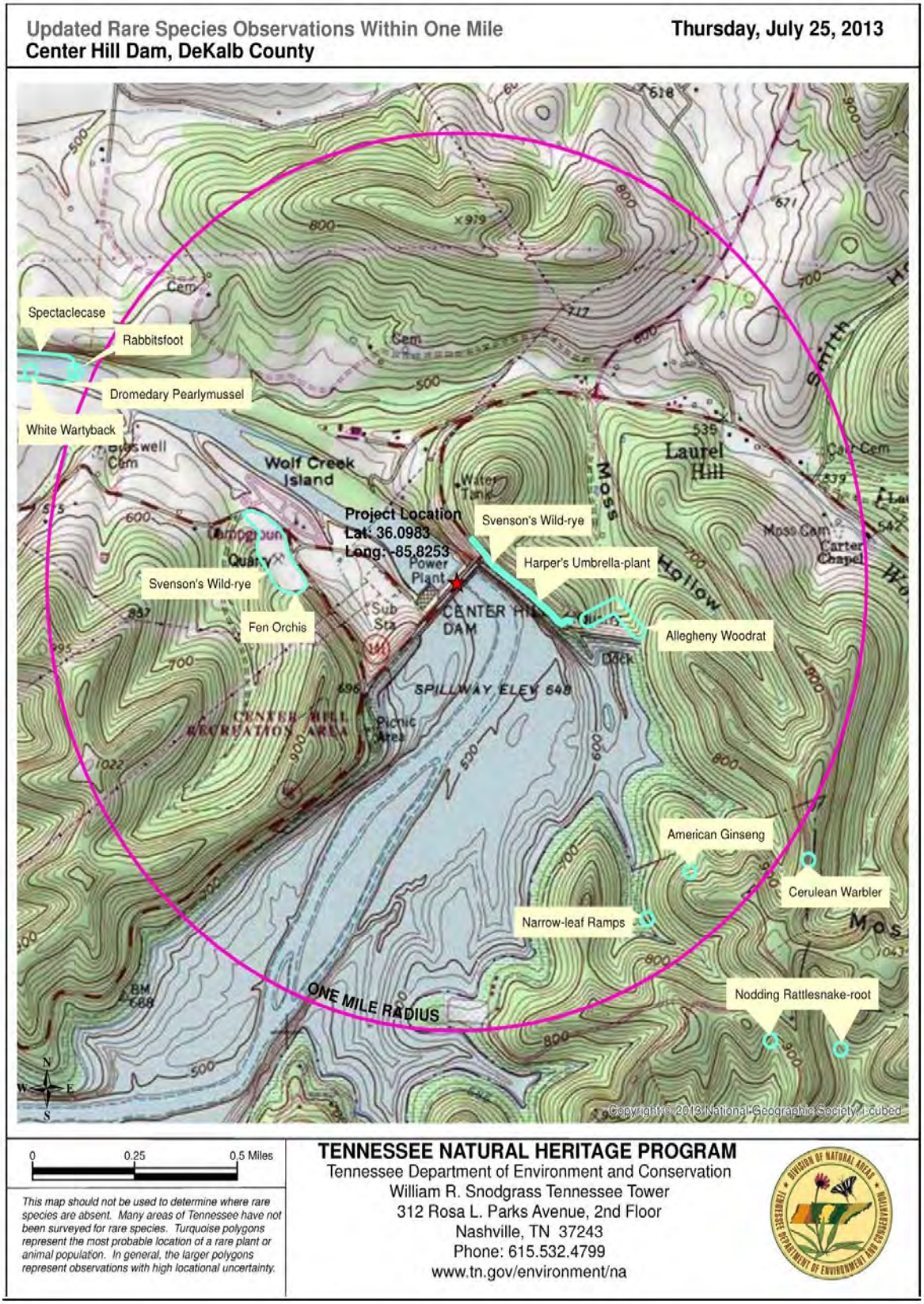


Figure 6. NHP - location of listed species within 1 mile.

Table 1. Summary of Effect Determination for State and Federally Listed Species.

Type	Scientific Name	Common Name	Fed. Prot.	St. Prot.	Potential Impact
Invertebrate Animal	Cumberlandia monodonta	Spectaclecase	LE	Rare, Not State Listed	No Effect; Not found within impact footprint
Invertebrate Animal	Cyprogenia stegaria	Fanshell	LE	E	No Effect; Not found within impact footprint
Invertebrate Animal	Dromus dromas	Dromedary Pearlymussel	LE	E	No Effect; Not found within impact footprint
Invertebrate Animal	Epioblasma brevidens	Cumberlandian Combshell	LE	E	No Effect; Not found within impact footprint
Invertebrate Animal	Epioblasma capsaeformis	Oyster Mussel	LE	E	No Effect; Not found within impact footprint
Invertebrate Animal	*Epioblasma obliquata obliquata	Catspaw	LE	E	No Effect; Not found within impact footprint
Invertebrate Animal	*Epioblasma triquetra	Snuffbox	LE	Rare, Not State Listed	No Effect; Not found within impact footprint
Invertebrate Animal	Lampsilis abrupta	Pink Mucket	LE	E	No Effect; Not found within impact footprint
Invertebrate Animal	*Lexingtonia dolabelloides	Slabside Pearlymussel	C	Rare, Not State Listed	No Effect; Not found within impact footprint
Invertebrate Animal	Lithasia armigera	Armored Rocksnail	--	Rare, Not State Listed	No Effect; Not found within impact footprint
Invertebrate Animal	*Obovaria subrotunda	Round Hickorynut	--	Rare, Not State Listed	No Effect; Not found within impact footprint
Invertebrate Animal	*Plethobasus cicatricosus	White Wartyback	LE	E	No EffectNo; t found within impact footprint
Invertebrate Animal	*Plethobasus cyphyus	Sheepnose	LE	Rare, Not State Listed	No Effect; Not found within impact footprint
Invertebrate Animal	Pleurobema clava	Clubshell	LE	E	No Effect; Not found within impact footprint
Invertebrate Animal	Quadrula cylindrica cylindrica	Rabbitsfoot	--	Rare, Not State Listed	No Effect; Not found within impact footprint

Invertebrate Animal	Villosa trabalis	Cumberland Bean	LE	E	No Effect; Not found within impact footprint
Nonvascular Plant	Tortula fragilis	Fragile Tortula	--	E	Not found within impact footprint
Vascular Plant	Acalypha deamii	Deam's Copperleaf	--	S	Not found within impact footprint
Vascular Plant	Allium tricoccum	Ramps	--	S-CE	Not found within impact footprint
Vascular Plant	Amsonia tabernaemontana var. gattingeri	Limestone Blue Star	--	S	Not found within impact footprint
Vascular Plant	Apios priceana	Price's Potato-bean	LT	E	No Effect; Not found within impact footprint
Vascular Plant	Draba ramosissima	Branching Whitlow-grass	--	S	Not found within impact footprint
Vascular Plant	Elymus svensonii	Svenson's Wild-rye	--	E	Road consutruction may affect individuals
Vascular Plant	Eriogonum longifolium var. harperi	Harper's Umbrella-plant	--	E	Road consutruction may affect individuals
Vascular Plant	Erysimum capitatum	Western Wallflower	--	E	Not found within impact footprint
Vascular Plant	Juglans cinerea	Butternut	--	T	Not found within impact footprint
Vascular Plant	*Packera plattensis	Prairie Ragwort	--	S	Not found within impact footprint
Vascular Plant	Prenanthes crepidinea	Nodding Rattlesnake-root	--	E	Not found within impact footprint
Vascular Plant	Stellaria fontinalis	Water Stitchwort	--	S	Not found within impact footprint
Vertebrate Animal	Dendroica cerulea	Cerulean Warbler	--	D	Construction activities may disturb
Vertebrate Animal	Haliaeetus leucocephalus	Bald Eagle	R	D	No Effect, nest located 8 miles upstream
Vertebrate Animal	Etheostoma olivaceum	Sooty Darter	--	D	Not found within impact footprint

Vertebrate Animal	Myotis grisescens	Gray Bat	LE	E	May Affect, Not Likely to Adversely Affect
Vertebrate Animal	Myotis sodalis	Indiana Bat	LE	E	May Affect, Not Likely to Adversely Affect

4. FEDERALLY PROTECTED AND LISTED SPECIES CONSIDERED

One federally protected and seventeen federally listed species were considered in preparation for this BA. Species accounts were written for the protected bald eagle (*Haliaeetus leucocephalus*), the threatened Price's Potato-bean (*Apios priceana*), the endangered Indiana bat (*Myotis sodalis*), and the endangered gray bat (*Myotis grisescens*). No accounts were written for thirteen federally endangered freshwater mussels.

4.1. FEDERALLY ENDANGERED FRESHWATER MUSSELS

No accounts were written for thirteen federally endangered mussels. Moss Hollow Branch is an perennial/intermittent bedrock stream that often dries up in the summer and fall. The stream has been walked many times and in different seasons and no evidence of mussels (relic shells or pieces) has been found. No mussels exist or have existed in Moss Hollow Branch.

In 2009-2010, a mussel survey was performed in the Caney Fork River tailwater, from the main dam to the confluence with the Cumberland River (Lewis 2011). Only two live Pimplebacks (*Quadrula pustulosa*) were found among the miles of relic shells of 30 species that could be identified. The 2009-2010 survey confirmed that none of the freshwater mussel species listed in Table 1 exists below the dam to the confluence with the Cumberland River. Based on this information, a **No Effect** determination was made for the freshwater mussels.

4.2. FEDERALLY PROTECTED AND LISTED SPECIES ACCOUNTS

The Species Accounts were based on the Corps' 2007a Biological Assessment, Center Hill Lake and Dam, DeKalb County, Tennessee, Changes to Operational Guide Curves, Pool Elevations, Biological Assessment (FWS #07 – FA – 0554), and the 2007b Biological Assessment, Operation and Maintenance of the Tennessee and Cumberland Rivers Navigation Systems (FWS 2007 – F – 0726), and the 2004 Draft Biological Assessment for Operation and Maintenance of the Ohio River Navigation System. This information was updated from sources listed in the reference section.

4.1. FEDERALLY PROTECTED BIRDS

4.1.1. Bald Eagle (*Haliaeetus leucocephalus*)

Listing: The bald eagle was first described in 1766 as *Falco leucocephalus*. Later it was renamed as the southern bald eagle, subspecies *Haliaeetus leucocephalus leucocephalus*, when, in 1897, the northern bald eagle was identified as *Haliaeetus leucocephalus alascanus*. These two subspecific names were in use when the southern bald eagle (arbitrarily declared to occur south of the 40th parallel) was listed in March 11, 1967 as endangered under the Endangered Species Preservation Act (ESPA) of 1966. In 1978, the Service listed the bald eagle, *Haliaeetus leucocephalus* (no subspecies referenced) throughout the lower 48 States as endangered except in Michigan, Minnesota, Wisconsin, Washington, and Oregon, where it was designated as threatened (Corps 2004). The species was reclassified to threatened in 1995 and was proposed for removal from the list in 1999 (Corps 2007b). The bald eagle was removed from the federal list of threatened and endangered species on August 9, 2007. Although delisted, bald eagles are still protected by the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Lacey Act (USFWS 2012a).

Taxonomy: Male bald eagles generally measure 3 feet from head to tail, weigh 7 to 10 pounds (lb), and have a wingspan of about 6-1/2 ft. Females are larger, some reaching 14 lb and having a wingspan of up to 8 ft. The bald eagle has large, pale eyes; a powerful yellow beak; and large black talons (USFWS 1995). Young bald eagles are mostly dark brown until they reach four to six years of age, at which time the distinctive white head and tail feathers appear (Corps 2007b).

Life History: The bald eagle is a bird of aquatic ecosystems. It frequents estuaries, large lakes, reservoirs, major rivers, and some seacoast habitats. However, such areas must have an adequate food base, perching areas, and nesting sites to support bald eagles. In winter, bald eagles often congregate at specific wintering sites that are generally close to open water and that offer good perch trees and night roosts. Bald eagle habitats encompass both public and private lands (USFWS1995; Corps 2004). Bald eagles are opportunistic feeders with fish comprising much of their diet. They also eat waterfowl, shorebirds, colonial water birds, small mammals, turtles, and carrion (often along roads or at landfills). Because they are visual hunters, eagles typically locate their prey from a conspicuous perch, or soaring flight, then swoop down and strike (USFWS, 2012c). In winter, northern birds migrate south and gather in large numbers near open water areas where fish or other prey are plentiful. Bald eagles have few natural enemies. In general they need an environment of quiet isolation with tall, mature trees and clean waters (Corps 2004).

Bald eagles mate for life and may live 15 to 25 years in the wild, longer in captivity (USFWS 2012a). They build huge nests in the tops of large trees near rivers, lakes,

marshes, or other wetland areas away from human disturbance. Nests are often re-used year after year (Corps 2004). Nests may reach 10 ft across and weigh a half ton. They may also have one or more alternate nests within their breeding territory. The birds travel great distances but usually return to breeding grounds within 100 miles of the place where they were raised (USFWS 2012a). Most bald eagles can breed at 4 or 5 years of age, but many do not start breeding until much older. Bald eagle pairs begin courtship about a month before egg-laying. The nesting season lasts about 6 months (Corps 2004). During the nesting period, breeding bald eagles occupy and defend "territories." Nesting period varies by latitude, but generally begins with courtship and nest building in late January and early February and ends when the young fledge by late July. Generally the non-nesting period is from August through mid-January (NatureServe 2012). Bald eagles normally lay two to three eggs once a year and the eggs hatch after about 35 days. The young eagles are flying within 3 months with parental care lasting an addition 4 to 11 weeks. As they leave their breeding areas, some bald eagles stay in the general vicinity while most migrate for several months and hundreds of miles to their wintering grounds. Young eagles may wander randomly for years before returning to nest in natal areas (Corps 2004).

Threats: Major threats to the bald eagle at present and for the foreseeable future is destruction and degradation of its habitat and human disturbance. This occurs through direct cutting of trees for shoreline development, human disturbance associated with recreational use of shorelines and waterways, and contamination of waterways from point and non-point sources pollution. Environmental contaminants may affect the survival as well as the reproductive success and health of bald eagles (USFWS 1995; Corps 2004). Other causes of death include fatal gunshot wounds, electrocution from taking off and landing on power lines, collisions with vehicles, starvation where food is scarce, exposure, and unknown diseases (Corps 2004). For young eagles, disease, lack of food, bad weather, or human interference can kill many eaglets. Recent studies show that approximately 70 percent survive their first year of life (USFWS 2012a).

General Distribution: The bald eagle historically ranged over most of the continent, from the northern reaches of Alaska and Canada down to northern Mexico. The number of bald eagles has steadily climbed for the past 4 decades (Corps 2007b). The USFWS has reported the recovery of the bald eagle in the lower 48 states from 417 pairs in 1963 to more than 9,700 nesting pairs in 2012 (USFWS 2012d).

Local Distribution: Bald eagles are known to overwinter in Tennessee in areas with appropriate habitat (NatureServe 2012). Bald eagles have been sighted in DeKalb County and a nest has been found on Center Hill Lake approximately 8 miles upstream of the proposed impact footprint at the saddle dam (Robbie Sykes, USFWS, personal communication).

Conservation: Conservation measures include protecting habitat around eagle nests and by keeping safe distance from their nests or winter roost sites. Bald eagles are susceptible to harm by disturbance because of the prominence of their nests and communal roosts. Bald eagles need continued conservation so that their population remains healthy. Disturbing nesting bald eagles can be avoided by maintaining a distance of at least 330 ft from nesting eagles. In open areas, where there is increased visibility and exposure to noise, stay at least 660 ft from the nesting eagles (USFWS 2012c).

Effects: The closest eagle sighting is approximately 8 miles away from the potential impact footprint below the saddle dam. At this distance, it is unlikely the nesting pair would be disturbed by any construction activities occurring within the impact site. Tree clearing associated with construction and maintenance would occur; however, the limited acreage would be minor relative to the forested area surrounding the lake. It is anticipated that cut trees would not meet requirements as a potential nesting or roosting tree.

Cumulative Effects**:** Besides construction activities, there are no known additional future state, tribal, local, or private actions that are reasonably certain to occur in the impact footprint that would have any cumulative effects on the bald eagle. On project completion, preserving the large trees surrounding the impact footprint would likely preserve potential future nesting sites.

Determination: Based on the information above, a **No Effect** determination has been reached for this species. The nearest nest is 8 miles away, hidden by hilly terrain, and would not be disturbed by construction activities at the saddle dam.

4.2. FEDERALLY THREATENED PLANTS

4.2.1. Price's Potato-bean (*Apios priceana)*

Listing: Price's Potato-bean was federally listed as a threatened species by the USFWS under the ESA of 1973, on January 5, 1990. It was listed because of the small number of populations and threats to its habitat. The NHP (2012) ranks this species as globally impaired (G2) because of rarity (6 to 20 occurrences and less than 3000 individuals) or because of vulnerability to extinction. Price's Potato-bean is state listed as endangered in the states of Kentucky, Illinois, Tennessee (NHP 2012; USFWS1993), and threatened in Alabama (Corps 2004).

Taxonomy: The Price's Potato-bean is a herbaceous twining perennial vine that belongs to the pea family. A single large potato-like tuber produces a vine that can grow up to 16 ft long. Leaves are comprised of 5-9 (usually 7) ovate leaflets, each about 8-10 in long. The fragrant, swollen, pea-like flowers are generally greenish-pink with maroon tints that bloom from June through August. The flowers are pollinated by a

butterfly (*Eudamus tityrus*), honey and bumble bees. The fruit is an elongated legume that matures from August to September and grows up to 8 in long. The seeds are oblong, smooth, dark brown and about 0.3 in long. The tubers are edible and may have been a source of food for Native American Indians and early settlers (NatureServe 2012).

Life History: The plant grows in open, rocky, wooded slopes and floodplain edges, usually under mixed hardwoods or in associated forest clearings. It is often found where bluffs or ravine slopes meet creek or river bottoms. Soils are well-drained and loamy, formed on alluvium or over calcareous boulders. Within the scattered populations, none make up of more than 50 plants. The plant is shade intolerant (USFWS, 2012c).

Threats: Excessive habitat modification is considered a threat to the existence of the species. Many of the few remaining occurrences are threatened by cattle grazing/trampling, right-of-way maintenance and forestry activities. In some places the plant is being eliminated through natural succession as surrounding forest closes in over the plants creating habitat for shade-loving plants that crowd out the potato-bean (USFWS 1012c; Corps 2004). Other impacts include its mode of reproduction (the plant has only a single tuber), disease, predation, historical tuber collection, and overcrowding by invasive, non-indigenous plant species (KDFWR 1998; Corps 2004).

General Distribution: It is currently known from about 25 widely scattered populations, most with fewer than 50 individuals. Four populations have been found in Mississippi (Clay, Oktibbeha and Lee counties); 3 populations in Alabama (Madison, Autauga and Marshall counties); 4 populations in Kentucky (Lyon, Livingston and Trigg counties);and 4 populations in Tennessee (Marion, Montgomery and Williamson counties). It is historic in Illinois. It also grows along highway rights-of-way and power line corridors (USFWS 2012b). In Tennessee, the largest population is in an area recovering from a recent clear-cut tree operation (NatureServe 2012).

Local Distribution: Populations are known, or believed to occur in the following Tennessee counties: DeKalb, Giles, Hickman Marion, Maury, Montgomery, Stewart, Wayne, and Williamson. According to the NHP, Price's potato-bean has a record of occurrence within 4 miles of the proposed impact footprint, but there are no records within the proposed RCC Berm impact footprint. Corps personnel have performed visual surveys on multiple occasions between May and August 2012. To date, Price's Potato-bean has not been observed.

Conservation: Precise management needs are poorly known at this time (NatureServe 2012). This plant is apparently dependant on a moderate level of disturbance (USFWS 2012c). Land protection must include land occupied by the primary population with an adequate buffer to protect the site. Maintenance of natural openings, possibly via artificial cutting or prescribed fire, has been suggested by some authorities. Price's

Potato-bean is apparently able to withstand light, selective logging (Kral 1983), but whether this is a suitable management alternative is unknown. It has been suggested that light logging may enhance the species, while heavy clear-cut logging would destroy populations (Kral 1983). Kral (1983) stated that Price's Potato-bean has been observed in secondary forests, suggesting that it is able to survive logging. He also observed that it recovered well to fire disturbance, as do many legumes with tuberous rootstalks. The rarity of the species suggests that it has a narrow ecological range (Kral 1983), so understanding the local habitat conditions is needed in selecting management options. Bulldozing or root raking are believed to destroy the plant (Kral 1983). Thinning or cutting the over-story may possibly damage Price's Potato-bean plants if done during the growing season. Management options should be implemented when the plant is dormant (NatureServe 2012).

Effects: No records of this plant's occurrence were found within 1 mi of the impact footprint (NHP). Visual surveys have been performed by the Corps during the time the plant flowers. To date, no individuals have been observed..

Cumulative Effects: Besides construction activities, there are no known additional future state, tribal, local, or private actions that are reasonably certain to occur in the impact footprint that would have any cumulative effects on Price's Potato-bean. The proposed RCC Berm and impact footprint is on federal and state property. Development is prohibited on both properties. On project completion, some areas would be maintained as open areas for seepage monitoring activities, and some of the area would be allowed to transition from open field to forest. More open canopy could be available which may provide potential habitat for the species.

Determination: Based on the information above, a **No Effect** determination has been reached for Price's Potato-bean. No records occur within the proposed impact footprint.

4.3. FEDERALLY ENDANGERED BATS

On November 30, 2011, the Corps requested assistance from the USFWS to conduct a preliminary survey to identify potential summer bat habitat below the saddle dam. Several suitable Indiana bat maternity and roosting trees and snags were located within a portion of the proposed impact footprint. On April 24, 2012 the Corps met with the USFWS. Both agencies agreed that Indiana, gray, and other bat species may exist within the proposed impact footprint. Acoustic sampling was selected as the method to confirm presence. Acoustic equipment, such as the AnaBat Bat Detector (Harvey et al., 2011), records the shape and frequency of echolocation calls and produces a sonogram, which is unique for each bat species. The calls do not represent number of bats present because a single bat can fly past the equipment several times producing numerous calls, however, its species can be identified.

Corps personnel collected acoustic data for five consecutive nights (Table 2), between May 23 and 27, 2012 at four pre-selected stations (Figure 7). Corps personnel met with TWRA, Region 3, to analyze the recordings. TWRA identified four bat species and confirmed presences of a *Myotis* species (Table 3). Species of the *Myotis* genus are difficult to identify because the species have similar sonogram signatures. Recordings were sent to Dr. Eric Britzke, a noted bat expert. Dr. Britzke is a Research Wildlife Biologist, US Army Corps of Engineers, Engineer Research and Development Center (ERDC). Recording results verified that no Indiana bats were recorded; however gray bats were present and recorded on May 25 and 26, 2012.

Table 2. Acoustic Sampling Dates.

Date	Location
May 23, 2010	Station 1
May 24, 2010	Station 2
May 25, 2010	Station 3
May 26, 2010	Station 4
May 27, 2010	Station 4

Table 3. Acoustic Sampling Results of Bat Species Present within the Impact Footprint.

Scientific Name	Common Name	Scientific Name	Common Name
Myotis grisescens *	Gray Bat	*Nycticeius humeralis*	Evening Bat
Lasiurus borealis	Eastern Red Bat	*Perimyotis subflavus*	Tri-colored Bat
* *Species determined by Dr. Eric Britzke, ERDC*		*Lasiurus cinerecus*	Hoary Bat

4.3.1. Indiana Bat (*Myotis sodalis*)

Listing: The Indiana bat was listed as endangered throughout its range in March 1967 initially under the ESPA of 1966, and then under the ESA of 1973. A recover plan was approved in June 1976 and a final plan was approved in October 1983. The plan has been revised several times, but as of 2011, a final draft plan has not been approved (Harvey et al., 2011).

Taxonomy: The Indiana bat is medium sized in comparison with the gray bat, and closely resembles the little brown bat (*Myotis lucifugus*), except for coloration. Its fur is a dull grayish chestnut rather than bronze, with the basal portion of the hairs on the back a dull-lead color. This bat's under parts are pinkish to cinnamon, and its hind feet are smaller and more delicate than those of the little brown bat. The calcar (heel of the foot) is strongly keeled (USFWS 2012b). The Indiana Bat weighs between 0.2-0.3 ounces (oz) and has a wingspan of 9-11 in (Harvey et al., 2011).

Figure 7. Acoustic Sampling Stations at below the Saddle Dam.

Life History: The bats hibernate in large dense clusters consisting of thousands of individuals. Depending on latitude, they may hibernate from October to April. The bats arrive at their hibernation cave as early as late July, but most arrive between early August and mid-September. On arrival, the bats swarm in and near the cave opening from dusk to dawn engaging in mating activities. Swarms continue for several weeks peaking in September and early October, and usually ending in mid-October. Most bats hibernation from October to April. Females depart hibernation caves before the males and arrive at summer maternity roosts in trees in mid-May. Small maternity colonies reside under the exfoliating bark and hollows of dead trees or man-made structures. Males usually roost near the maternity colonies, but may also roost near or in the hibernation cave (Harvey et al., 2011). The bats will roost in trees as small as 9 in diameter at breast height (dbh), but females prefer to roost in the largest trees available.

Bachelor males have been found in trees with loose bark as small as 3 in dbh. A variety of tree species can be used for roosts. Examples including shagbark hickory (*Carya ovata*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), cottonwood (*Populus deltoides*), northern red oak (*Quercus rubra*), post oak (*Quercus stellata*), white oak (*Quercus alba*), shingle oak (*Quercus imbricaria*), sassafras (*Sassafras albidum*), sugar maple (*Acer saccharum*), silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), and bitternut hickory (*Carya cordiformis*). Recent discoveries have noted that the Indiana bat has been found roosting in barns, splintered telephone poles, and old houses. Some have been found in bat houses. Limestone caverns are used as winter habitat. Floodplains and riparian forests are the primary summer roosting and foraging areas, as well as upland forests. The bat roosts are ephemeral and frequently associated with dead or dying trees (Tyrell, K. and V. Brack, Jr. 1990). Bats forage at a height between 7 and 98 ft. They feed primarily on moths and aquatic insects. Indiana bats may forage up to 3.1 mi from their roost site (Corps 2004). Pregnant females consume soft bodied insects (moths) when lactating and hard bodied insects (moths and beetles) after lactation. One baby is born around the first of June and raised under loose tree bark primarily in wooded streamside habitat. Young Indiana bats are capable of flight within a month of birth. They spend the latter part of the summer foraging to accumulate fat reserves for the fall migration and hibernation (Corps 2004). Bats live for nearly 14 years (Harvey et al., 2011).

Threats: Many winter caves of Indiana bats are in protected public ownership; however, the species is declining in number. In addition to pesticide accumulation, the other main threat to the species is loss of its summer habitat. It appears the diminishing acreage of forest and wetlands is having significant impact on the Indiana bat population. Disturbance of a maternity colony may cause young to be dropped to the forest floor where they perish; excessive disturbance may cause a colony to completely abandon a site. Other factors, which contribute to the decline, include pesticide poisoning, natural calamities such as flooding and cave-ins at hibernacula caves, loss of caves due to inundation by man-made impoundments, and possibly a reduction in insect prey over streams that have been degraded through excessive pollution and siltation. Improper cave gating or cave commercialization could also contribute to some population declines (USFWS 2012b, Corps 2004).

General Distribution: Historically, Indiana bats are found in cave regions ranging from Oklahoma, Iowa, and Wisconsin eastward to Vermont and southward to northern Florida. In 1965 the population was estimated to be around 1,270,000. A 2009 survey found that the total population had declined nearly 70% to slightly more than 387,000. Nearly 85% of the population is distributed in 15 major caves. Many caves have been gated to prevent human disturbance during hibernation. After several years of increases, the population is declining due to a fungal infection referred to as white-nose syndrome (WNS) (Harvey et al., 2011).

Local Distribution: According to USFWS (2012b) winter habitat (hibernation caves) and/or summer habitat (roosting trees) have been found in all the counties in Tennessee. Over the past year, Corps personnel conducted several searches within and immediately surrounding the proposed RCC Berm impact footprint, but no caves have been located. On November 30, 2011, the Corps and USFWS identify potential summer bat habitat within a portion of the proposed impact footprint. Acoustic sampling revealed that no Indiana bats were recorded in this area. It is possible Indiana bats were roosting and foraging at other locations on Project and State lands during the sampling period time.

Conservation: Because many known threats are associated with hibernation, protection of hibernacula has been a management priority. There has been an increased focus to maintain, protect, and restore summer maternity habitat. Attention is also being directed to minimizing exposure to insecticides as these have been known or are suspected as the cause of a number of bat die-offs. The insect diet and longevity of bats also exposes them to persistent organochlorine chemicals, which may bioaccumulate in bat tissue and cause sub-lethal, subtle effects such as impaired reproduction (Corps 2004). Monitoring riparian areas, stream crossings, sedimentation, storm water, and minimizing off-road use of vehicles maintains stream water quality that provides benefits to the bats (Corps 2007c).

Effects: Proposed tree removal in the impact footprint would likely include removing potential tree roosting habitat. Noise from construction activities would likely disturb foraging bats. Disturbance may cause the bats to seek roosting and foraging habitat at other locations outside of the proposed impact footprint during construction. If the bats acclimate to the noise and disturbance, continuous lighting may draw insect swarms and thereby concentrate forage food. Construction is temporary, and when complete, there would be more open area and a near pre-construction disturbance level as maintenance activities are expected to be minimal.

Cumulative Effects: There are no known future state, tribal, local, or private actions that are reasonably certain to occur in the action area and that would combine with the existing proposed RCC Berm construction activities that would add to bat impacts. The project impact footprint is located entirely on federal and state property and would be protected from development in perpetuity. When construction is complete, a larger open area would remain around and below the new RCC Berm. Access road improvements could possibly provide a more open corridor adjacent to Moss Hollow Branch. The large trees encircling the impact footprint would be protected. It is possible that these actions could improve the quality of roosting and foraging habitat by preserving remaining trees (live and dead) and providing more open space and larger corridors adjacent Moss Hollow Branch for foraging.

Determination: No caves have been located within the proposed impact footprint. Potential summer roosting and forage habitat has been identified within the proposed impact footprint. No Indiana bat echolocation calls were recorded within the proposed impact footprint during May 23 – 27, 2012. Based on the presence of potential summer habitat and the information above, a **May Affect, but Not Likely to Adversely Affect** determination has been reached for the Indiana bat.

4.3.2. Gray Bat (*Myotis grisescens*)

Listing: The gray bat was listed as federally endangered on April 28, 1976 under the ESPA of 1966 (Corps 2004). The gray bat was listed as endangered throughout its range in April 1976 under the ESA of 1973. A recovery plan was completed in July 1982 (Harvey et al., 2011).

Taxonomy: The gray bat is the largest of its genus. The skull has a distinct sagittal crest. The fur of the gray bat is woolly and uniform in color from the base to the tip of the hair. The fur is gray immediately following the molt in midsummer but may bleach to chestnut-brown or bright russet by the following May or June, especially in reproductive females. The ears are dark, usually black, and longer than in any other *Myotis* species. When the ears are laid forward, they extend slightly more than 1/4 in beyond nose. The tragus is long and thin, and the calcar is keeled (Corps 2004). The gray bat is an insectivore and weighs between 0.3 – 0.4 oz and has a wingspan of 11-12 in (Harvey et al., 2011).

Life History: Gray bat colonies are residents of limestone caves or cave-like habitats, and migrate seasonally between maternity and hibernating caves. During the summer, the colonies are segregated into maternity and bachelor caves (Corps 2004). Gray bats occupy caves year-round but use colder caves during the winter and warmer caves during the summer. Few have been found roosting outside of caves. Because the bats have specific cave requirements, fewer than 5% of known caves provide suitable habitat. Gray bats form tight clusters in caves and about 95% of gray bats hibernate in approximately 15 caves. Mating occurs in September and October and females enter hibernation immediately after mating, followed by the males. Females store the sperm and become pregnant after emerging from hibernation. One baby is born late May or early June and begins to fly within 20-25 days of age. They forage over rivers and lakes consuming moths, beetles, flies, mosquitoes and mayflies, and a variety of other insects. Gray bats may live more than 15 years (Harvey et al., 2011). The bat's foraging range is approximately 10 miles (TDOT 2004).

Threats: Natural factors such as flooding, cave-ins, and freezing occasionally impact gray bats; however human disturbance, habitat alteration, deforestation and chemical contamination from insecticide use appears to be the major causes of population declines and decrease in prey availability. Other threats include vandalism and shootings (USFWS 2012b; Corps 2004).

General Distribution: Nearly all of the total population is distributed in 15 caves concentrated in cave regions of Arkansas, Missouri, Kentucky, Tennessee and Alabama with scattered colonies and individuals located in adjacent states. In 2007, the total population was estimated to be more than 3,400,000 (Harvey et al., 2011).

Local Distribution: A 2003 study by Michael Harvey, Ph.D. identified a gray bat bachelor colony in Ament Cave, a known summer roost. The cave is located approximately 1.25 mi south-southeast of Cookeville (TDOT 2004). Other nearby caves that contain gray bat populations include Bridgewater and New Piper Caves, Smith County; Ward Cave, White County; Cripps Mill/Goat Cave, DeKalb County; and Dud's and Haile Caves, Jackson County. The Corps provided support to the USFWS and TNC to gate the Dud's and Haile cave systems near Cordell Hull Lake in Jackson County, TN (Corps 2007).

According to the Corps (2007) winter and summer caves have been located in DeKalb and surrounding counties. Over the past year, Corps personnel conducted several searches within and immediately surrounding the proposed RCC Berm impact footprint, but no caves have been located. Acoustic sampling recorded the presence of gray bats on May 25 and 26, 2012. Results indicate that the gray bat occasionally forages within the proposed impact footprint.

Conservation: Because many known threats are associated with hibernation, protection of hibernacula has been a management priority. There has been an increased focus to maintain, protect, and restore summer foraging habitat. Attention is also being directed to minimizing exposure to insecticides as these have been known or suspected as the cause of a number of bat die-offs. The insect diet and longevity of bats also exposes them to persistent organochlorine chemicals, which may bioaccumulate in bat tissue and cause sub-lethal, subtle effects such as impaired reproduction (Corps 2004). Monitoring riparian areas, stream crossings, sedimentation, storm water, and minimizing off-road use of vehicles maintains stream water quality protects flyways through stream corridors (Corps 2007c).

Effects: Proposed tree removal in the impact footprint could alter foraging habitat. Noise from construction activities would likely disturb foraging bats. Disturbance may cause bats to seek foraging habitat at other locations during construction. If the bats acclimate to the noise and disturbance, continuous lighting may draw insect swarms and thereby concentrate forage food. Construction is temporary, and when complete, there would be more open area and a near post-construction disturbance level as maintenance activities are expected to be minimal.

Cumulative Affects: There are no known future state, tribal, local, or private actions that are reasonably certain to occur in the action area and that would combine with the existing proposed RCC Berm construction activities and add to bat impacts. The project impact footprint is located entirely on federal and state property and will be protected

from development in perpetuity. On construction completion, a larger open area would remain around and below the new RCC Berm. Access road improvements could possibly provide a more open corridor adjacent to Moss Hollow Branch. The large trees encircling the impact footprint would be protected. It is possible that these actions could improve the quality of foraging habitat by providing more open space and a larger corridor adjacent the stream.

Determination: No caves have been located within the proposed impact footprint. Foraging habitat apparently exists. Acoustic sampling has confirmed the presence of gray bats within the proposed RCC Berm impact footprint. Gray bats have a reported 10 mi foraging distance from its roosting cave, therefore foraging area is not limited to the proposed impact area. Based on the information above, a **May Affect, but Not Likely to Adversely Affect** determination has been reached for the gray bat.

5. SPECIES/IMPACT SUMMARY/CONCLUSIONS AND DETERMINATIONS

The Corps is proposing a new seepage repair alterative – RCC Berm, at the Center Hill saddle dam. Construction of the RCC Berm would require tree removal. Up to approximately 30 acres of trees could be affected. The cleared areas are needed for excavation of the RCC Berm foundation and concrete apron footprints, road widening improvements, laydown and aggregate storage areas, and a 100-ft open buffer zone around the saddle dam, RCC Berm, concrete apron, and the area below the RCC Berm and apron. The exact number of acres for tree removal is not known at this time; however, the Corps will consider construction designs that would minimize the number of acres that need to be cleared. Land clearing and construction activities are likely to disturb resident species. This BA was written to assess potential impacts to federally protected and listed species if the proposed RRC Berm is implemented. The BA strives to identify ways to avoid and minimize impacts to all species including listed species. If this is not possible, the Corps would mitigate for habitat losses that have the potential to affected federally listed species.

One federally protected and twelve federally listed species were considered in this BA.

No accounts were written for nine federally listed freshwater mussels. Species Accounts were written for one federally protected bird (bald eagle), one federally threatened plant (Price's Potato-bean), and two federally endangered bat (Indiana and gray) species that could be potentially affected by the proposed construction of an RCC Berm.

Moss Hollow Branch was assessed for potential mussel presence. Moss Hollow Branch is a perennial/intermittent stream that cannot support mussels because stream flow is either at low-flow with a few inches of depth, or the stream is dry. The Caney Fork River tailwater was assessed for potential mussel presence. A 2009-2010 mussel survey found only two live Pimplebacks. Only the relic shells of approximately 30

species remain in the 26.6 miles of the tailwater. Based on the existing condition of Moss Hollow Branch and the Caney Fork River tailwater, a "No Effect" determination has been made for all nine federally endangered freshwater mussels.

There were no records for the presence of Price's Potato-bean within the impact footprint. The species account suggests that mature forests with closed canopies do not encourage growth as the plant is shade intolerant. Based on no records for presence and the existing conditions within the proposed impact footprint, Price's Potato-bean is likely not present; therefore a "No Effect" determination has been made for Price's potato-bean.

Nesting bald eagles has been located approximately 8 miles upstream from the saddle dam. The hilly terrain prevents a view of the nest and would likely dampen noise that would be generated from construction activities. Based on the species account, far distance, and no view of the nest from the saddle dam, a "No Effect" determination was made for the bald eagle.

The Indiana bat was anticipated to be present within the vicinity of the proposed impact footprint. No caves have been found within or adjacent the proposed impact footprint, indicating that winter hibernation habitat (caves) is not present. Potential Indiana bat roosting and foraging habitat has been identified within the proposed impact footprint. Acoustic sampling revealed that Indiana bats were not present during the nights sampled. It is possible that Indiana bats were foraging at some other location around Center Hill Lake on the Corps and Edgar Evins State Park property. Based on the presence of suitable roosting and foraging habitat within the proposed RCC Berm impact footprint, a "May Affect, But Not Adversely Affect" determination has been made for the Indiana bat.

The gray bat was anticipated to be present within the vicinity of the proposed impact footprint. No caves have been found within or adjacent the proposed impact footprint indicating that winter and summer caves (roosting and hibernation habitat) is not present. Gray bat foraging habitat apparently exists within the proposed impact footprint. Acoustic sampling confirmed the presence of gray bats on two sampling nights (May 25 and 26, 2012). Given the foraging range of approximately 10 miles, it is possible that the gray bat may be foraging at other times and locations on Corps and Edgar Evins State Park property and around Center Hill Lake. Base on the confirmed presence of gray bats within the proposed RCC Berm impact footprint, a "May Affect, But Not Adversely Affect" determination has been made for the gray bat.

By itself, tree removal of up to 30 acres, and the construction activities to build the proposed RCC Berm are actions that would likely have negligible effects on federally endangered bats. The acreage of tree removal is small in comparison to the thousands of acres of forested area on Corps and State property surrounding Center Hill Lake. However, when considered with threats and cumulative impacts to a species, the

proposed alternative could have a minor, but temporary effect on both bat species. Efforts would be made to avoid and minimize impacts, however, if this is not possible, the Corps would mitigate for bat habitat that may be impacted by implementing the proposed RCC Berm alternative.

6. PROPOSED PROTECTIVE MEASURES

The ESA not only directs that Federal agencies insure that their actions are not likely to jeopardize the continued existence of a listed species or adversely affect its critical habitat, but also directs that Federal agencies utilize their authorities to further the conservation of listed species. In the spirit of both directives of the Act, the Corps proposes a series of conservation measures:

- The Corps would continuously reevaluate design plans and seek options that would minimize tree cutting and soil disturbing activities.

- The Corps would coordinate with the USFWS and the Edgar Evins State Park as the proposed RCC Berm alternative progresses to proposed implementation.

- Tree removal in construction zones would be scheduled between October 15 and March 31 to prevent disturbance to trees that may serve as roosting and/or foraging habitat for Indiana and gray bats.

- A riparian buffer zone would be maintained by limiting tree cutting to that absolutely necessary in areas where construction activities and road improvements must occur. A 30-ft buffer would be maintained along Moss Hollow Branch to preserve the stream corridor. In a few areas along the stream, a smaller buffer would be maintained due to road location. Additional best management practices (BMP) would be installed along smaller buffers for added stream protection.

- Some disturbed areas would be re-vegetated with tree species that produce sloughing bark and snags. Species to consider include white oak, northern red oak, white ash (*Fraxinus americana*), shagbark hickory, slippery elm (*Ulmus rubra*), black locust (*Robinia pseudoacacia*), American elm, shellbark hickory (*Carya laciniosa*), and sycamore (*Platanus occidentalis*). Other species may be recommended by USFWS and Edgar Evins State Park.

- Because bat forage over local waters it is important to preserve water quality in forage areas. Stream crossings and stream protection BMPs would be installed and maintained to protect the water quality of Moss Hollow Branch.

- All construction equipment would be located outside stream buffers. Staging, re-fueling and clean-up areas would be located outside stream buffers and spill prevention BMPs will be installed and maintained during project construction.

- Proposed construction activities may include blasting. The Corps will consult further with the USFWS when additional details on blasting are known.

- On project completion, the Corps would coordinate with Edgar Evins State Park, USFWS, and TWRA to consider restoration measures that would provide improved habitat for state and federally listed species

The Corps believes that through the use of these conservation measures, potential impacts to endangered bats would be greatly reduced. As a result the proposed RCC Berm construction would have little effect on the Indiana and gray bats and therefore mitigation is not required.

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APPENDIX E

CLEAN WATER ACT SECTION 404(B)1 EVALUATIOIN

Center Hill Seepage Rehabilitation Project
Proposed Roller Compacted Concrete Reinforcement Berm
404 (b) (1) Evaluation
Center Hill Dam and Lake, DeKalb County, Tennessee

I. Project Description.

A. Location.

Center Hill Dam and Lake is owned and operated by the U.S. Army Corps of Engineers (Corps). The project is located at mile 26.6 on the Caney Fork River in DeKalb County, Tennessee. A saddle dam is located about 1500 feet (ft) east of the main dam on the north side of Center Hill Lake. The approximate location is at 36.098 N and 85.819 W (Figure 1).

B. General Description.

The proposed project is to construction a Roller Compacted Concrete Berm (RCC Berm) downstream of the saddle dam. The saddle dam is an earthen embankment that fills a naturally occurring gap in the topography. The dam is approximately 125 ft tall, 780 linear ft long, and 600 ft wide at the base. The earthen saddle dam is covered with 20 ft by 20 ft by 1.5 ft concrete plates. The top of the saddle dam is located at elevation 658. It is capped with a fuse plug that raises the top elevation to 692. During a probable maximum flood (PMF), the fuse plug is designed to fail. The saddle dam would function as an emergency spillway to prevent overtopping of the main dam and maintain Center Hill Lake to elevation 658.

Due to the karst topography, seepage in bedding plans and solution features under the earthen saddle dam; and leveling sand loss from under the concrete plates jeopardize the dam's structural integrity. Based on recent information (models and geological investigations) there is a credible risk of losing the saddle dam during a PMF. Based on this information, the Corps concluded that a new saddle dam seepage repair alternative (RCC Berm) should be considered that provides the most reliable and robust protection against a saddle dam failure. A solid RCC Berm would be cost effective and would not be affected by seepage. A saddle dam failure with this alternative in place would preserve the lake at elevation 658 even if the RCC Berm is overtopped after a saddle dam failure.

The proposed RCC Berm footprint is approximately 68 acres composed of 44 acres of mature deciduous/evergreen forest, 13 acres of early succession old fields, and 11 acres of hardened surfaces (saddle dam, staging areas, roads, and buildings). Moss Hollow Branch and a 0.13 acre wetland area are located within the RCC Berm footprint (Figure 2). Impacts to the 0.13 acre wetland are unavoidable and would be mitigated at a 2:1 ratio via an approved mitigation bank, in-lieu fee program, and/or permittee responsible mitigation. Public Notice NRS12.227, dated November 8, 2012 was circulated for a 30-day review. State

Figure 1. Center Hill Dam - Proposed RCC Berm Location.

Figure 2. Proposed RCC Berm, Streams, and Wetland Location.

401 Water Quality Certification was received from the Tennessee Department of Environment and Conservation (TDEC) on January 9, 2013.

C. Authority and Purpose.

Center Hill Dam and Lake was authorized by the Flood Control Act of 1938 (Public Law (PL) 761, 75th Congress, 3rd Session) and the Rivers and Harbors Act of 1946 (PL 525, 79th Congress, 2nd Session). The study was conducted under the Corps' ongoing operation and maintenance authorities. The purpose and need for the federal action is to address the risk of saddle dam failure that would result from internal erosion from seepage under the dam, or overtopping and loss of the concrete plates covering the saddle dam during a PMF.

D. General Description of Dredged or Fill Material.

1) General Characteristics of Material. Fill material consists of native soil (clay, sand, gravel, and cobble) and rock from on site.

2) Quantity of Material. Approximately 50,000 cubic yards (CY) of native soil and rock would be placed within the proposed project footprint. Approximately 2,000 CY of native soil and rock would be used to fill of the 0.13 acre wetland. An additional 100,000 CY of native soil and rock would be disposed in existing upland disposal sites on site, or in state and Corps approved disposal sites located off site.

3) Source of Material. On-site native soil and rock within the RCC Berm footprint.

E. Description of the Proposed Discharge Sites.

1) Location. Two discharge sites would be located within the RCC Berm footprint. Fill would be used to improve the access gravel roads and construct a laydown and aggregate storage area. Fill would permanently cover the 0.13 acre wetland and temporarily cover a portion of Moss Hollow Branch.

2) Size. The proposed discharge site would cover approximately eight acres within the RCC Berm footprint. Within the proposed discharge area approximately 450 linear feet of Moss Hollow Branch would be temporarily encapsulated and covered with fill. Bottom substrate is to be avoided or restored after construction. Approximately 50 linear feet of Moss Hollow Branch would have a permanent stream crossing. A 0.13 acre wetland would be filled due to road and laydown construction for the RCC Berm. Approximately 500 linear feet of a wet weather conveyance (wwc)/ephemeral stream adjacent the access road at the base of the saddle dam that drains storm water from the saddle dam, would be temporarily relocated. The size of onsite disposal sites include the existing saddle dam disposal site (7.5 acres), the left rim access road disposal site (2 acres), the left rim work platform (5 acres), and state and Corps approved disposal sites of varying size located off site.

3) Type of Site (confined unconfined, open water). No discharge would be placed in open water. Discharge would be confined to a 0.13 acre emergent wetland, encapsulation of a portion of Moss Hollow Branch (intermittent section), and surrounding early successional upland fields and forest. Disposal sites on the left rim, and offsite disposal sites would be located in state and Corps approved upland areas.

4) Type of Habitat. The discharge site is characterized by varying topography from hills to valley flats. Habitat is a composed of a mosaic of a 0.13 acre emergent wetland, wwc/ephemeral, intermittent, and perennial streams (Moss Hollow Branch and Tributaries), open fields, early successional scrub brush, and upland xeric deciduous forest interspersed with red cedar stands.

5) Timing and Duration of Discharge. Construction could begin in the beginning in the fall of 2013 and continue through the construction of the RCC Berm (2017).

6) Description of Disposal Method. Sound environmental and engineering practices commonly referred to as Best Management Practices (BMPs) would be followed during all phases of project construction. Material would be transported using articulated dump trucks. As the site is located in upland fields and forest there is little potential for plumes that would result in violations to water quality standards.

II. Factual Determinations.

A. Physical Substrate Determinations.

1) Substrate Elevation and Slope. The portion of Moss Hollow Branch affected by this project ranges from elevation 500 ft to 600 ft. The average slope of Moss Hollow Branch is 2:1. The 0.13 wetland is located at elevation 570.

2) Sediment type. Sediment in Moss Hollow Branch consists mostly of bedrock with shallow pockets of clay, sand, gravel, cobble, and boulders. The 0.13 acre wetland is located on bedrock with a thin layer of fine sediment.

3) Dredged/fill Material Movement. BMPs would be maintained throughout construction to prevent soil erosion and sediment loss from any disposal site into Moss Hollow Branch.

4) Physical Effects on Benthos. The section of Moss Hollow Branch that is proposed to be impacted is considered an intermittent stream with sections drying up and leaving small isolated pools. Within the isolated pools species such as Caddis flies, Mayflies, and stoneflies have been recorded. However, based on location of pools and small number of species recorded impacts would be negligible.

5) Other Effects. On project completion, Moss Hollow Branch would be uncovered and returned to pre-construction stream morphology. The benthos would be expected to return once the stream is returned to pre-construction condition. The wetland would

be eliminated and mitigated 2:1 via an approved mitigation bank, in-lieu fee program, and/or permittee responsible mitigation.

6) Actions Taken to Minimize Impacts. Construction BMPs would be implemented to minimize impacts. BMPs, such as silt fencing, riprap, jersey barriers, filter cloth, check dams, and waddles would control soil erosion. All work would be done in accordance with local, state, and federal laws, not limited to but including the National Pollutant Discharge Elimination System (NPDES) for storm water and TDEC Water Quality Certification.

B. Water Circulation, Fluctuation, and Salinity Determinations.

1) Water.

a. Salinity. Water salinity not applicable. This is a freshwater system.

b. Water Chemistry. BMPs would ensure that storm water runoff would not affect water chemistry.

c. Clarity. BMPs would ensure that storm water runoff would not affect clarity.

d. Color. BMPs would ensure that storm water runoff would not affect color.

e. Odor. BMPs would ensure that storm water runoff would not affect odor.

f. Taste. BMPs would ensure that storm water runoff would not affect taste.

g. Dissolved Gas Levels. BMPs would ensure that storm water runoff would not affect dissolved gas levels.

h. Nutrients. BMPs would ensure that storm water runoff would not affect nutrients.

i. Eutrophication. BMPs would ensure that storm water runoff would not result in eutrophication.

j. Others as Appropriate. BMPs would ensure that storm water runoff would not affect water quality standards to any surface waters.

2) Current Patterns and Circulation.

a. Current Patterns and Flow. No affect on Moss Hollow Branch current or flow patterns would be expected. The encapsulated stream portion would continue to flow unimpeded under the laydown area.

b. Velocity. No affect on Moss Hollow Branch flow velocity would be expected. The encapsulated stream portion would continue to flow unimpeded under the laydown area.

c. Stratification. Not applicable. Streams do not stratify.

d. Hydrologic Regime. The hydrologic regime of Moss Hollow Branch is not expected to change. The watershed topography would not change. The stream is flashy and would continue to respond to storm events. The hydrologic regime of the seeps that sustain the 0.13 wetland are unlikely to change and would continue to respond to storm events.

3) Normal Water Fluctuations. No affect on Moss Hollow Branch water fluctuations would be expected. The encapsulated stream portion would continue to fluctuate.

4) Salinity Gradients. Not applicable. This is a freshwater system.

5) Actions That Will Be Taken to Minimize Impacts. Design would ensure that the temporary encapsulated and covered portion of Moss Hollow Branch remains a free flowing stream and restored after construction. Impacts to the 0.13 acre wetland are unavoidable because the wetland is located directly in the path of road widening and construction of the laydown area. The 0.13 acre wetland would be mitigated on a 2:1 ratio via an approved mitigation bank, in-lieu fee program, and/or permittee responsible mitigation

C. <u>Suspended Particulate/Turbidity Determinations.</u>

1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site. No changes are expected. Appropriate BMPs would contain suspended particles and minimize turbidity.

2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column. Chemical properties of Moss Hollow Branch are not expected to change. Design would ensure minimal effects to the physical channel in the headwater of Moss Hollow Branch that would be temporarily constrained by culverting and covering during construction. On project completion, Moss Hollow Branch would be day-lighted and physical properties of the water column would be restored. These properties would be changed for the filled 0.13 wetland that would be mitigated.

a. Light Penetration. Approximately 500 linear feet of the head water of Moss Hollow Branch would be temporarily encapsulated and covered. During this time, there would be no light penetration into the covered stream during construction. On project completion, Moss Hollow Branch would be restored and light would penetrate the stream. No light would penetrate the 0.13 acre wetland because it would be filled, however, the wetland would be mitigated.

b. Dissolved Oxygen. Dissolved oxygen would be affected since Moss Hollow Branch is a fast moving stream. The 0.13 wetland would be filled; therefore there would be no dissolved oxygen. The wetland would be mitigated.

c. Toxic Metals and Organics. There are no toxic metals or organics in Moss Hollow Branch. There is some elevated arsenic soil in the wetland. The arsenic soil is on State property. The soil would be avoided, covered in place to prevent spreading, or removed. The Corps and the State would work together to determine the best course of action.

d. Pathogens. No pathogens have been identified in Moss Hollow Branch or the 0.13 acre wetland.

e. Aesthetics. During construction, much of the valley vegetation would be temporarily removed. On project completion, Moss Hollow Branch would be restored. The RCC Berm footprint would be re-vegetated. In time, forests would return via tree seedling plantings and natural succession. The area would be expected to look similar to pre-construction condition.

f. Others as Appropriate. No other changes are expected.

3) Effects on Biota

a. Primary Production, Photosynthesis. Little change is expected to Moss Hollow Branch . The section of Moss Hollow Branch that is proposed to be impacted is considered an intermittent stream with sections drying up and leaving small isolated pools. The wetland would be filled and the limited primary production and photosynthesis it provides when it contains water would be lost.

b. Suspension/filter Feeders. The section of Moss Hollow Branch that is proposed to be impacted is considered an intermittent stream with sections drying up and leaving small isolated pools. The wetland would be filled and therefore there would be no impacts to suspension/filter feeders.

c. Sight Feeders. The section of Moss Hollow Branch that is proposed to be impacted is considered an intermittent stream with sections drying up and leaving small isolated pools. The wetland would be filled and therefore there would be little impact to sight feeders

4) Actions taken to Minimize Impacts. BMPs would be used to protect the limited biota with Moss Hollow Branch contains water. The wetland cannot be avoided and would be mitigated to offset the small loss to the limited biota.

D. Contaminant Determination.

Treated timbers were stockpiled and burned adjacent the 0.13 acre wetland. The soil in the burn pit contained elevated arsenic. The arsenic soil is on State property. The soil would be avoided, covered in place to prevent spreading, or removed and disposed of at a special landfill. The Corps and the State would work together to determine the best course of action.

E. Aquatic Ecosystem and Organism Determinations.

1) Effects on Plankton. The section of Moss Hollow Branch that is proposed to be impacted is considered an intermittent stream with sections drying up and leaving small isolated pools. The wetland would be filled.

2) Effects on Benthos. The section of Moss Hollow Branch that is proposed to be impacted is considered an intermittent stream with sections drying up and leaving small isolated pools. Due to sections drying up there would be little effect on benthos The wetland would be filled.

3) Effects on Nekton. The section of Moss Hollow Branch that is proposed to be impacted is considered an intermittent stream with sections drying up and leaving small isolated pools. Due to sections drying up there would be little effect on nekton. The wetland would be filled.

4) Effects on Aquatic Food Web. The section of Moss Hollow Branch that is proposed to be impacted is considered an intermittent stream with sections drying up and leaving small isolated pools. Due to sections drying up there would be little effect on the aquatic food web.. The 0.13 acre wetland would be filled and any temporary contribution to the aquatic food web when it contains water would be lost. The wetland would be mitigated.

5) Effects on Special Aquatic Sites.

    a. Sanctuaries and Refuges. No effect. None are located on site.

    b. Wetlands. The 0.13 acre wetland would be filled. It would be mitigated on a 2:1 ratio via an approved mitigation bank, in-lieu fee program, and/or permittee responsible mitigation.

    c. Mud flats. No effect. None are present.

    d. Vegetated Shallows. No effect.

    e. Coral Reefs. No effect. This is a freshwater system.

f. Riffle and Pool Complexes. No effect. The section of Moss Hollow Branch that is proposed to be impacted is considered an intermittent stream with sections drying up and leaving small isolated pools.

6) Threatened and Endangered Species. The USFWS concurred with Corps findings of No Effect for thirteen species of freshwater mussels, the Prices Potato-bean (*Apios priceana*) and the protected bald eagle (*Haliaeetus leucocephalus*); and a May Effect, Not Likely to Adversely Affect for the Indiana (*Myotis sodalis*) and gray (*Myotis grisescens*) bats.

7) Other Wildlife. Resident wildlife would likely be disturbed and temporarily relocate during construction. On project completion, the area would be and vegetated. In time, the resident wildlife would be expected to return.

8) Actions to Minimize Impact. BMPs would ensure minimal impact to the aquatic ecosystem and resident wildlife.

F. <u>Proposed Disposal Site Determination</u>

1) Mixing Zone Determinations. No effect. No disposal would occur in water. All disposal sites are located in upland areas.

2) Determination of Compliance with Applicable Water Quality Standards. The proposed project is in compliance with applicable water quality standards.

3) Potential Effects on Human Use Characteristics.

a. Municipal and Private Water Supply. No effect. There are no water supplies in the upland disposal sites.

b. Recreational and Commercial Fisheries. No effect. There is no fishing in upland disposal sites.

c. Water-related Recreation. No effect. Disposal would occur on dry land.

d. Aesthetics. Temporary degradation to the aesthetic environment would occur during construction. On project completion, onsite disposal sites would be stabilized and vegetated.

e. Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and similar preserves. There would be temporary, short-term effects on the State Park and Corps properties due to construction. On project completion, the affected area would be vegetated and in time, return to forest.

G. Determination of Cumulative Effects on the Aquatic Ecosystem.

No cumulative effects on the aquatic ecosystem are expected. The impacts to the encapsulated and covered portion of Moss Hollow Branch are temporary and short-term. On project completion, the stream would be restored to pre-construction condition. The wwc/ephemeral stream at the base of the saddle dam only has flow during rain events and does not support aquatic life. The 0.13 acre wetland would be filled and mitigated at a 2:1 ratio via an approved mitigation bank, in-lieu fee program, and/or permittee responsible mitigation that would ensure no net loss of wetland habitat.

H. Determination of Secondary Effects on the Aquatic Ecosystem.

No secondary effects are expected.

III. Findings of Compliance or Non-Compliance with Restrictions on Discharge.

a) Adaptation of the Section 404(b)(1) Guidelines to this Evaluation. No significant adaptations of the Section 404(b)(1) guidelines were made relative to this evaluation.

b) Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem.
Several alternatives to the proposed RCC Berm alternative to address seepage at the Center Hill Dam and Lake Project were considered and discussed in EA Supplement 3 to which this evaluation is appended and are given as follows:

1) No Action

This alternative was described in EA Supplement 2 and would have adverse impacts on the aquatic ecosystem. Should no action be taken to address seepage at the saddle dam, the dam would likely fail during a PMF. Dam failure would result in loss of most of Center Hill Lake. Flood water during a PMF would scour the valley and severely damage the existing aquatic and terrestrial habitat within and downstream Moss Hollow Branch watershed.

2) Grout curtain, barrier wall, and cofferdam in Center Hill Lake

This alternative was the approved plan to address seepage at the saddle dam. The approved plan serves as the No Action Alternative in EA Supplement 3. This alternative would have adverse impacts on the aquatic ecosystem. A cofferdam would add impacts to the aquatic ecosystem in the lake. The barrier wall is insufficient to prevent saddle dam failure due to over-toping of the saddle dam. Flood water during a PMF would scour the valley and severely damage the existing aquatic and terrestrial habitat within and downstream Moss Hollow Branch watershed.

3) Proposed RCC Berm

This alternative would have the least impact to the aquatic ecosystem. It would have no impact on Center Hill Lake. There would be minor, temporary, and short-term impact to the intermittent stream section, Moss Hollow Branch. A 0.13 acre wetland

would be filled but it would be mitigated on a 2:1 ratio via an approved mitigation bank, in-lieu fee program, and/or permittee responsible mitigation to ensure no net loss to wetlands. The RCC Berm would be unaffected by karst seepage under the berm, and would be designed to withstand over-topping. Flood water during a PMF would scour the valley. The existing aquatic and terrestrial habitat would be damaged during a PMF with the RCC Berm in place; however, these resources would likely recover over time.

c) Compliance with Applicable State Water Quality Standards. Compliance with Tennessee water quality standards would be maintained and monitored. A National Pollutant Discharge Elimination System (NPDES) for storm water permit (TNR171208) has been obtained and is in effect as of February 7, 2012. A Tennessee 401 Water Quality Certification (NRS12.227) has been obtained and is in effect as of January 9, 2013.

d) Compliance with Applicable Toxic Effluent Standard of Prohibition Under Section 307 of the Clean Water Act. Disposal operations would not violate Section 307 of the Clean Water Act.

e) Compliance with the Endangered Species Act. In a letter dated September 28, 2012, the USFWS noted that based on a review of an Environmental Assessment, Supplement 3 and a Biological Assessment for this project, the USFWS believes that requirements of section 7 ESA have been fulfilled.

f) Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972. Not applicable. This is a freshwater system.

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. The proposed action would no significant adverse effects to municipal or private water supplies.

b) Recreation and Commercial Fisheries. The proposed action would have no significant adverse effects to recreation or commercial fisheries.

c) Benthic Organisms. Small populations of benthic organisms that are temporary and tolerant to dry conditions would be impacted within the construction area. However, these organisms are common and widespread and would be expected to repopulate affected water courses on project completion. The proposed action would have negligible adverse effects.

d) Fisheries Resources. No effect. The section of Moss Hollow Branch that is proposed to be impacted is considered an intermittent stream with sections drying up and leaving small isolated pools which do not support fish species.

e) Shellfish. No effect. There are no shell fish (fresh water mussels) or their habitat in Moss Hollow Branch.

f) Wildlife. The proposed action would have temporary and minor effects on resident wildlife. Wildlife would be expected to return on project completion

g) Special Aquatic Sites. No special aquatic sites are identified within the project area.

2) Significant Adverse Effects on Life Stages of Aquatic Life and Other Wildlife Dependent on Aquatic Ecosystems. There would be temporary, short-term, and minor impacts to the life stages of aquatic and terrestrial species, however, on project completion, the project would return to pre-construction condition.

3) Significant Adverse Effects on Aquatic Ecosystem Diversity, Productivity, and Stability. The proposed action would have minor, short-term, and temporary impacts on life stages of aquatic life and other wildlife dependent species. A 0.21 acre wetland is located adjacent/outside the RCC Berm footprint and would be avoided. The 0.13 acre wetland would be lost but mitigated on a 2:1 ratio via an approved mitigation bank, in-lieu fee program, and/or permittee responsible mitigation to insure no net loss to wetlands.

4) Significant Adverse Effects on Recreational, Aesthetic, and Economic Values. The proposed action would have little effect on these resources.

h) Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the discharge on the Aquatic Ecosystem.

Avoidance: The access road would be widened landward to avoid impacting the main stem of Moss Hollow Branch (perennial section) and a 0.21 acre wetland.

Minimization: BMPs would be implemented to minimize erosion and sedimentation and prevent impacts to water quality standards. Construction activities would be in accordance with all local, state, and federal laws and state permits.

Mitigation: Mitigation will be required for the loss of a 0.13 acre wetland. Mitigation would require wetland replacement a 2:1 ratio into an via an approved mitigation bank, in-lieu fee program, and/or permittee responsible mitigation.

i) On the Basis of EPA 404 (b) (1) Guidelines, the Proposed Disposal Site for the Discharge of Dredged or Fill Material is: Specified as complying with requirements of

these guidelines, with the inclusion of appropriate conditions to minimize pollution or adverse effects on the aquatic ecosystem.

FINDING OF COMPLIANCE
FOR
EA SUPPLEMENT 3
PROPOSED RCC BERM

1. No significant adaptations of the guidelines were made relative to this evaluation.

2. There are no open water disposal sites available for this project. All disposal sites are located upland.

3. The planned disposal of fill material would not violate any applicable State water quality standards. Disposal operations would not violate the Toxic Effluent Standards of Section 307 of the Clean Water Act.

4. Use of selected disposal sites would not harm any endangered species or their critical habitat.

5. The Proposed disposal of fill material would not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife would not be adversely affected. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic and economic values would not occur.

6. Appropriate steps to minimize potential adverse impacts of fill material on aquatic systems would be implemented.

7. On the basis of the guidelines proposed disposal sites for fill material is specified as complying with the inclusion of appropriate and practical conditions and measures to minimize pollution and adverse effects to the aquatic ecosystem.

APPENDIX F

SCOPING LETTER
ORIGINAL NOTICE OF AVAILABILITY
SECOND NOTICE OF AVAILABILITY
RESPONSES

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1070
NASHVILLE, TENNESSEE 37202-1070

REPLY TO
ATTENTION OF
Project Planning Branch

February 13, 2012

TO ALL INTERESTED PARTIES:

The US Army Corps of Engineers, Nashville District (Corps) is performing seepage rehabilitation repairs at Center Hill Dam and Lake located in DeKalb County, in middle Tennessee (Figure 1). Center Hill Main Dam and Saddle Dam were built in the 1940's on karst geology using accepted engineering practices of the day. Since the 1960s the Corps has monitored seepage flows through the dam foundations and rims. In an attempt to reduce seepage, a flowable concrete called "grout" has been injected at various times and locations along dam foundations, abutments and rim walls. These repairs were effective, however, over time; increased seepage has become a safety concern.

A comprehensive plan and Selected Alternatives to address seepage rehabilitation repairs were described in the following Environmental Assessments (EA): EA, Proposed Center Hill Dam Seepage Rehabilitation, July 2005; EA, Proposed Center Hill Dam Seepage Rehabilitation, Supplement 1, April 2006; and EA, Center Hill Seepage Rehabilitation Study, Supplement 2, January 2008. All three Findings of No Significant Impact (FONSI) were signed as decision documents for each EA. The previously approved alternatives in prior EAs were grout injection curtain and installation of cutoff walls into the Main and Saddle Dams; and grout injection curtains into the Left and Right rims (limestone bluffs) adjacent the Main and Saddle Dams. These Seepage rehabilitation repair alternatives were initiated in 2007. To date, grout injection curtains in the Left Rim and Main Dam embankment are complete.

New studies revealed that the existing Saddle Dam alternative of a combined grout injection curtain and cutoff wall alone may not fully ensure the reliability of the Saddle Dam. Based on this information, new alternatives are being considered to reinforce the Saddle Dam including placement of a concrete structure at the base of the Saddle Dam. New proposed Saddle Dam alternatives would likely impact the area downstream of the Saddle Dam as outlined in blue on Figure 1. All Alternatives to address seepage at the Saddle Dam, including the No Action Alternative, will be evaluated in a new EA, Supplement 3. The EA is necessary to provide National Environmental Policy Act (NEPA) compliance to address impacts that could occur as a result of each alternative plan considered.

This letter serves to solicit scoping comments from the public; federal, state and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of new proposed Alternatives to address seepage at the Saddle Dam. Any comments received during the comment period will be considered in the development of the EA. We encourage comments not only about the immediate project area, but also of plans or proposals for any other development that may impact or influence project resources.

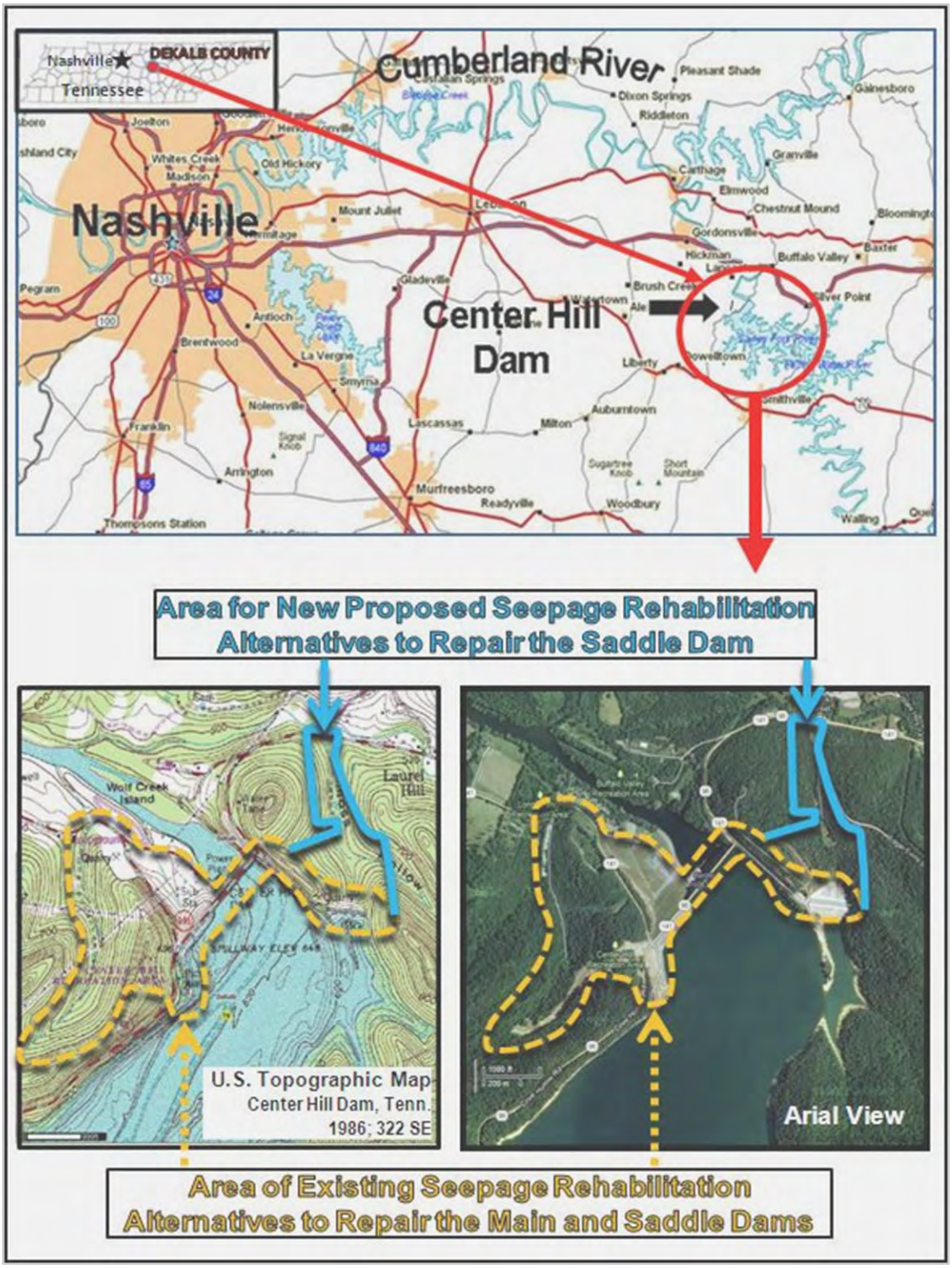
This letter also serves to initiate the public involvement requirements of Section 106 of the National Historic Preservation Act of 1966, as amended. Section 106, implemented by regulations at 36CFR800, requires the Corps of Engineers to consider the effects of its undertakings on historic properties. The Corps plans to undertake a cultural resource survey to identify historic properties within the affected area's footprint and viewshed. The Corps will further consult with the Tennessee State Historic Preservation Officer, Tribes, and other consulting parties prior to making a determination under section 106.

The public is invited to submit written comments no later than thirty (30) days from the date of this letter. Please send comments to the address above, ATTN: CELRN-PM-P (Joy Broach). Comments can be e-mailed to: CenterHillRepair@.usace.army.mil. For additional project information, visit: www.lrn.usace.army.mil/CenterHill.

Sincerely,

Russ Rote
Chief, Project Planning Branch

Figure 1. Center Hill Dam and Lake Location Map.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

March 14, 2012

Ms. Joy Broach
Planning Branch
U.S. Army Corps of Engineers
P.O. Box 1070
Nashville, Tennessee 37202-1070

Subject: Center Hill Saddle Dam, Seepage Rehabilitation Repairs.

Dear Ms. Broach:

Thank you for your correspondence of February 13, 2012, concerning the preparation of an environmental assessment (EA), Supplement 3 to evaluate the impacts of proposed seepage rehabilitation repairs on the Saddle Dam at Center Hill Reservoir in DeKalb County, Tennessee. New studies have revealed that the existing Saddle Dam alternative of a combined grout injection curtain and cutoff wall alone may not fully ensure the reliability of the Saddle Dam. New alternatives are now being considered and would likely include placement of a concrete structure at the base of the Saddle Dam. Your agency has asked for comments regarding possible impacts that might occur from the new alternatives being considered. Fish and Wildlife Service personnel have reviewed your correspondence and we offer the following comments.

Potential summer roost habitat for the federally endangered Indiana bat *(Myotis sodalis)* may exist within the potential impact area of the project and could be altered by the proposed action. Suitable roost habitat for the Indiana bat includes trees with a diameter at breast height of five inches or greater and having loose, cracked, or scaly bark.

The US Army Corps of Engineers, Nashville District has coordinated with our office regarding potential impacts to Indiana bat roosting habitat during the early investigative portion of the project (drilling). Your agency has agreed to continue coordinating with our office regarding potential impacts to Indiana bat roosting habitat as the project moves forward.

Thank you for the opportunity to comment during the scoping phase of this proposal. Please contact Robbie Sykes (telephone 931/525-4979) of my staff if you have questions regarding the information provided in this letter.

Sincerely,

Mary E. Jennings
Field Supervisor

TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

May 16, 2012

Mr. Russ Rote
COE-Nashville District
Post Office Box 1070
Nashville, Tennessee, 37202-1070

RE: COE-N, RRC DAM/CENTER HILL LAKE, UNINCORPORATED, DEKALB COUNTY

Dear Mr. Rote:

In response to your request, received on Wednesday, May 2, 2012, we have reviewed the documents you submitted regarding your proposed undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicant for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800. You may wish to familiarize yourself with these procedures (Federal Register, December 12, 2000, pages 77698-77739) if you are unsure about the Section 106 process. You may find additional information concerning the Section 106 process and the Tennessee SHPO's documentation requirements at. http://www.tennessee.gov/environment/hist/federal/sect106.shtml

Considering available information, we find that the project as currently proposed will NOT ADVERSELY AFFECT ANY PROPERTY THAT IS ELIGIBLE FOR LISTING IN THE NATIONAL REGISTER OF HISTORIC PLACES. Therefore, this office has no objection to the implementation of this project. Please direct questions and comments to Joe Garrison (615) 532-1550-103.
We appreciate your cooperation.

Sincerely,

E. Patrick McIntyre, Jr.

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

EPM/jyg

STATE OF TENNESSEE

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Division of Natural Areas
Natural Heritage Program
7th Floor L&C Tower
401 Church Street
Nashville, Tennessee 37243
Phone 615/532-0431 Fax 615/532-0046

June 27, 2012

Joy Broach
U.S. Army Corps of Engineers—Nashville District
P.O. Box 1070; 801 Broadway
Nashville, TN 37202-1070

Subject: Center Hill Dam Seepage Rehabilitation Project
DeKalb County, Tennessee
Rare Species Database Review

Dear Ms. Broach:

Thank you for your correspondence requesting a rare species database review for the Center Hill Dam Seepage Rehabilitation project, located in DeKalb County, Tennessee.

We have reviewed the state's natural heritage database with regard to the project location, and we find that the following rare species have been observed previously within one mile of the project:

Type	Scientific Name	Common Name	Global Rank	St. Rank	Fed. Prot.	St. Prot.	Habitat
Vascular Plant	Allium burdickii	Narrow-leaf Ramps	G4G5	S1S2	--	T-CE	Rich Woods
Vascular Plant	Elymus svensonii	Svenson's Wild-rye	G3	S2	--	E	Rocky Bluffs
Vascular Plant	Eriogonum longifolium var. harperi	Harper's Umbrella-plant	G4T2	S1	--	E	Rocky Bluffs
Vascular Plant	Liparis loeselii	Fen Orchis	G5	S1	--	T	Calcareous Seeps
Vascular Plant	Panax quinquefolius	American Ginseng	G3G4	S3S4	--	S-CE	Rich Woods

Within four miles of the project the following rare species have been observed previously:

Type	Scientific Name	Common Name	Global Rank	St. Rank	Fed. Prot.	St. Prot.	Habitat
Invertebrate Animal	Cumberlandia monodonta	Spectaclecase	G3	S2S3	LE	Rare, Not State Listed	Medium to large rivers; in substrates from mud and sand to gravel, cobble, and boulders; Cumberland and Tennessee river systems.
Invertebrate Animal	Cyprogenia stegaria	Fanshell	G1Q	S1	LE	E	Medium to large streams and rivers with coarse sand and gravel substrates; Cumberland and Tennessee river systems.
Invertebrate Animal	Dromus dromas	Dromedary Pearlymussel	G1	S1	LE	E	Medium-large rivers with riffles and shoals w/ relatively firm rubble, gravel, and stable substrates; Tennessee & Cumberland systems.
Invertebrate Animal	Epioblasma brevidens	Cumberlandian Combshell	G1	S1	LE	E	Large creeks to large rivers, in coarse sand or mixtures of gravel, cobble, or rocks; Tennessee & Cumberland river systems.
Invertebrate Animal	Epioblasma capsaeformis	Oyster Mussel	G1	S1	LE	E	Shallow riffles in mod-swift current of small-medium rivers with coarse sand and gravel; Tennessee & Cumberland river systems.
Invertebrate Animal	Lampsilis abrupta	Pink Mucket	G2	S2	LE	E	Generally a large river species, preferring sand-gravel or rocky substrates with mod-strong currents; Tennessee & Cumberland river systems.
Invertebrate Animal	Lithasia armigera	Armored Rocksnail	G3G4	S1S2	--	Rare, Not State Listed	Partially buried logs, gravel, and preferably submerged rock outcrops; lower Cumberland River & larger tributaries; Obey River.
Invertebrate Animal	Plethobasus cicatricosus	White Wartyback	G1	S1	LE	E	Presumed to inhabit shoals and riffles in large rivers; Tennessee & Cumberland river systems. Very rare & poss extirpated in TN.
Invertebrate Animal	Pleurobema clava	Clubshell	G2	SH	LE	E	Small/med-sized rivers and streams; deeply buried in sand/fine gravel or in clean, coarse sand/gravel runs; lower Cumb. & Tenn. rivers.

Type	Scientific Name	Common Name	Global Rank	St. Rank	Fed. Prot.	St. Prot.	Habitat
Invertebrate Animal	Quadrula cylindrica cylindrica	Rabbitsfoot	G3G4T3	S3	--	Rare, Not State Listed	Large rivers in sand and gravel; Tennessee & Cumberland systems; big river form of Q. cylindrica.
Invertebrate Animal	Villosa trabalis	Cumberland Bean	G1	S1	LE	E	Riffle areas of small rivers & streams in sand, gravel, & cobble substrates with swift current; upper Cumb. & upper Tenn. river systems.
Nonvascular Plant	Tortula fragilis	Fragile Tortula	G5	S1	--	E	Steep Calcareous Bluffs
Vascular Plant	Acalypha deamii	Deam's Copperleaf	G4?	S1	--	S	Mesic Woods-Sandbars
Vascular Plant	Allium burdickii	Narrow-leaf Ramps	G4G5	S1S2	--	T-CE	Rich Woods
Vascular Plant	Allium tricoccum	Ramps	G5	S1S2	--	S-CE	Rich Woods
Vascular Plant	Amsonia tabernaemontana var. gattingeri	Limestone Blue Star	G5T3Q	S3	--	S	Glades, Barrens, And Rocky River Bars
Vascular Plant	Apios priceana	Price's Potato-bean	G2	S3	LT	E	Openings In Rich Woods
Vascular Plant	Draba ramosissima	Branching Whitlow-grass	G4	S2	--	S	Calcareous Bluffs
Vascular Plant	Elymus svensonii	Svenson's Wild-rye	G3	S2	--	E	Rocky Bluffs
Vascular Plant	Eriogonum longifolium var. harperi	Harper's Umbrella-plant	G4T2	S1	--	E	Rocky Bluffs
Vascular Plant	Erysimum capitatum	Western Wallflower	G5	S1S2	--	E	Rocky Bluffs
Vascular Plant	Juglans cinerea	Butternut	G4	S3	--	T	Rich Woods And Hollows
Vascular Plant	Liparis loeselii	Fen Orchis	G5	S1	--	T	Calcareous Seeps
Vascular Plant	Packera plattensis	Prairie Ragwort	G5	S1	--	S	Open Riverbanks, Barrens
Vascular Plant	Panax quinquefolius	American Ginseng	G3G4	S3S4	--	S-CE	Rich Woods
Vascular Plant	Prenanthes crepidinea	Nodding Rattlesnake-root	G4	S2	--	S	Rich Bottomlands
Vascular Plant	Stellaria fontinalis	Water Stitchwort	G3	S3	--	S	Seeps And Limestone Creek Beds
Vertebrate Animal	Dendroica cerulea	Cerulean Warbler	G4	S3B	--	D	Mature deciduous forest, particularly in floodplains or mesic conditions.

Type	Scientific Name	Common Name	Global Rank	St. Rank	Fed. Prot.	St. Prot.	Habitat
Vertebrate Animal	Etheostoma olivaceum	Sooty Darter	G3	S3	--	D	Small streams with slabrock on limestone bedrock; Nashville Basin tribs to Cumberland & lower Caney Fork rivers.
Vertebrate Animal	Myotis grisescens	Gray Myotis	G3	S2	LE	E	Cave obligate year-round; frequents forested areas; migratory.

Should suitable habitat exist on or immediately downstream of the site, we ask that project plans provide for the protection of these species. We ask that you coordinate this project with the Tennessee Wildlife Resources Agency (Rob Todd, rob.todd@tn.gov , 615-781-6577) to ensure that legal requirements for protection of state listed rare animals are addressed. Additionally, we ask that you contact the U.S. Fish and Wildlife Service Field Office, Cookeville, Tennessee (931-525-4970) for comments regarding federally listed species.

For stabilization of disturbed areas, the Tennessee Natural Heritage Program advocates the use of native trees, shrubs, and warm season grasses, where practicable. Care should be taken to prevent re-vegetation of disturbed areas with plants listed by the Tennessee Exotic Pest Plant Council as harmful exotic plants.

Please keep in mind that not all of Tennessee has been surveyed and that a lack of records for any particular area should not be construed to mean that rare species necessarily are absent. For information regarding species protection status and ranks, please visit http://www.tn.gov/environment/na/pdf/Status&Ranks.pdf.

In order to better assist with determining whether rare species are located on a given development site, the Tennessee Natural Heritage Program has implemented a publicly accessible website where rare species data lists by county, quadrangle, watershed, and MS4 boundaries can be obtained: http://environment-online.state.tn.us:8080/pls/enf_reports/f?p=9014:3:3875605994273657.

Thank you for considering Tennessee's rare species throughout the planning of this project. Should you have any questions, please do not hesitate to contact David at (615) 532-0441 or david.withers@tn.gov .

Sincerely,

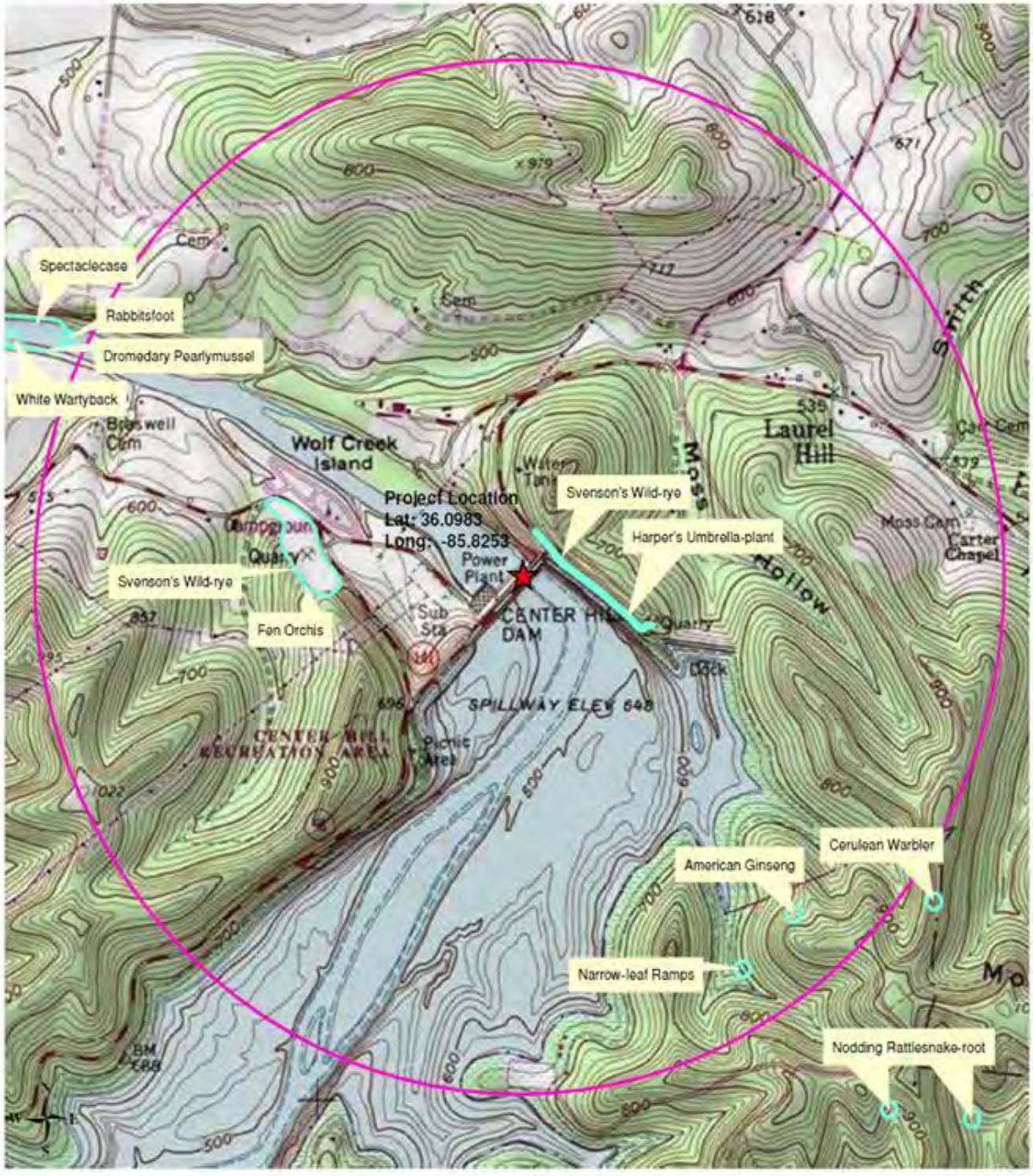
Chelsea L Broach

Chelsea L. Broach
Interim Data Manager

David Ian Withers
Natural Heritage Zoologist

Rare Species Observations Within One Mile
Center Hill Dam, DeKalb County

Wednesday, June 27, 2012



0 0.25 0.5 Miles

This map should not be used to determine where rare species are absent. Many areas of Tennessee have not been surveyed for rare species. Turquoise polygons represent the most probable location of a rare plant or animal population. In general, the larger polygons represent observations with high locational uncertainty.

TENNESSEE NATURAL HERITAGE PROGRAM
7th Floor L&C Annex
401 Church Street
Nashville, TN 37243
Phone: 615.532.0441
www.state.tn.us/environment/na

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1070
NASHVILLE, TENNESSEE 37202-1070

REPLY TO
ATTENTION OF

Project Planning Branch

TO ALL INTERESTED PARTIES: AUG 2 7 2012

The U.S. Army Corps of Engineers, Nashville District (Corps), has prepared an Environmental Assessment, Supplement 3 (EA3) and unsigned Finding of No Significant Impact (FONSI) for a new proposed dam safety alternative to address seepage at the Center Hill saddle dam in DeKalb County, Tennessee. The saddle dam was built on karst geology using accepted engineering practices of the day. Since the 1960's, seepage flows through the limestone formations under the saddle dam have been monitored. Seepage has increased to cause a concern for the stability of the saddle dam. Several repair alternatives have been considered in previous EAs. The EA3 evaluates potential impacts of a new alternative not previously considered. Alternative 1 is a Proposed Roller Compacted Concrete (RCC Berm) Berm. The proposed RCC Berm is a solid concrete structure measuring 900 feet long, 125 feet wide at the base, and 100 feet high. The proposed RCC Berm would be constructed on the landside below the saddle dam. The EA3 also considered potential impacts of Alternative 2 – No Action. Under Alternative 2, no Federal Action would be taken to address seepage at the saddle dam.

The EA3 will provide the basis for a decision on whether to proceed with preparation of an Environmental Impact Statement, sign a FONSI, or take No Action. The EA3 was completed under the original authority of the Center Hill Dam and Lake Project as authorized by the Flood Control Act of 1938 (Public Law (PL) 761, 75th Congress, 3rd Session) and the Rivers and Harbors Act of 1946 (PL 525, 79th Congress, 2nd Session). A scoping letter was circulated on February 13, 2012, that described the proposed project; two responses were received and have been incorporated in the EA3.

This letter serves as a Notice of Availability for reviewing the EA3 and unsigned FONSI. The EA3 is prepared pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality Regulations (40 CFR 1500-1508), and Corps of Engineers implementing regulation, ER 200-2-2, 1988, Policies and Procedures for Implementing NEPA. The EA3 revealed no significant direct or indirect impacts for the proposed RCC Berm on cultural resources listed in or determined eligible for listing in the National Register of Historic Places (NRHP). There would be minor impacts to wetlands, and potentially minor but temporary effects on endangered species; water quality; vegetation/habitat; wildlife; traffic; hazardous, toxic, and radiological wastes and aesthetics.

Hard copies may be viewed at the Nashville District Office, 801 Broadway in Nashville, Tennessee 37203. Electronic copies are found at: http://www.lrn.usace.army.mil/pmgt/Environmental/public_notices.htm. Please submit written comments **no later than September 30, 2012**, to ensure evaluation and inclusion in the EA3. Please send your comments to the address above, Attn: CELRN-PM-P (Joy Broach), or email your comments to joy.i.broach@usace.army.mil.

Your participation is valued and appreciated.

Sincerely,

Jim Higgs

for Russ Rote, P.E., PMP, CFM
Chief, Project Planning Branch

United States Department of the Interior

FISH AND WILDLIFE SERVICE
446 Neal Street
Cookeville, TN 38501

September 25, 2012

Ms. Joy Broach
Project Planning Branch
U.S. Army Corps of Engineers
P.O. Box 1070
Nashville, Tennessee 37202-1070

Subject: Environmental Assessment, Supplement 3 for the Center Hill Saddle Dam, DeKalb County, Tennessee.

Dear Ms. Broach:

Thank you for your correspondence dated August 27, 2012, concerning the Environmental Assessment, Supplement 3 (EA3) and unsigned Finding of No Significant Impact for a proposed dam safety alternative to address seepage at the Saddle Dam on Center Hill Reservoir in DeKalb County, Tennessee. New studies revealed that the previous Saddle Dam alternative of a combined grout injection curtain and cutoff wall alone may not fully ensure the reliability of the Saddle Dam. The new alternative (Alternative 1) includes placement of a roller compacted concrete berm at the base of the Saddle Dam. The other alternative (Alternative 2) considered in the EA3 would be No Action. Your agency has requested review and comments on Alternative 1 that is discussed in the EA3 and FONSI. Fish and Wildlife Service personnel have reviewed your correspondence and we offer the following comments.

As indicated in the EA3, nine federally listed mussels historically occurred in the Caney Fork River watershed. You have made a No Effect determination on listed mussels due to no suitable habitat occurring in the project area. You have also made a No Effect determination for the federally threatened Price's potato-bean (*Apios priceana*) and the recently recovered bald eagle (*Haliaeetus leucocephalus*) due to none observed, or no nests within the project area. The EA3 is adequate and supports your conclusions of No Effect for federally listed mussels, Price's potato-bean, and the bald eagle.

The EA3 indicates that summer roost habitat for the federally endangered Indiana bat (*Myotis sodalis*) exists within the impact area of the project and would be altered by the proposed action. Also, based on recent acoustic surveys, the federally endangered gray bat (*Myotis grisescens*) appears to utilize the area. Your agency has coordinated with our office regarding potential impacts to Indiana and gray bats throughout the early phases of the project. Based on protective measures that are outlined under the Environmental Commitments section (pg. 47) of the EA3,

you have reached a determination of May Effect, Not Likely to Adversely Affect. The EA3 is adequate and supports your conclusions of May Effect, Not Likely to Adversely Affect for the Indiana and gray bats.

Upon review of the EA3 and the associated Biological Assessment, the Service concurs with your determinations on potential impacts to federally listed/protected species. In view of this, we believe that the requirements of section 7 of the Endangered Species Act (Act) have been fulfilled. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals that the proposed action may affect listed species in a manner or to an extent not previously considered, (2) the proposed action is subsequently modified to include activities which were not considered in this biological assessment, or (3) new species are listed or critical habitat designated that might be affected by the proposed action.

These constitute the comments of the U.S. Department of the Interior in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). Please contact Robbie Sykes (telephone 931/525-4979) of my staff if you have questions regarding the information provided in this letter.

Sincerely,

Brad Bingham

Actg for Mary E. Jennings
Field Supervisor

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
NASHVILLE, TENNESSEE 37243-0435

ROBERT J. MARTINEAU, JR.
COMMISSIONER

BILL HASLAM
GOVERNOR

September 28, 2012

Via First Class Mail and Electronic Mail to joy.i.broach@usace.army.mil

Department of Army
Nashville District, Corps of Engineers
P.O. BOX 1070
Nashville, Tennessee 37202

Attention: CELRN-PM-P (Joy Broach)

Ms. Broach:

Please find enclosed the Tennessee Department of Environment and Conservation's (TDEC) comments on the U.S. Army Corps of Engineers, Nashville District's (Corps) EA3 and unsigned Finding of No Significant Impact (FONSI) regarding a dam safety alternative to address seepage at Center Hill saddle dam in DeKalb County, Tennessee. The Corps proposes a new repair alternative to remediate the seepage at Center Hill saddle dam. The new alternative is to construct a Roller Compacted Concrete Berm (RCC Berm) on the land side base of the existing saddle dam, which would replace the previously selected alternative to install a grout curtain and barrier wall into the lake side of the dam and to place over 150,000 cubic yards of fill into Center Hill Lake to construct a cofferdam. The No Action alternative was also considered. Below are TDEC's comments regarding the EA3 and unsigned FONSI:

The Corps has proposed a land exchange that is necessary to implement the proposed RCC Berm Alternative on lands under the control of the Corps and Edgar Evins State Park (Park). The proposed exchange involves two parcels, each consisting of 3.47 acres. The Corps notes it will receive the land occupied by the proposed RCC Berm and will include 100 feet of open-space buffer to maintain the land surrounding the proposed RCC Berm and saddle dam. The land proposed for transfer to the State as a part of the Park is currently being leased to the State and includes the Park's visitor center and observation tower. The Corps indicates it will seek a permanent easement to the access road to the base of saddle dam and will be responsible for road construction, maintenance, and repair. The Corps also indicates that once construction of the RCC Berm is complete, it will confer with the Park to identify State land affected by the implementation of the RCC Berm Alternative that is need of restoration. TDEC's State Parks has consulted with the Corps concerning the land exchange and supports the proposal. The exchange was approved by the State Building Commission this month, September 2012. State Parks will work with the Corps to identify lands needing restoration following implementation of the RCC Berm Alternative.

According to the EA3 and the unsigned FONSI, approximately 0.34 acres of wetlands were identified within the proposed impact footprint. The Corps indicates that most of the wetlands will be avoided; however, approximately 0.13 acres of wetlands may be impacted. The Corps commits to avoid, minimize or mitigate for the wetland loss and mitigation may include on or off site restoration, wetland banking, or use of an in-lieu fee program. If the project is kept under 0.10 acres of impact, a general permit may be issued through a TDEC Environmental Field Office. If the impact is greater, an individual Aquatic Resource Alteration Permit, issued through TDEC's Central Office, is required. If mitigation for impacts to wetlands is required, the Corps may consider working with State Parks to evaluate whether appropriate sites for mitigation exist within the Park.

Coverage under Tennessee's General NPDES Permit for Discharges of Stormwater Associated with Construction Activities (CGP) will be needed for the 30 acres of soil disturbance. The widening of the State Park entrance should be included under this same CGP coverage. It is desirable that stockpiles and fill areas remain on Corps property. If materials are removed off site, additional CGP coverage may be needed, along with Solid Waste permitting (depending on the waste material). The Corps has a current CGP for the Dam repairs (TNR171208); however, the Notice of Intent (NOI) and Stormwater Pollution Prevention Plans (SWPPP) do not include this area below the saddle dam.

These comments represent a review of the EA3, unsigned FONSI, and best available data sources, not a comprehensive field evaluation. Please verify all information contained within this letter in the field. The issuance of this letter does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, State or local laws or regulations.

Please contact me should you have any questions regarding these comments.

Sincerely,

Michelle B. Walker
Director, Office of Policy and Planning
Phone: (615) 532-9668

cc: Mary Parkman, TDEC, Office of General Counsel
Regan McGahen, TDEC, Division of Water Resources
Scotty Sorrells, TDEC, Division of Water Resources
Terry Bonham, TDEC, State Parks

STATE OF TENNESSEE
DEPARTMENT OF TRANSPORTATION
ENVIRONMENTAL DIVISION
SUITE 900 - JAMES K. POLK BUILDING
505 DEADERICK STREET
NASHVILLE, TENNESSEE 37243-0334
(615) 741-3655

September 28, 2012

Mr. Russ Rote
Chief, Project Planning Branch
Department of the Army
Nashville District, Corps of Engineers
PO Box 1070
Nashville, Tennessee 37202-1070

Re: Proposed Dam Safety at Center Hill Saddle Dam, Dekalb County

Dear Mr. Rote:

I have reviewed your letter concerning the Proposed Dam Safety at Center Hill Saddle Dam in Dekalb County.

At this time, the Tennessee Department of Transportation (TDOT) has no transportation projects in the report area.

As your project progresses, if it is determined that TDOT right-of-way will be impacted by the project, please contact Mr. Ray Rucker, TDOT Region 2 Regional Director at 423-892-3430 for further coordination.

Thank you for the opportunity to review this notice.

Sincerely,

Digitally signed by Ann Andrews
DN: cn=Ann Andrews, c=US, ou=TDOT, email=Ann.Andrews@tn.gov
Reason: Ann Andrews
Date: 2012.10.01 16:01:11 -05'00'

Ann Andrews
Transportation Manager 2
Environmental Division

ec: Mr. Jim Ozment
Mr. Ray Rucker
Mr. Bob Allen

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1070
NASHVILLE, TENNESSEE 37202-1070

REPLY TO ATTENTION OF

Project Planning Branch

TO ALL INTERESTED PARTIES: AUG 27 2012

The U.S. Army Corps of Engineers, Nashville District (Corps), has prepared an Environmental Assessment, Supplement 3 (EA3) and unsigned Finding of No Significant Impact (FONSI) for a new proposed dam safety alternative to address seepage at the Center Hill saddle dam in DeKalb County, Tennessee. The saddle dam was built on karst geology using accepted engineering practices of the day. Since the 1960's, seepage flows through the limestone formations under the saddle dam have been monitored. Seepage has increased to cause a concern for the stability of the saddle dam. Several repair alternatives have been considered in previous EAs. The EA3 evaluates potential impacts of a new alternative not previously considered. Alternative 1 is a Proposed Roller Compacted Concrete (RCC Berm) Berm. The proposed RCC Berm is a solid concrete structure measuring 900 feet long, 125 feet wide at the base, and 100 feet high. The proposed RCC Berm would be constructed on the landside below the saddle dam. The EA3 also considered potential impacts of Alternative 2 – No Action. Under Alternative 2, no Federal Action would be taken to address seepage at the saddle dam.

The EA3 will provide the basis for a decision on whether to proceed with preparation of an Environmental Impact Statement, sign a FONSI, or take No Action. The EA3 was completed under the original authority of the Center Hill Dam and Lake Project as authorized by the Flood Control Act of 1938 (Public Law (PL) 761, 75th Congress, 3rd Session) and the Rivers and Harbors Act of 1946 (PL 525, 79th Congress, 2nd Session). A scoping letter was circulated on February 13, 2012, that described the proposed project; two responses were received and have been incorporated in the EA3.

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Your participation is valued and appreciated.

Sincerely,

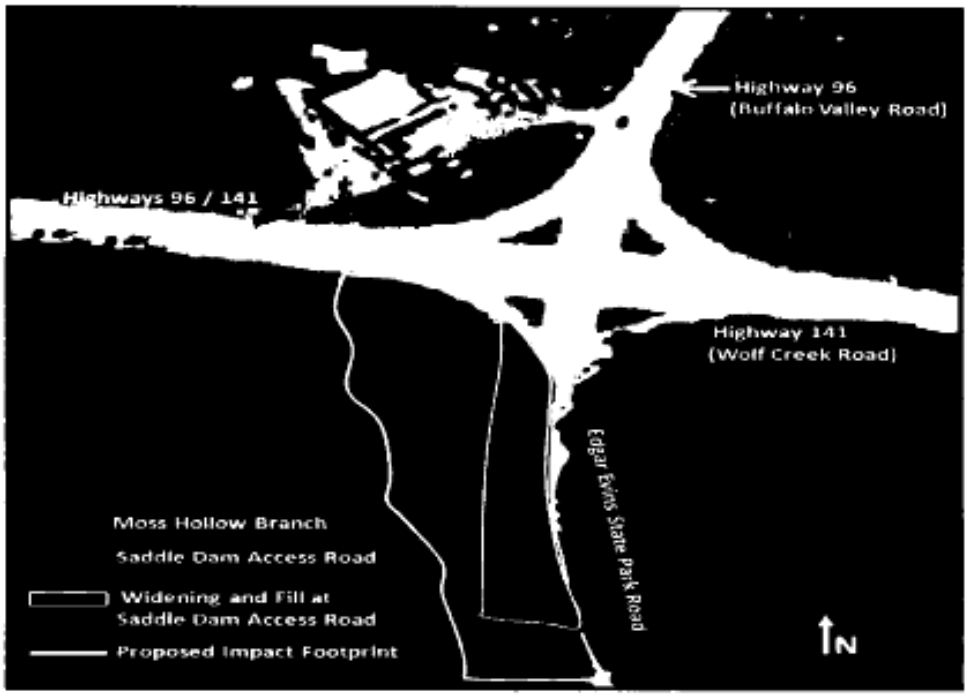
Jim Higgs

Russ Rote, P.E., PMP, CFM
Chief, Project Planning Branch

3.17 Traffic

Existing Conditions: The access road to the bottom of the saddle dam exits onto Edgar Evins State Park Road (Figure 16). A complete closure of this road to accommodate construction traffic would close access to the park because this is the only entrance to the park. The entrance and road shoulder to the saddle dam would require widening to allow large excavating equipment and dump trucks to remove rock and soil, and bring in construction supplies for the proposed RCC Berm. One possible option is to widen the road shoulder from the saddle dam entrance to the intersection of Highways 96/141 to create a pull-over. This would maintain two-way traffic to and from the park and create a wide road shoulder for construction traffic to pull over and travel to and from the saddle dam. Detailed plans would require review from the Park and the Tennessee Department of Transportation (TDOT).

Figure 16. Intersection of Saddle Dam Access Road and Edgar Evins State Park Road



Impacts – Alternative 1 – Proposed RCC Berm: Construction traffic to and from the proposed RCC Dam along the access entrance and road would affect traffic to and from the Park for potentially 2-3 years. However, creation of a pull over would minimize the impact to park traffic. On completion, the widen road shoulder would allow large equipment access to maintain the access road and proposed RCC Dam with little hindrance to the Park traffic.

Impacts – Alternative 2 – No Action: There would be no change to the current traffic pattern. There would be no action to repair seepage at the saddle dam. In the event of a saddle dam fail and ensuing loss of the lake to potentially elevation 570, the valley and roads would be scoured and destroyed.

3.18 Safety

Existing Conditions: Safety is an intrinsic consideration in the planning and operation of the lake. Safety concerns include the safety for the construction crews working on the proposed RCC Berm and operating a construction site in close proximity to public highways and traffic. Currently the primary safety hazard is at the intersection of the saddle dam access road and EESP road. The saddle dam access road entrance is small and narrow and enters at a blind curve in the EESP road. There are no warning signs or lights to alert traffic from the Park to construction traffic entering or exiting the saddle dam access road.

Impacts – Alternative 1 – Proposed RCC Berm: Prior to any road and saddle dam access improvements, a traffic plan would be developed and reviewed by the Park and TDOT. Any action which lessens the traffic concerns would also reduce potential accidents to Park users. On completion, signage and warning signals may remain in place for use during access road repairs and proposed RCC Berm maintenance.

Impacts – Alternative 2 – No Action: There would be no change to the current traffic pattern and no need for signage or warning signals. There would be no action to repair seepage at the saddle dam. In the event of a saddle dam fail and ensuing loss of the lake to potentially elevation 570, the valley and roads including EESP road entrance would be scoured and destroyed.

3.19 Air Quality

Existing Conditions: Currently the site is in an attainment area with regard to the National Ambient Air Quality Standard (NAAQS).

Impacts – Alternative 1 – Proposed RCC Berm: This Alternative would have temporary and minor impacts on air quality from vehicle and equipment exhaust and from fugitive windborne dust. These effects would be minimized by implementing adequate construction BMPs to ensure vehicle and equipment air pollution reduction systems and filters are in good repair. Dust would be controlled with daily road sweeping or water spraying.

Impacts – Alternative 2 – No Action: No change would occur in air quality as long as the saddle dam remains intact. During a catastrophic flood and loss of the saddle dam, sediment may deposit along the floodway. Dry sediment could become airborne resulting in dust problems.

3.20 Noise

Existing Conditions: Local noise is produced by road traffic to and from the Park, and motor boats on the Lake. Construction of the proposed RCC Berm would be anticipated to produce noise from construction equipment and trucks.

Impacts – Alternative 1 – Proposed RCC Berm: Construction noise would be minimized by implementing adequate construction BMPs to ensure vehicle and equipment mufflers are in good repair. Construction noise would be temporary and would cease within 2 – 3 years on completion of the RCC Berm.

Impacts – Alternative 2 – No Action: There would be no additional noise to what already exists.

-----Original Message-----
From: Rob Todd [mailto:Rob.Todd@tn.gov]
Sent: Wednesday, October 03, 2012 5:09 PM
To: Broach, Joy I LRN; Carl Halfacre; Terry Bonham; Roger McCoy; Rita Thompson; david_pelren@fws.gov; Robbie_Sykes@fws.gov; Robert D. Baker
Cc: Higgs, Timothy A LRN; Adcock, Linda H LRN; Salvilla, Kevin LRN; Chris Simpson
Subject: RE: Draft EA for Center Hill Dam and Lake Project - Saddle Dam Repair - Proposed Rolled Concrete Compacted Berm (UNCLASSIFIED)

Joy:

The Tennessee Wildlife Resources Agency has reviewed the DEA, Supplement3, for the New Saddle Dam Repair Alternative, Roller Compacted Concrete Berm, Center Hill Dam and Lake, DeKalb County, Tennessee and the unsigned Finding of No Significant Impact (FONSI) and our concerns regarding potential impacts to listed species under our authority have been addressed and we have no objection to the proposed project. Let me know if you need anything else on this from us.

Robert Todd
Fish & Wildlife Environmentalist
Tennessee Wildlife Resources Agency
Ellington Agricultural Center
P.O. Box 40747
Nashville, TN 37204
Office: 615-781-6572
Cell: 931-881-8240
Fax: 615-781-6667
Email: rob.todd@tn.gov

-----Original Message-----
From: Chelsea Broach [mailto:Chelsea.Broach@tn.gov]
Sent: Thursday, October 18, 2012 3:12 PM
To: Broach, Joy I LRN
Cc: Michelle B. Walker; Rob Todd; David Withers; Roger McCoy
Subject: RE: Draft EA for Center Hill Dam and Lake Project - Saddle Dam Repair - Proposed Rolled Concrete Compacted Berm (UNCLASSIFIED)

Ms. Broach,

The Tennessee Natural Heritage Program concurs with the Saddle Dam Repair Draft Environmental Assessment (EA) determination that no impacts to the indicated rare plants are anticipated. Please note that during the rattlesnake relocation of August 2012 a number of Allegheny woodrats (Neotoma magister, State Deemed in Need of Management) were observed inside the impact area. These data are not reflected in our database at this time. Please consult with TWRA to determine if any additional protective measures are warranted for this population.

If you have any questions or concerns, please contact our division.

Thank you,

Chelsea L. Broach
Interim Data Manager
Tennessee Natural Heritage Program
7th Floor L&C Tower, 401 Church Street
Nashville, TN 37243-0447

(615) 532-0440
chelsea.broach@tn.gov

http://www.tn.gov/environment/na/data.shtml

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1070
NASHVILLE, TENNESSEE 37202-1070

REPLY TO
ATTENTION OF

October 23, 2012

Project Planning Branch

Ms. Michelle B. Walker, Director
Office of Policy and Planning
Commissioner's Office
Department of Environment and Conservation
Nashville, Tennessee 37243-0435

Dear Ms. Walker:

Thank you for the Tennessee Department of Environment and Conservation (TDEC) review comments received in correspondence dated September 28, 2012. The comments addressed the draft Environmental Assessment, Supplement 3 and the unsigned Finding of No Significant Impact proposing construction of a Rolled Compacted Concrete (RCC) Berm below the existing saddle dam at Center Hill Dam and Lake in DeKalb County, Tennessee. TDEC provided comments on a proposed government land exchange, land restoration, wetland mitigation, and the Tennessee General NPDES Permit for Discharges of Stormwater Associated with Construction Activities (CGP). As requested, the Corps has verified the above information in the field and has been working closely with the TDEC Cookeville Environmental Field Office (CFO).

The Corps appreciates the State Building Commission's approval to exchange 3.47 acres of Edgar Evins State Park (Park) property for 3.47 acres of federal (Corps) property to facilitate implementation of the proposed RCC Berm. The Corps has, and will continue to coordinate with the Park through the life of the project to minimize impact and restore affected Park land. If Park wetlands cannot be avoided or impacts minimized, the Corps will work with the Park to identify wetland restoration opportunities within the Park in addition to considering other wetland mitigation alternatives.

In January 2012, the Corps updated the Center Hill Dam CGP TNR171208 and processed the permit through the CFO. The Corps submitted an updated Notice of Intent, Storm Water Pollution Prevention Plan, and additional fees to cover the increased acreage below the saddle dam to address seepage repairs. Coverage for the entire project was issued on February 7, 2012.

The Corps will continue to coordinate permits with the CFO to ensure compliance and provide continuous coordination with the Park and CFO through project completion anticipated to be in 2015. If you have questions or additional comments, please contact Ms. Joy Broach at 615-736-7956. Thank you for your time and review.

Sincerely,

Russ Rote, P.E., PMP, CFM
Chief, Project Planning Branch

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1070
NASHVILLE, TENNESSEE 37202-1070

REPLY TO
ATTENTION OF

Project Planning Branch

OCT 24 2013

TO ALL INTERESTED PARTIES:

The U.S. Army Corps of Engineers, Nashville District (Corps) has prepared an Environmental Assessment, Supplement 3 (EA3) and unsigned Finding of No Significant Impact (FONSI) to address major rehabilitation and seepage repairs at the Center Hill Dam and Lake Project (Project) located in DeKalb County, Tennessee (Figure 1). The purpose and need for federal action is to reduce the risk of dam failure at the Project. The Project has a long history of seepage problems since construction in the 1940's. The main and saddle dams were built on karst geology using accepted engineering practices of the day. Since the 1960's, seepage flows through the limestone formations under the main and saddle dams have been monitored. Seepage had increased to cause a concern for the stability of the main and saddle dams. Several repair alternatives have been considered in previous EA's. Selected alternatives were documented in a 2006 Major Rehabilitation Evaluation Report (MRER). The previously approved 2006 MRER plan addressing seepage repairs was implemented, and construction began in 2008 on Center Hill Dam (main dam).

Since 2008, new information resulted in revisions to the 2006 MRER plan and development of additional changes to project features (left rim, right rim and abutment, saddle dam embankment, and maintenance grouting for the entire project). Revisions are documented in a draft revised 2013 MRER plan that includes consideration of a new seepage repair alternative for the saddle dam embankment not considered in previous EAs. The new alternative is a proposed Roller Compacted Concrete (RCC Berm) Berm to be constructed below the saddle dam. The draft revised 2013 MRER plan also considered added measures to address safety and improved monitoring for future seepage problems as part of on-going dam safety program.

The EA describes existing conditions, and evaluates potential impacts associated with the No Action and Proposed Action alternatives. The No Action alternative is to implement seepage repairs without revision as described in the previously approved 2006 MRER plan. The Proposed Action alternative is to implement revised repairs to project features as described in the draft revised 2013 MRER plan, and to consider the RCC Berm repair and added safety and monitoring measures as described in the draft 2013 MRER Supplement. The EA would provide the basis for a decision on whether to proceed with preparation of an Environmental Impact Statement, sign a FONSI, or No Action. The EA3 was completed under the original authority of the Center Hill Dam and Lake Project as authorized by the Flood Control Act of 1938 (Public Law (PL) 761, 75th Congress, 3rd Session) and the Rivers and Harbors Act of 1946 (PL 525, 79th Congress, 2nd Session). A scoping letter was circulated on February 13, 2012, and a Notice of Availability was previously circulated on August 27, 2012. Both letters described the proposed project and comments previously received have been incorporated in the EA.

This letter serves as a Notice of Availability for reviewing the EA and unsigned FONSI. The EA is prepared pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality Regulations (40 CFR 1500-1508), and Corps of Engineers implementing regulation, ER 200-2-2, 1988, Policies and Procedures for Implementing NEPA. The EA revealed no significant direct or indirect impacts on Cultural Resources listed in or determined eligible for listing in the National Register of Historic Places. There would be minor impacts to wetlands, and potentially minor but temporary effects on endangered species, water quality, vegetation/habitat, wildlife, traffic, hazardous, toxic, and radiological wastes and aesthetics.

Hard copies may be requested or viewed at the Nashville District Office, 801 Broadway in Nashville, Tennessee 370202. Electronic copies are found at: http://www.lrn.usace.army.mil/Missions/CurrentProjects/Construction/CenterHillDamSafetyRehabilitationProject.aspx. Please submit comments **no later than November 29, 2013**, to ensure evaluation and inclusion in the EA3. Please send your written comments to the address above, Attn: CELRN-PM-P (Joy Broach), or email your comments to joy.i.broach@usace.army.mil.

Your participation is valued and appreciated.

Sincerely,

Russ Rote, P.E., PMP, CFM
Chief, Project Planning Branch

Figure 1. Center Hill Dam, DeKalb County, Tennessee