ENGINEERS & CONSULTANTS

FINAL REPORT

CCW IMPOUNDMENTS INSPECTION REPORT

GORGAS STEAM PLANT WALKER COUNTY, ALABAMA

PREPARED FOR:

U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, DC

UNDER SUBCONTRACTO TO:

LOCKHEED MARTIN
EDISON, NJ

Engineering & Construction Management
Hydro-Nuclear-Fossil
Geotechnical Engineering
Seismic and Structural Engineering
Hydrological & Hydraulic Engineering
Tunnel Engineering
Environmental Engineering & Permitting

PAUL C. RIZZO ASSOCIATES, INC.
101 WESTPARK BOULEVARD, SUITE B
COLUMBIA, SOUTH CAROLINA USA 29210

PROJECT NO. 09-4157
SEPTEMBER 2009

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WILLIAM CRAWFORD GORGAS ELECTRIC GENERATING PLANT
WALKER COUNTY, ALABAMA
PROJECT N0. 09-4157

1.0 EXECUTIVE SUMMARY

1.1 GENERAL

This Section is a summary of the Independent Engineer's Review of Management Units for the William Crawford Gorgas Electric Generating Plant (Gorgas). The Report was prepared by Paul C. Rizzo Associates Inc. (RIZZO) for the United States Environmental Protection Agency (USEPA) under subcontract to Lockheed Martin. This Section summarizes the finding, assessments, conclusions and recommendations of the Independent Engineer.

The Gorgas plant is a coal fired power plant located on the north bank of the Black Warrior River in Parrish, Walker County, Alabama owned and operated by Alabama Power Company (APC). Under normal operating conditions, byproducts of coal combustion including fly ash, bottom ash, boiler slag, flue gas emission control residuals, and other general wastewater products are sluiced into a storage basin south of the plant impounded by Rattlesnake Dam, a rockfill embankment structure with an upper RCC facing block. In addition, gypsum byproducts are sluiced and stored in a basin northwest of the plant consisting of a gypsum storage pond and a series of clarification basins.

The ash pond dam, called Rattlesnake Dam, was originally constructed as a random rockfill structure in 1954 using local borrow materials. The original structure was raised and made larger in 1979, and then raised once again in 2007. Along with raising the ash pond dam in 2007, a series of gypsum and clarification ponds were built. For the purposes of this assessment, Rattlesnake Dam and the Gypsum Ponds have been classified as significant hazard potential structures. Significant hazard potential structures are classified as structures where failure is not likely to result in loss of life, but may cause significant

economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. The predominant risk of failure for Rattlesnake Dam and the Gypsum Ponds is environmental damage.

1.2 SUMMARY OF FIELD INSPECTION FINDINGS

The site inspection was conducted on June 9, 2009. The inspection team consisted of representatives from APC, Southern Company, Alabama Department of Environmental Management (ADEM), Balch and Bingham, the USEPA, and RIZZO. The team stopped at each of the Project features to inspect the structures and the surrounding area. Particular attention was paid to site features that may contribute to typical failure modes of embankment structures such as settlement, seepage, and slope stability.

The rockfill embankment forming Rattlesnake Dam and the associated spillway, weir flow discharge structure, and associated piping were found to be well maintained and in good condition at the time of inspection. The dam exhibits little seepage, with the only seepage noted at the time of inspection occurring just to the right of the maximum section at the dam toe. According to site personnel, a small pond at the downstream toe of the maximum section of the structure was built during the initial construction of the Project. APC has not definitively quantified the water source for this pond but believes that it is influenced by both seepage and the adjacent river. RIZZO concurs with this assessment.

The Gypsum Ponds consist of four structures: the gypsum storage basin; a sedimentation basin; and two clear pools, one of which is designated for extra/emergency storage. The recently constructed gypsum storage basin and three associated sedimentation/clarification pools were found to be in good condition at the time of inspection, with no signs of distress, settlement, or instability noted. The gypsum ponds are provided with impermeable liners, with flow carried from pool to pool by a system of decant pipes and a concrete lined open channel connecting the gypsum storage pond and the sedimentation basin.

1.3 SUMMARY OF O&M STATUS

The Project is attended full time by plant operators and dedicated safety personnel. The current inspection schedule for the structures consists of an annual inspection by dam safety experts employed by Southern Company Services. The inspection for Rattlesnake Dam includes surveying of a series of six monuments positioned along the crest of the Dam embedded in the upstream RCC facing block. No other instrumentation has been provided at Rattlesnake Dam or the Gypsum Ponds.

At the time of inspection, the structures and the Plant appeared to be well maintained and in good working order. Currently, neither the Rattlesnake Dam nor the Gypsum Ponds are regulated by state or federal dam safety programs.

1.4 CONCLUSIONS

1.4.1 Project Description

The Gorgas Power Plant is a coal fired power plant. CCW byproducts of coal combustion are sluiced to on site storage ponds which appear to be well maintained and operated.

The last major revisions to the CCW storage structures include a raise of Rattlesnake Dam to provide more storage and the construction of the Gypsum Ponds, both of which occurred in 2007. Designs for the recent construction projects were developed by APC, Southern Company employees. The structures are not regulated by any state or federal dam safety programs. Dam safety is monitored by APC employees on a day-to-day basis and annually by Southern Company representatives.

1.4.2 Field Inspection

Field inspection was performed in light of EPA guidelines and typical embankment failure modes. Minor seepage was noted at one location at the toe of Rattlesnake Dam, and an area of poor vegetative cover was noted on the downslope between the gypsum storage pond and sedimentation/clear pools at the Gypsum Ponds. Recommendations were

developed based on field observations and technical review of Project documentation provided by APC.

1.5 SUMMARY OF RECOMMENDATIONS

There were a total of five recommendations resulting from the document review and field inspection. The Recommendations are summarized below in ***Table 1-1*** and discussed in detail in ***Section 4.0.***

TABLE 1-1: SUMMARY OF RECOMMENDATIONS

NO.	RECOMMENDATION	TIMEFRAME
1	Institute Formal Monthly Visual Inspection Program.	Summer 2009
2	Improve Condition of Seepage Monitoring Weir at Toe of Rattlesnake Dam	Summer 2009
3	Monitor Developing Cracks in RCC at Rattlesnake Dam.	Concurrent with Annual Inspections.
4	Maintain Vegetation on Slopes of Gypsum Ponds	According to Owner's Existing Plan.
5	Continued Vegetation Control on Slopes and Toe of Rattlesnake Dam	As Required by 2008 Inspection Report.

1.6 CERTIFICATION

1.6.1 List of All Field Inspection Participants

The field inspection was conducted on June 9, 2009. The individuals participating in the inspection were:

Karrie-Jo Shell	USEPA
H. Grady Adkins, PE	RIZZO – Independent Engineer
John P. Osterle, PE	RIZZO
Conrad Ginther, EIT	RIZZO
Jim Courington	Gorgas – Alabama Power
Tracie Hill	Gorgas – Alabama Power

Susan Mayfield	Gorgas – Alabama Power
Jerry Mitchell	Gorgas – Alabama Power
Shane Lovett	ADEM
Scott Story	ADEM
Scott Ramsey	ADEM
Edward Poolos	ADEM
Steven Burns, Esq.	Balch and Bingham
Tommy Ryals	APC Environmental Affairs
Jim Pegues	Southern Company

1.6.2 Signature of Independent Engineer

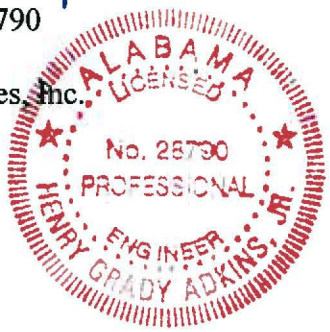
I acknowledge that the management units referenced herein were personally inspected by me and was found to be in the following condition:

SATISFACTORY

Signature: H. Grady Adkins 9/14/09

H. Grady Adkins, PE,
AL Registration No. 28790
Independent Engineer
Paul C. Rizzo Associates, Inc.

1.6.3 PE Stamp



2.0 PROJECT DESCRIPTION

2.1 EXISTING PROJECT FEATURES AND HAZARD POTENTIAL CLASSIFICATION

2.1.1 Rattlesnake Dam and Ash Pond

Rattlesnake Dam is identified as a Significant Hazard structure with the ID "AL 01662" in the National Inventory of Dams. It is also referred to as Rattlesnake Hollow Dam.

Rattlesnake Dam was originally constructed as a random rockfill berm with a crest elevation of approximately 320 feet, referred to in the provided documentation and drawings as "Stage 1". Limited details of the original construction or foundation preparation were available at the time of inspection. In the mid 1970's, the dam was raised to crest elevation 375 feet (Stage 2). The Stage 2 crest raise consisted of excavation and removal of ash that had collected against the rockfill face of the Dam, the construction of an upstream blanket intended to limit seepage through the existing and new rockfill, placement of an intermediate sized material intended to act as a filter between the impermeable material and rockfill, and the placement of additional rockfill on the downstream shell. According to documents provided by APC, the construction of the upstream seepage blanket and intermediate filter was difficult due to the craggy surface provided by the existing rockfill surface. The Stage 2 crest raise appears to have been largely successful at reducing seepage through the structure, with only one location of notable seepage at a location around 150 feet west and downstream of the concrete culvert that had previously served as the diversion channel for the original construction. This seepage feature generally coincides with the location of seepage noted at the time of inspection, and is estimated to be on the order of five gallons per minute.

In 2005, as the storage capacity of the ash pond dwindled, a feasibility study was performed to determine the available methods to raise the existing dam and the associated risks and costs of a second crest increase. The study consisted of historical document reviews, field exploration including a two phase geophysical testing program, test pits and other field sampling, and seepage and slope stability analysis of existing and proposed conditions. The resulting Report, "Crest Raise Feasibility Study", issued in October 2005 was provided by APC at the time of inspection. As a result of the Feasibility Study, a

cross section consisting of a 10 foot wide RCC facing block with a design slope of 0.75 H:1V, a core section up to 30 feet thick, a 10 foot thick fine and coarse filter section, and additional rockfill placed on the downstream shell to provide a downstream slope of 1H:1V was selected for the crest raise project (Stage 3), with a design crest elevation of 395 feet. According to provided calculations, it was estimated that raising the crest an additional 20 feet would provide on the order of 30 years of additional ash storage.

Documentation reviewed as a part of the inspection included the previously mentioned feasibility study, design stability calculations performed using the program Slope/W and performed for normal, seismic, and flood loading conditions, and the construction drawings for the crest raise project. The review of these documents did not include a detailed check of calculations however, assumptions made in the analysis such as loading conditions and material properties were well documented and the assumptions and results of the analyses appeared reasonable to the reviewers.

The Stage 3 construction at Rattlesnake Dam was completed in 2007, and consisted of removal and replacement of the weir flow intake structure used to control water levels at normal conditions, a 20 feet raise of the dam crest using the typical section mentioned above, and the construction of a two bay emergency spillway with a spill elevation of 385 feet designed to pass the PMF without overtopping of the structure. The RCC facing block was installed using a paving machine without the use of water stops at construction joints and with few measures to control cracking in the RCC. The current dam crest elevation is 395 feet, and the approximate height of the dam is 140 feet.

In addition to the crest raise, an intermediate dike was constructed in the ash pond to facilitate better water quality at the discharge by limiting the travel of ash in the pond. This dike extends from the east side of the pond nearly all the way to the west side, where a narrow channel allows water to flow to Rattlesnake Dam and through the discharge structure. An HDPE bubbler line has been added in the channel to provide extra water quality treatment.

Currently, CCW byproducts are sluiced from the Gorgas combustion units, under the Black Warrior River, to the far southern (upstream) extremity of the ash pond via HDPE sluice lines. Discharge water travels through the channel at the intermediate dike and to

the weir flow intake structure near the right abutment of Rattlesnake Dam, where a four feet diameter line carries flow to the discharge point in the river. The discharge from the ash pond is regulated by the Alabama Department of Environmental Management under NPDES Permit #AL0002909.

According to information provided by APC, the Ash Pond has an approximate area of 420 acres, is holding approximately 6.2 million cubic yards of CCW, and has an approximate storage capacity of 17.3 million cubic yards of CCW.

Based on field reconnaissance and a review of USGS maps and aerial photographs, Rattlesnake Dam has been classified by the Independent Engineer as a significant hazard potential structure due to the environmental damage that would be caused by misoperation or failure of the structure. ***Table 2-1*** below summarizes the location information for Rattlesnake Dam.

TABLE 2-1: RATTLESNAKE DAM LOCATION DATA

	DEGREES	**MINUTES**	**SECONDS**
Longitude	-87	11	08
Latitude	33	38	23
State:	Alabama	**County:**	Walker

2.1.2 Gypsum Ponds

The Gypsum Ponds were constructed in 2007 and consist of a gypsum storage basin, a sediment basin, and two clear pools, one of which is used for emergency storage. All of the Gypsum Ponds are lined with a 60 mil HPDE welded liner and the gypsum storage pond is provided with underdrains.

The gypsum storage cell is the largest of the four ponds, and is partially incised into a hilltop and partially diked. According to documentation provided by APC, the hilltop the embankment is constructed on is at least partially comprised of coal mine spoil materials. The stability analyses provided by APC appear to have accounted for this foundation condition appropriately. The embankment is up to 80 feet high on the slope between the

gypsum storage pond and lower ponds, with a crest elevation of 440 feet. Inside and outside slopes of the basin are constructed at 2.5H:1V, with an intermediate bench provided to either side of the crest at elevation 420 feet. A decant pipe carries water from the center of the pond through the embankment to a concrete lined trapezoidal channel that ties into the sedimentation pond via several 36 inch diameter concrete pipes. The decant structure in the storage basin is constructed such that as gypsum accumulates risers can be added to the structure to rise the decant elevation in 4 foot intervals. The lowest decant elevation provided in the pond is 403.5 feet, approximately 3.5 feet higher than the low point of the pond bottom. Gypsum slurry is pumped from a low point below the clear pool to the northern extremity of the gypsum storage pond.

According to information provided by APC, the gypsum storage pond has an approximate area of 21 acres, is holding approximately 212 thousand cubic yards of gypsum, and has an approximate storage capacity of 1.6 million cubic yards of gypsum.

The sediment pond, clear pool, and emergency storage cell were incised into pre-existing grades and have interior slopes of 2.5H:1V. Two decant pipes carry water from the sediment pond to the clear pool under normal conditions. In addition, concrete lined overflow spillways connect the sediment pond to the clear pool and the clear pool to the emergency storage cell.

Documentation reviewed as a part of the inspection included design stability calculations performed using the program Slope/W and performed for normal, seismic, and flood loading conditions, and the construction drawings for the Gypsum Ponds. The review of these documents did not include a detailed check of calculations, however, assumptions made in the analysis such as loading conditions and material properties were well documented and the assumptions and results of the analyses appeared reasonable to the reviewers.

Based on field reconnaissance and a review of USGS maps and aerial photographs, the Gypsum Ponds (the gypsum storage pond in particular) have been classified by the Independent Engineer as a significant hazard potential structure due to the environmental damage that would be caused by misoperation or failure of the structure. ***Table 2-2*** below summarizes the location information for the Gypsum Ponds.

TABLE 2-2: GYPSUM POND LOCATION DATA

	DEGREES	MINUTES	SECONDS
Longitude	-87	13	02
Latitude	33	39	19
State:	Alabama	**County:**	Walker

2.2 SUMMARY OF STANDARD OPERATING PROCEDURES

2.2.1 Purpose of the Project

The Gorgas Plant is a coal fired power plant. Rattlesnake Dam was constructed to provide storage for waste coal combustion products and to provide necessary decantation capacity for the discharge water from the plant to comply with NPDES permit requirements. The Gypsum Ponds were constructed to provide storage for gypsum created as a byproduct of emissions scrubbing. Recent additions to the structure of Rattlesnake Dam have added an estimated additional storage capacity for on the order of 30 years more ash production.

To date there have been no failures, overtopping events, or uncontrolled releases into the Black Warrior River from Rattlesnake Dam or the Gypsum Ponds. This assessment does not include discharges already recorded in NPDES records.

2.2.2 Current Inspection Schedule

The current inspection schedule for the structures at Gorgas is as follows:

- **Visual Inspection by Site Staff**: Required not less than weekly by APC policy; and
- **Engineering Inspection by Alabama Power/Southern Company staff**: A more in-depth inspection by dam safety experts, performed annually, includes review of data from latest survey of displacement monuments.

2.3 MODIFICATIONS CONDUCTED FOR PROJECT SAFETY

In 2007 the Gypsum Ponds were constructed and Rattlesnake Dam was raised 20 feet. These construction projects were related to production capacity rather than dam safety improvements. No safety improvements have been conducted since 2007.

2.4 ENGINEERING INFORMATION

The following documents provided by APC were reviewed in the preparation of this Report:

1. Rattlesnake Hollow Ash Pond Dam – Raise Crest Feasibility Study;
2. Hydrologic Study and Calculations for Ash Pond Drainage Basin – Associated with Raise Crest Feasibility Study;
3. Hydraulic Design Calculations for Gypsum Storage Ponds;
4. Stability Analyses of the Gypsum Storage Pond;
5. Stability Analyses of the Rattlesnake Hollow Ash Pond Dam;
6. General Technical Specifications For Earthwork for New Gypsum Storage Facility at Gorgas Steam Plant;
7. Technical Specifications for Earthwork and Roller Compacted Concrete Crest Raise Construction –Plant Gorgas - Rattlesnake Hollow Ash Pond Dam;
8. Construction Drawings for Gypsum Storage Ponds;
9. Gorgas Steam Plant- Report of Annual Dam Safety Inspection – November 12, 2008;
10. Gorgas Steam Plant- Rattlesnake Hollow Ash Pond Dam- Biennial Inspection Observations November 30, 2006;
11. Alabama Power Company Responses to EPA Questions Regarding Management of Coal Combustion By-Products. Doc Control No. GOR-API-0033 & 0034;
12. Final Permit, NPDES Permit Number: AL0002909; and
13. Plant Gorgas – Overview Photos.

2.4.1 Slope Stability Analyses

The recommended minimum factors of safety for dams contained in the "Recommended Guidelines for Safety Inspections of Dams" (US Army Corps of Engineers ER-1110-2-106) are:

- Steady State Seepage Condition: 1.5;
- Sudden Drawdown Condition – 1.2; and
- Steady State Seepage with Seismic – 1.0

For the Ash Pond, stability analyses were performed on both the pre-raise embankment and the post-raise embankment. Both upstream and downstream sections were analyzed for stability under steady state seepage and seismic loading conditions. Stability analyses resulted in the following factors of safety.

STABILITY ANALYSES RESULTS

EMBANKMENT SECTION	PRE-RAISE		POST-RAISE	
	STEADY STATE	SEISMIC	STEADY STATE	SEISMIC
Upstream	2.24	1.82	1.94	1.61
Downstream	1.54	1.36	1.43	1.27

The Sudden Drawdown Condition is normally computed from the spillway crest to the pool level. In the case of this Dam, this is only a difference of two feet and would not be expected to be a critical loading condition.

For the Gypsum Storage Pond, the stability of the embankment was analyzed for the following conditions:

- Ponded Water with and without seismic load;
- Ponded Gypsum with and without seismic load; and
- Full Gypsum Stack with and without seismic load.

For each of these conditions, the factor of safety under static load was 1.88 and the factor of safety with seismic load was 1.64. A review of the calculations showed that no phreatic line within the embankment was considered. This is considered a valid assumption as long as the impermeable liner functions as designed.

2.4.2 Hydrologic Analyses

A Hydrologic Study for the Ash Pond Drainage Basin was completed by Southern Company Services in November 2005, as a part of the crest raise of the Ash Pond. Inflow hydrographs for the 6-hour 100-year and the 6-hour Probable Maximum Precipitation were developed and floodrouted through the planned spillway system using the SCS TR-20 Program. The results of this analysis are summarized below.

Normal Pool at Start of Storm	Elevation 382.0
Maximum Pool Stage from 100-yr Rainfall	Elevation 384.0
Maximum Pool Stage from PMPr Rainfall	Elevation 390.2
Crest of Dam	Elevation 395.0

The Gypsum Storage facility is located such that it has no drainage area and the only water that enters the basin is pumped in or rainfall that falls directly into the pond. Water exits the pond through two decant risers. No hydrologic or hydraulic calculations for these risers were found. The storm drainage system that carries runoff from the top of the gypsum storage area to the sedimentation basins is designed for a 25-year 24-hour storm event.

Based on the field inspection and review of the submitted documents, RIZZO concurs with the methods and conclusions of the hydrologic studies.

3.0 FIELD INSPECTION

3.1 FIELD INSPECTION OBSERVATIONS

The site inspection was conducted on June 9, 2009. The inspection team consisted of representatives from APC, Alabama Department of Environmental Management (ADEM), Balch and Bingham, Southern Company, the USEPA, and RIZZO. The team stopped at each of the Project features to inspect the structures and the surrounding area. Particular attention was paid to site features that may contribute to typical failure modes of embankment structures such as settlement, seepage, and slope stability. Photographs taken during the site inspection can be reviewed in ***Appendix A***.

The individuals participating in the inspection were:

Karrie-Jo Shell	USEPA
H. Grady Adkins, PE	RIZZO – Independent Engineer
John P. Osterle, PE	RIZZO
Conrad Ginther, EIT	RIZZO
Jim Courington	Gorgas Plant – APC
Tracie Hill	Gorgas Plant – APC
Susan Mayfield	Gorgas Plant – APC
Jerry Mitchell	Gorgas Plant – APC
Shane Lovett	ADEM
Scott Story	ADEM
Scott Ramsey	ADEM
Edward Poolos	ADEM
Steven Burns, Esq.	Balch and Bingham
Tommy Ryals	APC Environmental Affairs
Jim Pegues	Southern Company

3.1.1 Rattlesnake Dam

At the time of inspection, Rattlesnake Dam appeared to be well maintained and in good condition. The crest of the structure appeared well maintained and showed no signs of settlement or rutting. The upstream slope was not visible below the recently constructed RCC facing block. The downstream slope appeared to be uniformly graded, without signs

of sloughing or sliding. The abutment contacts appeared to be in good condition downstream and where visible upstream.

Vertical cracking was noted in the upstream face of the RCC near the intake weir and right abutment (***See Photo 6***). According to APC personnel, no construction joints were placed in the RCC facing between the abutments – a distance of approximately 1300 feet. No area of concentrated vertical cracking was noted elsewhere on the RCC facing. The existing cracks should be monitored for change in size as part of the inspection program. The left abutment is flatter than the right abutment but may be subject to cracking due to future differential settlement. Observation of the front face of the RCC for cracking should be included in periodic inspection checklists.

The weir intake structure is a new reinforced concrete structure in excellent condition. This structure outlets into a 48-inch diameter corrugated metal pipe that carries decant water down the hill to the NPDES permitted release point. The release point is under water; therefore observation of the water at the point of discharge was not visible. Water at the point of entry was clear water. (***See Photo 2***).

The auxiliary spillway consists of twin box culverts through the embankment discharging into a baffle chute spillway with a rock lined trapezoidal discharge channel (tailrace) below the chute stilling basin. This spillway was constructed in 2007 and is in excellent condition. It has not experienced flow to date.

The downstream face of the dam is rockfill with no signs of sloughing or sliding. The color difference in the photographs between the upper lighter colored rock and the lower darker colored rock is indicative of difference in exposure time between the new construction in 2007 and the older rock placed in the 1970's rather than an indication of seepage.

The downstream toe is generally grassed and clear of trees and heavy vegetation, with the exception of areas of tall brush in areas difficult to reach with tractor mowers. Seepage was noted below the toe in the left abutment area. The area around the pond in the center portion of the dam appears to be continuously wet from seepage and tailwater from the river. The pond was built during the initial dam construction. Wet areas and standing

water in tractor ruts were noted in the cleared area downstream of the dam. All were seeps of clear water with no cloudiness or indication of soil movement and may have been hillside seepage from recent rainfall.

The intermediate dike was observed from a distance and not walked. This dike serves as a baffle to enhance water quality, and with a crest elevation only slightly above normal pool, is not considered a safety risk to Rattlesnake Dam.

3.1.2 Gypsum Ponds

The Gypsum Ponds complex consists of the gypsum storage pond at the upper elevation and the sediment basin and two clear pools at the lower elevation. These engineered earthfill structures are lined with HDPE welded liners and were constructed in 2007. There is no moisture on exposed slopes that would be indicative of seepage.

At the time of the inspection, the ponds appeared to be well constructed, operated, and maintained.

The ponds were found to have smooth, even, well graded slopes with spotty vegetation on the exterior slopes. The lack of grass cover is attributed to the recent regional drought since the slopes were seeded after construction. This has resulted in areas of surface erosion on the slopes as shown in (***Photos 34, 35, and 36***). According to APC personnel, repairs to the slope erosion and vegetation are scheduled for the near future. The erosion is not an immediate threat to the embankments, but should be addressed before it becomes a problem. The planned slope and vegetation repairs should help solve the threat.

3.2 STATUS OF RESPONSES TO RECOMMENDATIONS IN LAST ANNUAL INSPECTION

APC provided a copy of the "Report of Annual Dam Safety Inspection, November 12, 2008" for review. In general, the inspection found no indications of concern for dam safety and as such the two recommendations are minor in nature.

3.2.1 Sapling Removal

***Recommendation*:**

Small saplings in rockfill dam should be removed or treated by spraying herbicide.

***Status*:**

At the time of inspection, rockfill slopes of Rattlesnake Dam appeared free of excessive vegetation, brush, and saplings.

3.2.2 Maintain a Clear Zone at Dam Toe

***Recommendation*:**

Vegetation along toe should be cleared to a distance of 20 feet from the dam toe. This clearing should be maintained to the extent necessary to allow inspection.

***Status*:**

At the time of inspection, the area was generally clear of heavy vegetation, with the exception of some areas of tall brush or grass in areas that appeared hard to reach with a mowing tractor. The area immediately downstream of the toe in the center portion of the Dam appears to stay wet and consequently is difficult to mow.

4.0 RECOMMENDATIONS

A total of five recommendations were generated during the preparation of this Inspection Report. All of the Recommendations are considered dam safety items. Each recommendation is presented below along with a proposed schedule to address the Recommendation.

4.1 RECOMMENDATION NO. 1

It is recommended that the visual inspections performed by site personnel be formalized in a monthly monitoring program. The program should consist of visual observation of slope conditions, general maintenance items such as vegetation control, and changes/appearances of seepage flow for both Rattlesnake Dam and the Gypsum Ponds and should include observations of any changes in depth, area, or other conditions of the toe pool and of changes in the volume of seepage at the existing seep in Rattlesnake Dam. A simple log sheet should be developed to facilitate easy reference and availability of the information for any future inspections, improvements, or remediations.
Schedule: Summer 2009

4.2 RECOMMENDATION NO. 2

In conjunction with Recommendation No. 1, the existing weir box at the toe of the downstream slope of Rattlesnake Dam should be cleaned out and repositioned, or replaced with a larger weir if necessary, to collect the seepage flow along the downstream toe observed at the time of inspection. As much of the seepage currently visible should be collected as possible and the small ditch creating the current flow path should be keep as clear as possible to facilitate observations of changes in volume, turbidity, or location of new seeps. Such information, along with the flow measured at the box should be recorded as a part of Recommendation No. 1, so that seepage trends can be established and reviewed easily. In the event of increased seepage flows, the installation of additional instrumentation and a more involved monitoring program may be warranted.
Schedule: In conjunction with Recommendation No. 1.

4.3 RECOMMENDATION NO. 3

It is recommended that cracks in the RCC facing block of Rattlesnake Dam be monitored as they develop, and that remedial measures such as caulking or grouting be considered to treat the cracks if they are deemed a risk to the embankment materials during normal conditions or high pool events.
Schedule: Concurrent with Annual Inspections.

4.4 RECOMMENDATION NO. 4

It is recommended that the slopes between the gypsum storage cell and the clarification basins be reseeded or otherwise provided with good vegetative cover to prevent excessive raveling of the slopes. It is our understanding that APC has a plan in place to restore and establish cover on the slopes in the near future.
Schedule: According to existing plans.

4.5 RECOMMENDATION NO. 5

It is recommended that efforts to control vegetation in the rockfill slopes and within 20 feet of the downstream toe of Rattlesnake Dam be continued as indicated in the last annual Inspection Report.
Schedule: Per the recommendations of the 2008 Report of Annual Dam Safety Inspection.

APPENDIX A

GORGAS STEAM PLANT PHOTO LOG

PHOTO 1: RATTLESNAKE DAM WEIR FLOW INTAKE STRUCTURE

PHOTO 2: CLOSEUP OF WEIR INTAKE

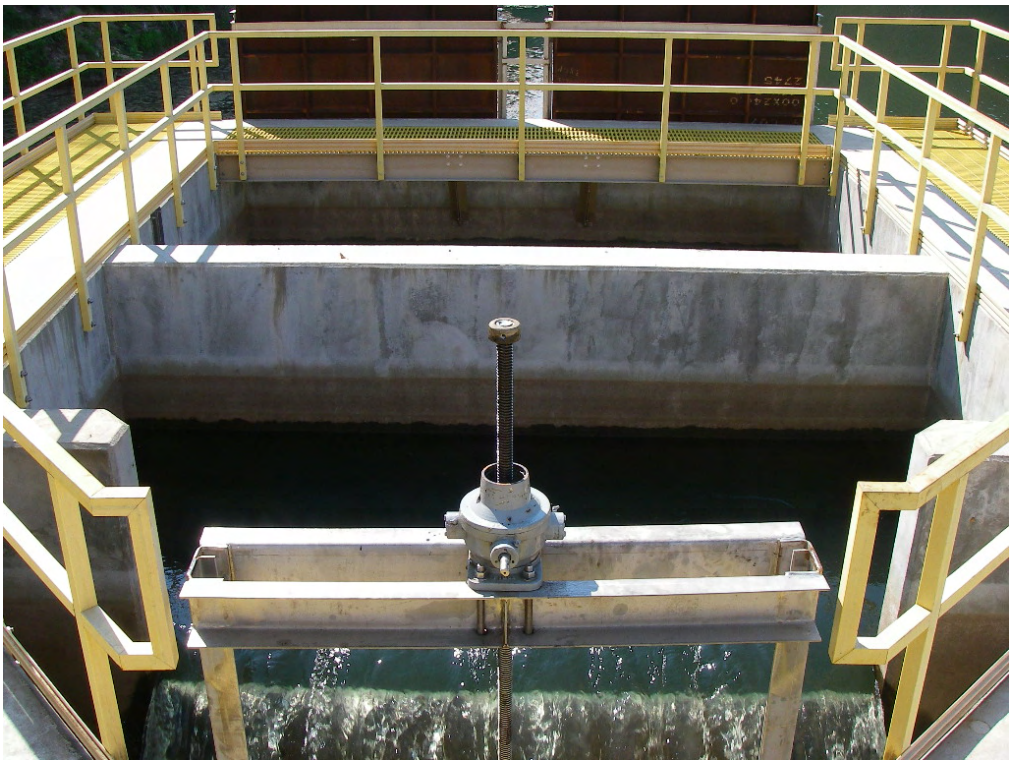


PHOTO 3: EMERGENCY SPILLWAY AND UPSTREAM FACE OF RATTLESNAKE DAM

PHOTO 4: RATTLESNAKE DAM LEFT ABUTMENT UPSTREAM CONTACT

PHOTO 5: RATTLESNAKE DAM RIGHT ABUTMENT UPSTREAM CONTACT

PHOTO 6: VERTICAL CRACKING IN RCC FACING BLOCK LEFT OF INTAKE STRUCTURE

PHOTO 7: RCC FACING ON UPSTREAM SIDE OF RATTLESNAKE DAM (LOOKING SW)

PHOTO 8: RCC FACING ON UPSTREAM SIDE OF RATTLESNAKE DAM (LOOKING NE)

PHOTO 9: RATTLESNAKE DAM DOWNSTREAM SLOPE FROM LEFT ABUTMENT (LOOKING SW)

PHOTO 10: RATTLESNAKE DAM DOWNSTREAM SLOPE FROM LEFT ABUTMENT (LOOKING NE)

PHOTO 11: EMERGENCY SPILLWAY CHUTE (LOOKING S)

PHOTO 12: EMERGENCY SPILLWAY (FROM DAM CREST, LOOKING N)

PHOTO 26: RIP RAP LINED SPILLWAY TAILRACE (LOOKING N)

PHOTO 13: DISCHARGE LINE FROM INTAKE STRUCTURE (LOOKING NW)

PHOTO 27: DISCHARGE LINE FROM RATTLESNAKE DAM TO BLACK WARRIOR RIVER

PHOTO 28: DISCHARGE INTO BLACK WARRIOR RIVER
(NPDES PERMIT #xx)

PHOTO 14: ORIGINAL BYPASS CHANNEL (ABANDONED)

PHOTO 15: ORIGINAL BYPASS CHANNEL & CULVERT (ABANDONED, LOOKING S)

PHOTO 16: POOL AT DOWNSTREAM TOE OF RATTLESNAKE DAM (LOOKING W)

PHOTO 17: RATTLESNAKE DAM DOWNSTREAM SLOPE AND POOL AT TOE

PHOTO 18: OVERGROWN SEEPAGE MEASUREMENT WEIR

PHOTO 19: APPROXIMATE SOURCE LOCATION OF SEEPAGE FROM DOWNSTREAM TOE OF RATTLESNAKE DAM

PHOTO 29: VIEW ACROSS ASH POND FROM ADJACENT TO INTERMEDIATE DIKE (LOOKING S)

PHOTO 30: INTERMEDIATE DIKE IN ASH POND (LOOKING E)

PHOTO 31: ASH SLUICE DISCHARGE LINE (LOOKING S)

PHOTO 32: BUBBLER AERATION LINE AT INTERMEDIATE DIKE (LOOKING E)

PHOTO 33: GYPSUM STORAGE POND (LOOKING SE)

PHOTO 34: SEDIMENT POND, BACKGROUND, AND CLEAR POOL, FOREGROUND (LOOKING NE)

PHOTO 35: DECANT PIPES IN SEDIMENT BASIN

PHOTO 36: EROSION ON SLOPE BETWEEN ASH BASIN AND CLEAR POOL

PHOTO 37: SILT SOCK PLACED AS E & S CONTROL AT BASE OF ERODED AREA

PHOTO 38: PUMP STATION FROM CLEAR POOL

APPENDIX B

FIGURES

CAD FILE NUMBER	09-4157-B2(M)		
CHECKED BY			
APPROVED BY			
CHG	6/21/09		
DRAWN BY			
PLOT 1=1			

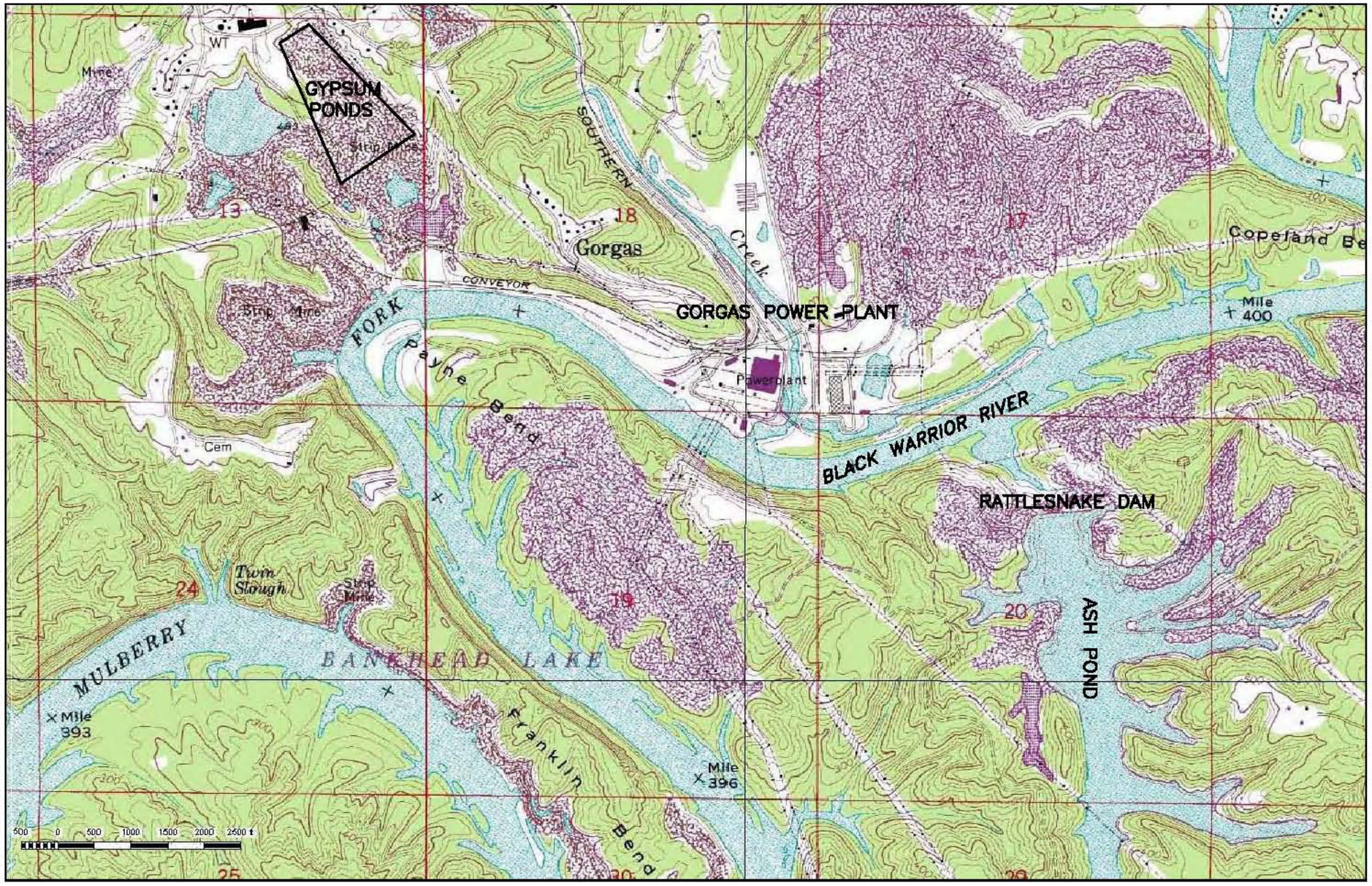


FIGURE 1

USGS VICINITY MAP
GORGAS PLANT
DAM SAFETY INSPECTION
PREPARED FOR

USEPA
WASHINGTON, D.C.

Paul C. Rizzo Associates, Inc.
ENGINEERS & CONSULTANTS

PLOT	DRAWN BY	CHG	CHECKED BY	CAD FILE NUMBER
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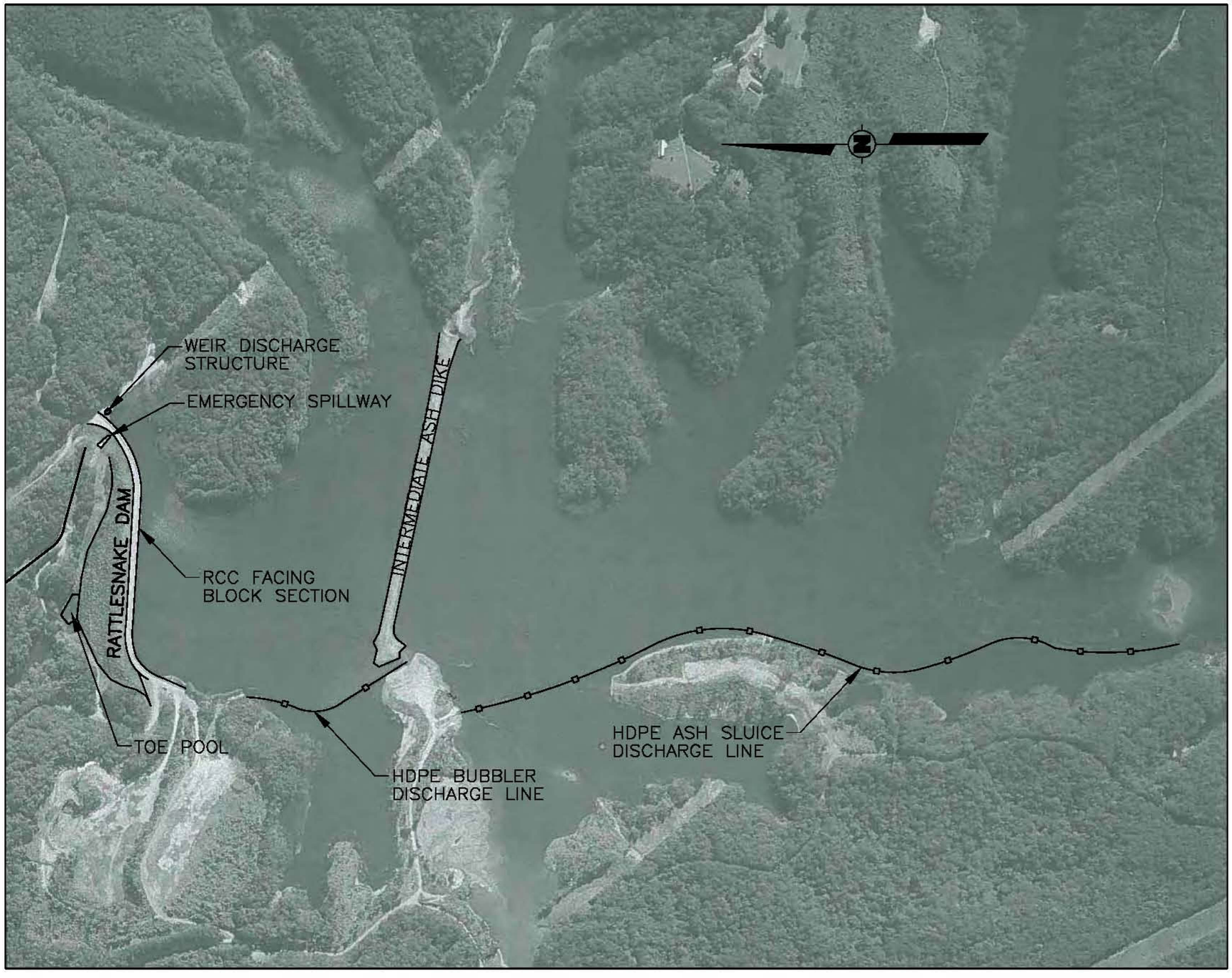

FIGURE 2
RATTLESNAKE HOLLOW
ASH POND AND FEATURES
GORGAS PLANT
DAM SAFETY INSPECTION
PREPARED FOR

USEPA
WASHINGTON, D.C.

NOTE: DRAWING DIGITIZED FROM HARD COPY FIGURES. NTS.

Paul C. Rizzo Associates, Inc.
ENGINEERS & CONSULTANTS

PLOT	DRAWN BY	CHG	CHECKED BY	CAD FILE NUMBER
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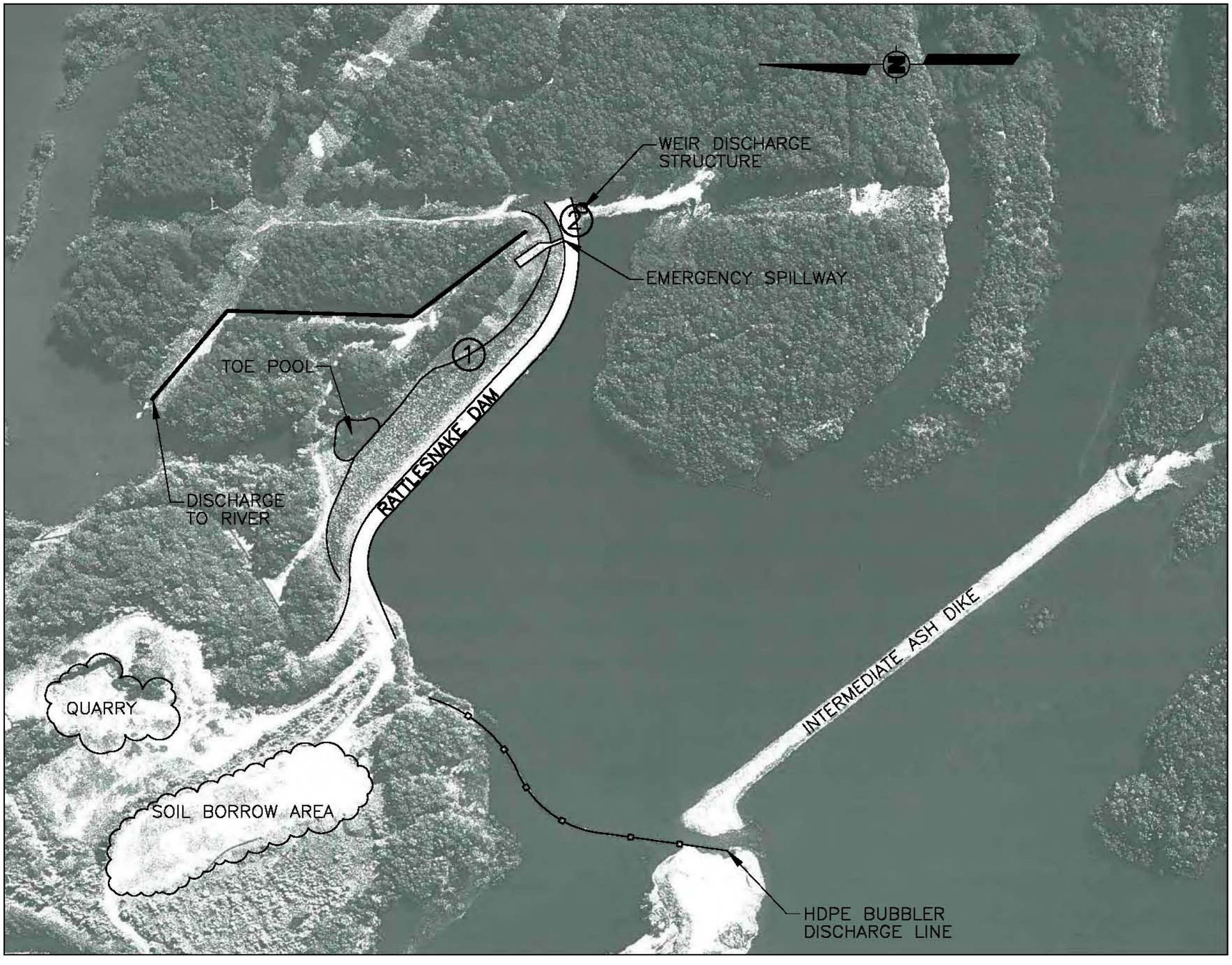

LEGEND

(1) APPROXIMATE LOCATION OF SEEPAGE FROM TOE.

(2) CRACKING IN RCC FACING BLOCK NOTED HERE.

FIGURE 3
RATTLESNAKE DAM AND FEATURES
GORGAS PLANT
DAM SAFETY INSPECTION
PREPARED FOR

USEPA
WASHINGTON, D.C.

NOTE: DRAWING DIGITIZED FROM HARD COPY FIGURES. NTS.

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PLOT	DRAWN BY	CHG	CHECKED BY		CAD FILE NUMBER
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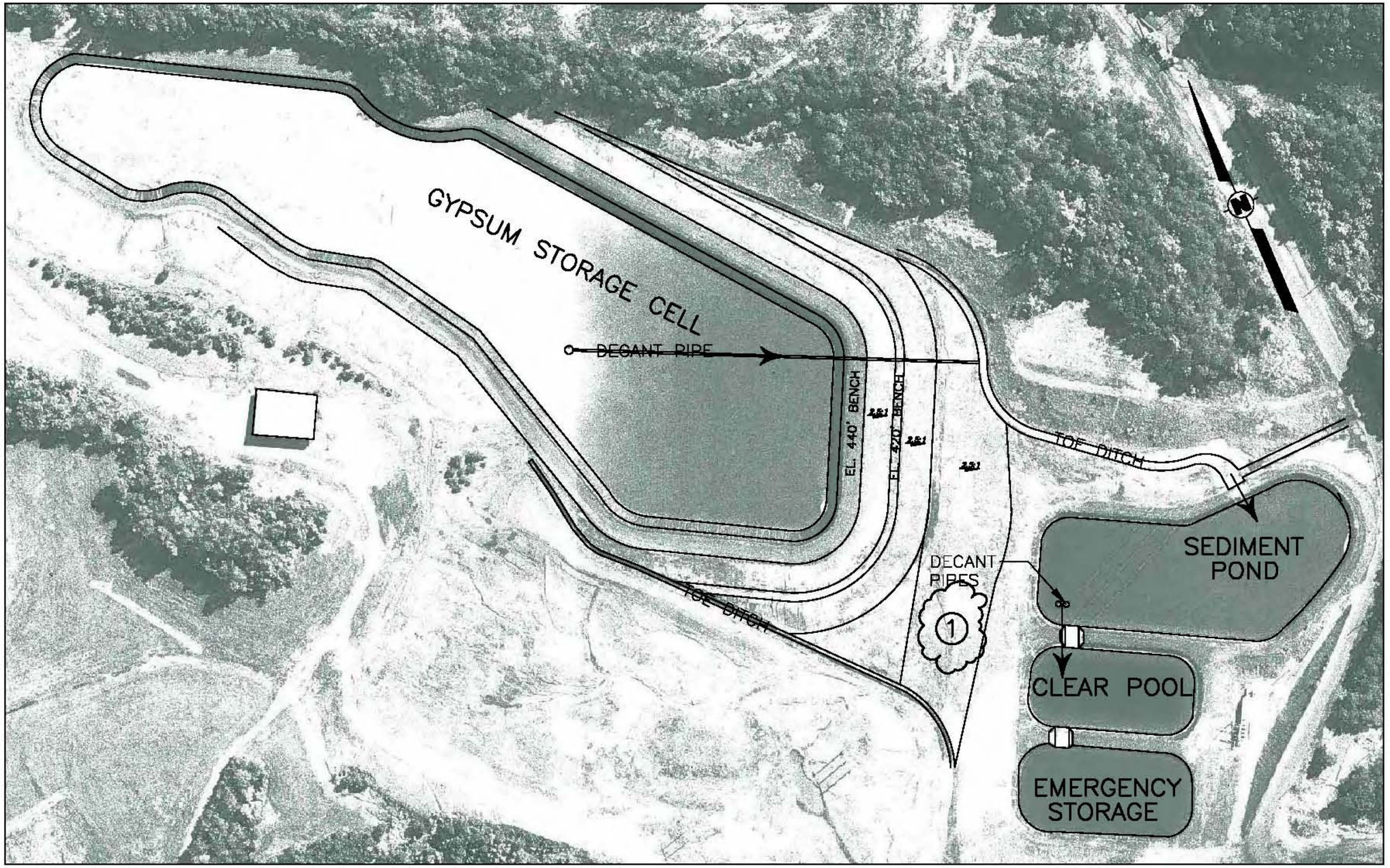


LEGEND

(1) AREA OF SLOPE EROSION CAUSED BY LACK OF VEGETATION.

NOTE: DRAWING DIGITIZED FROM HARD COPY FIGURES. NTS.

FIGURE 4

GYPSUM PONDS AND FEATURES
GORGAS PLANT
DAM SAFETY INSPECTION
PREPARED FOR

USEPA
WASHINGTON, D.C.

Paul C. Rizzo Associates, Inc.
ENGINEERS & CONSULTANTS

APPENDIX C

FIELD INSPECTION CHECKLISTS

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name:	Gorgas Steam Plant	Date:	06/09/2009
Unit Name:	Gypsum Storage Facility	Operator's Name:	Alabama Power Company
Unit I.D.:		Hazard Potential Classification:	High Significant ✓ Low
Inspector's Name:	Grady Adkins, John Osterle, Conrad Ginther		

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Annual		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	Variable		19. Major erosion or slope deterioration?		✓
3. Decant inlet elevation (operator records)?	Will vary		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	None		Is water entering inlet, but not exiting outlet?		✓
5. Lowest dam crest elevation (operator records)?	440		Is water exiting outlet, but not entering inlet?		✓
6. If instrumentation is present, are readings recorded (operator records)?			Is water exiting outlet flowing clear?	✓	
7. Is the embankment currently under construction?		✓	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?		✓	From underdrain?		✓
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?	✓		From downstream foundation area?		✓
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways, groin or diversion ditches?		✓	Around the outside of the decant pipe?		✓
15. Are spillway or ditch linings deteriorated?		✓	22. Surface movements in valley bottom or on hillside?		✓
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?		✓
17. Cracks or scarps on slopes?		✓	24. Were Photos taken during the dam inspection?	✓	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

2&3 - Decant inlet will be raised in 4 ft increments as gypsum accumulates. Lowest elevation 403.5

6 - No instrumentation installed

19 - Localized surface erosion rills. Embankment was seeded after construction during drought conditions. Owner has corrective measures scheduled.

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # N/A
INSPECTOR Adkins, Osterle Ginther
Date 06/09/09

Impoundment Name Gypsum Storage Facility
Impoundment Company Alabama Power Company
EPA Region IV
State Agency (Field Office) Addresss _____

Name of Impoundment _____
(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

Entered service in 2007

New _____ Update _____

	Yes	No
Is impoundment currently under construction?	_____	X
Is water or ccw currently being pumped into the impoundment? No discharge at inspection date	X	_____

IMPOUNDMENT FUNCTION: Gypsum Storage

Nearest Downstream Town : Name _____
Distance from the impoundment _____
Impoundment Location: Longitude -87 Degrees 13 Minutes 02 Seconds
Latitude 33 Degrees 39 Minutes 19 Seconds
State AL County Walker

Does a state agency regulate this impoundment? YES _____ NO X

If So Which State Agency? _____

Gypsum Pond

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

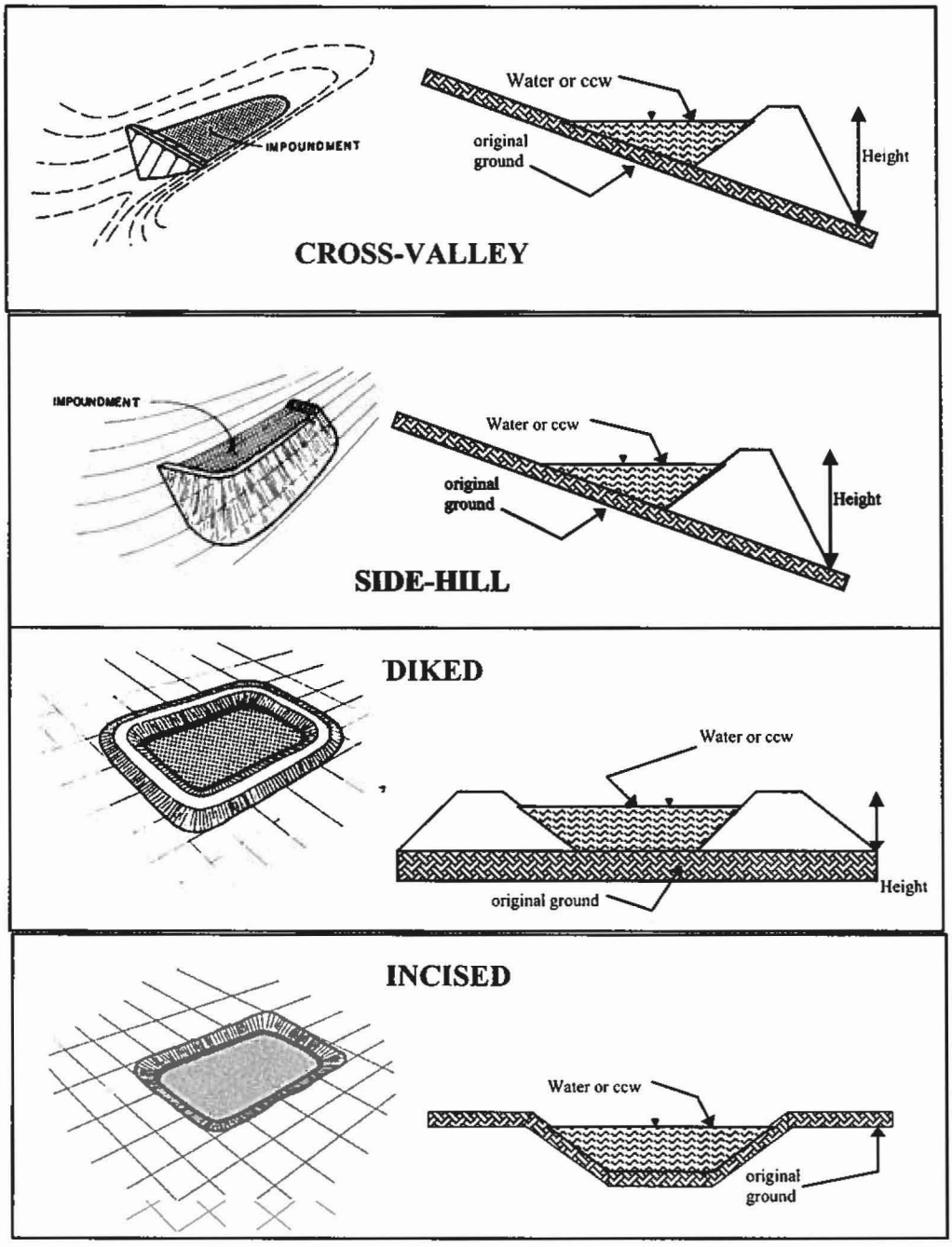
__✓__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:
Considered significant since failure would result in environmental damages from discharge into river - Property damage to owner's plant. Low probability of loss of life.

Gypsum Pond

CONFIGURATION:



_____ Cross-Valley
_____ Side-Hill
_____ Diked
_____ Incised (form completion optional)
_✓_ Combination Incised/Diked

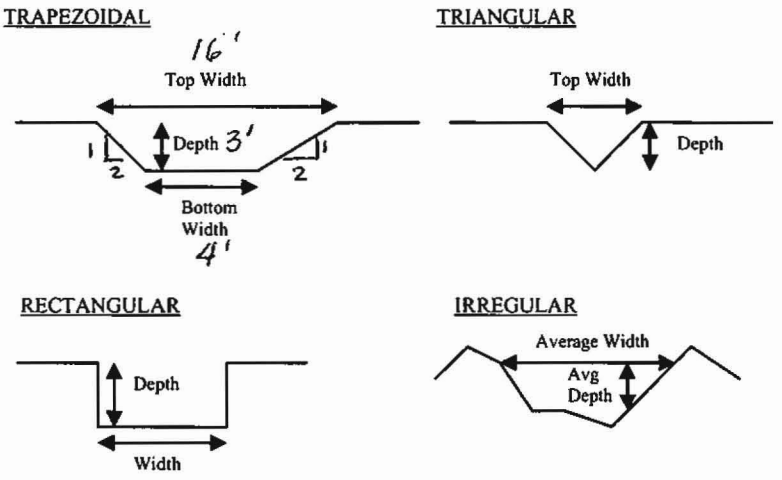
Embankment Height 80 feet
Pool Area 21 acres
Current Freeboard 30+ feet
Embankment Material Earth
Liner 60mil HDPE
Liner Permeability Very Low

Gypsum Pond

TYPE OF OUTLET (Mark all that apply) See next sheet

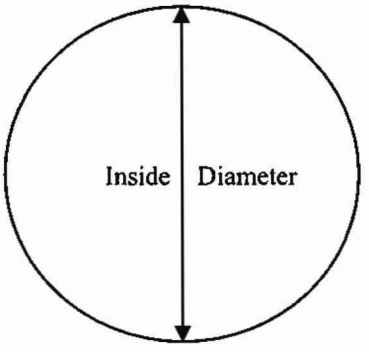
_____ **Open Channel Spillway**
__X__ Trapezoidal
_____ Triangular
_____ Rectangular
_____ Irregular

__3'__ depth
__4'__ bottom (or average) width
__16'__ top width



_____ **Outlet** through embankment

__48"__ inside diameter



Material
_____ corrugated metal
_____ welded steel
__X__ concrete
_____ plastic (hdpe, pvc, etc.)
_____ other (specify) _____

Is water flowing through the outlet? YES __✓__ NO _____

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) _____

The Impoundment was Designed By Southern Company

Gypsum Pond

OUTLET WORKS – GORGAS STEAM PLANT GYPSUM STORAGE FACILITY

Decant water enters through two(2) 54-inch diameter HDPE riser structures and is carried through 36-inch diameter HDPE pipes to an 8-foot square reinforced concrete junction box that also collects water from the basin underdrains. From the junction box, the water flows in a 48-inch diameter RCP through the embankment into a concrete trapezoidal channel at the toe of the embankment. From the concrete channel the water flows into a sedimentation pond through three (3) 36-inch diameter RCP's.

Has there ever been a failure at this site? YES _____ NO __X____

If So When? _____

If So Please Describe : _____

Gypsum Pond

Has there ever been significant seepages at this site? YES _____ NO X

If So When? _____

IF So Please Describe: _____

Gypsum Pond

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO X

If so, which method (e.g., piezometers, gw pumping,...)? _____

If so Please Describe : _____

Gypsum Pond

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name:	Gorgas Steam Plant	Date:	06/09/2009
Unit Name:	Rattlesnake Hollow Ash Pond Dam	Operator's Name:	Alabama Power Company
Unit I.D.:		Hazard Potential Classification:	High Significant ✓ Low
Inspector's Name:	Grady Adkins, John Osterle, Conrad Ginther		

Check the appropriate box below. Provide comments when appropriate. If not applicable or not available, record "N/A". Any unusual conditions or construction practices that should be noted in the comments section. For large diked embankments, separate checklists may be used for different embankment areas. If separate forms are used, identify approximate area that the form applies to in comments.

	Yes	No		Yes	No
1. Frequency of Company's Dam Inspections?	Annual		18. Sloughing or bulging on slopes?		✓
2. Pool elevation (operator records)?	383		19. Major erosion or slope deterioration?		✓
3. Decant inlet elevation (operator records)?	383		20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?	385		Is water entering inlet, but not exiting outlet?		✓
5. Lowest dam crest elevation (operator records)?	395		Is water exiting outlet, but not entering inlet?		✓
6. If instrumentation is present, are readings recorded (operator records)?	✓		Is water exiting outlet flowing clear?	✓	
7. Is the embankment currently under construction?		✓	21. Seepage (specify location, if seepage carries fines, and approximate seepage rate below):		
8. Foundation preparation (remove vegetation,stumps, topsoil in area where embankment fill will be placed)?	✓		From underdrain?		✓
9. Trees growing on embankment? (If so, indicate largest diameter below)		✓	At isolated points on embankment slopes?		✓
10. Cracks or scarps on crest?		✓	At natural hillside in the embankment area?		✓
11. Is there significant settlement along the crest?		✓	Over widespread areas?		✓
12. Are decant trashracks clear and in place?	✓		From downstream foundation area?	✓	
13. Depressions or sinkholes in tailings surface or whirlpool in the pool area?		✓	"Boils" beneath stream or ponded water?		✓
14. Clogged spillways, groin or diversion ditches?		✓	Around the outside of the decant pipe?		✓
15. Are spillway or ditch linings deteriorated?		✓	22. Surface movements in valley bottom or on hillside?		✓
16. Are outlets of decant or underdrains blocked?		✓	23. Water against downstream toe?	✓	
17. Cracks or scarps on slopes?		✓	24. Were Photos taken during the dam inspection?	✓	

Major adverse changes in these items could cause instability and should be reported for further evaluation. Adverse conditions noted in these items should normally be described (extent, location, volume, etc.) in the space below and on the back of this sheet.

Inspection Issue # Comments

1 & 6. Previous biannual, now annual inspections, monitor movement and settlement

20. Decant water entering pipe is clear. Outlet is underwater discharge.

21. Very minor seepage observed

23. Small pond at downstream toe has existed since initial construction

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # AL0002909 INSPECTOR Adkins, Osterle, Ginther 06/09/09

Date Issued Sep 6, 2007, Expires Sep 5, 2012

Receiving Waters: Mulberry Fork of the Black Warrior River and Bakers Creek.

Impoundment Name Rattlesnake Hollow Ash Pond Dam

Impoundment Company Alabama Power Company

EPA Region IV

State Agency (Field Office) Addresss AL Department of Environmental Management (ADEM) 1400 Coliseum Blvd, Montgomery, AL 36110

Name of Impoundment _____

(Report each impoundment on a separate form under the same Impoundment NPDES Permit number)

New _____ Update _____

	Yes	No
Is impoundment currently under construction?		X
Is water or ccw currently being pumped into the impoundment?	X	

IMPOUNDMENT FUNCTION: Ash Storage

Nearest Downstream Town : Name _____

Distance from the impoundment _____

Impoundment Location:

Longitude -87 Degrees 11 Minutes 08 Seconds

Latitude 33 Degrees 38 Minutes 23 Seconds

State AL County Walker

Does a state agency regulate this impoundment? YES _____ NO X Dam Safety

If So Which State Agency? Discharge only regulated by ADEM

HAZARD POTENTIAL (In the event the impoundment should fail, the following would occur):

_____ **LESS THAN LOW HAZARD POTENTIAL:** Failure or misoperation of the dam results in no probable loss of human life or economic or environmental losses.

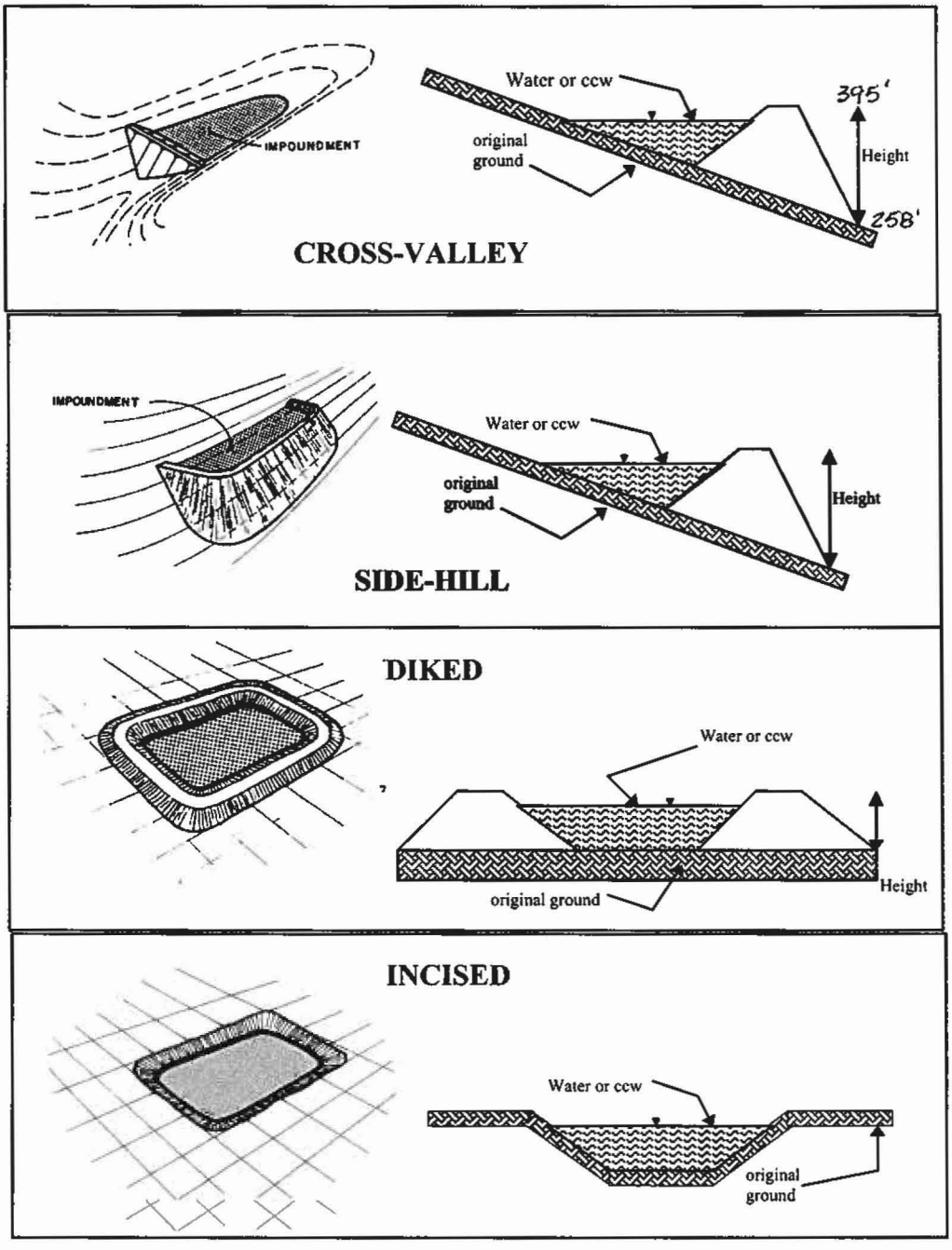
_____ **LOW HAZARD POTENTIAL:** Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

__✓__ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

DESCRIBE REASONING FOR HAZARD RATING CHOSEN:
Considered significant since failure would result in damage to plant as well as environmental damage. Low probability of loss of life.

CONFIGURATION:



✓ Cross-Valley
____ Side-Hill
____ Diked
____ Incised (form completion optional)
____ Combination Incised/Diked

Upstream - Earth Fill, RCC top 30'
Center - Earth Fill core
Rock Fill Downstream

Embankment Height 137 feet
Pool Area 420 acres
Current Freeboard 12 feet

Embankment Material Combination
Liner None
Liner Permeability N/A

Rattlesnake

TYPE OF OUTLET (Mark all that apply)

Emergency / Auxiliary Spillway - Twin Box Culvert Inlet to Baffled Chute Spillway

_____ **Open Channel Spillway**

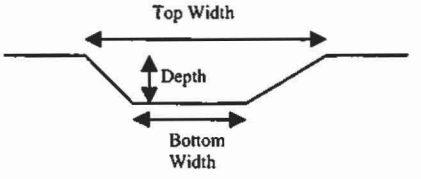
_____ Trapezoidal

_____ Triangular

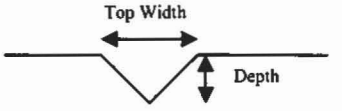
__X__ Rectangular

_____ Irregular

TRAPEZOIDAL (5' H x 7' W)



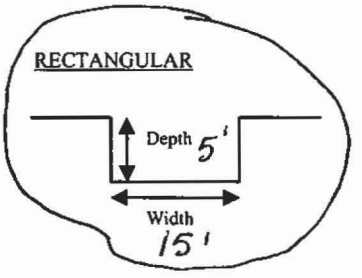
TRIANGULAR

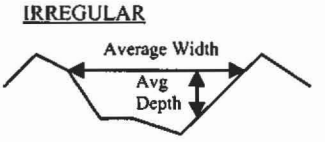


__5'__ depth

__15'__ bottom (or average) width

__15'__ top width

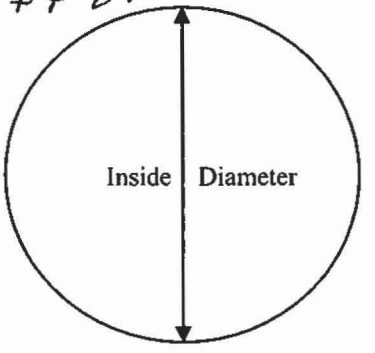




_____ **Outlet**

Primary Spillway - Weir Box Intake Structure in reservoir with ≈ 1500 ft of 48ϕ CMP to outlet

__48"__ inside diameter



Material

__X__ corrugated metal

_____ welded steel

_____ concrete

_____ plastic (hdpe, pvc, etc.)

_____ other (specify) _____

Is water flowing through the outlet? YES __X__ NO _____

_____ **No Outlet**

_____ **Other Type of Outlet** (specify) _____

The Impoundment was Designed By Southern Company

_____

Has there ever been a failure at this site? YES _____ NO X

If So When? _____

If So Please Describe : _____

Rattlesnake

Has there ever been significant seepages at this site? YES _____ NO X

If So When? _____

IF So Please Describe: _____

Rattlesnake

Has there ever been any measures undertaken to monitor/lower Phreatic water table levels based on past seepages or breaches at this site? YES _____ NO X

If so, which method (e.g., piezometers, gw pumping,...)? _____

If so Please Describe : _____

Rattlesnake