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Comments on Lower Colorado River Authority Fayette Power Project Draft Report

EPA:

Page 4-3, paragraph 1: clarify if impoundment is going to be closed.

Checklist for Reclaim Pond notes that piezometers are read semi-annually, however, this does not appear to be mentioned in the "monitoring" or "instrumentation" sections of the report. Please verify/clarify.

State: None

Company: See attached report where the company used Microsoft Word's "Track Changes" feature to comment on the draft report.

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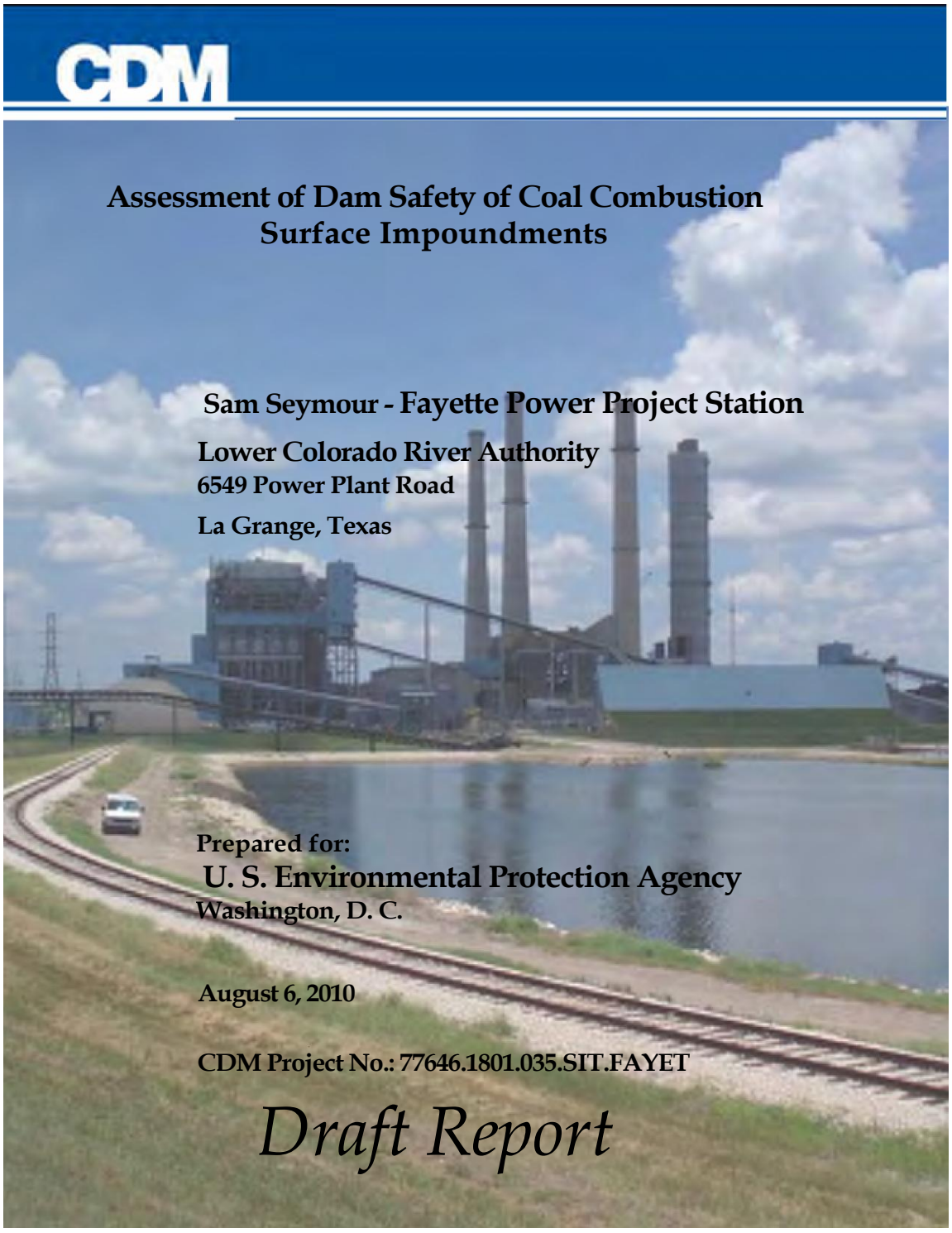

Assessment of Dam Safety of Coal Combustion Surface Impoundments

Sam Seymour - Fayette Power Project Station

Lower Colorado River Authority
6549 Power Plant Road
La Grange, Texas

Prepared for:
U. S. Environmental Protection Agency
Washington, D. C.

August 6, 2010

CDM Project No.: 77646.1801.035.SIT.FAYET

Draft Report

Preface

The assessment of the general condition of the impoundments is based upon available data and visual observations. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations are beyond the scope of this report.

In reviewing this report, it should be realized that the reported condition of the impoundments is based on observations of field conditions at the time of assessment, along with data made available to the assessment team, In cases where an impoundment may have been lowered or drained prior to the assessment, such action, while improving the stability and safety of the impoundment, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is critical to note that the condition of impoundments depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It would be incorrect to assume that the present condition of the impoundment at the time of the assessment is representative of the condition of the impoundment at some point in the future. Only through continued care and assessment can there be any chance that unsafe conditions will be detected.

Prepared By:

COM

I certify that the management unit(s) referenced herein have been assessed on June 23 and 24, 2010:

Michael L. Schumaker
Senior Geotechnical Engineer

Michael P. Smith, EEL
Geotechnica l Ingineer

Mic lac . Schultz, RE.
Senior Vice President
TX PE #88959

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Contents

Section 1 Introduction and Project Description

1.1 Introduction 1-1
1.2 State Regulation 1-1
1.2.1 Issued Permits 1-2
13 Datum 1-2
1.4 Site Description and Location 1-2
1.4.1 Impoundment Construction and Historical Information 1-2
1.4.2 Current CCW Impoundment Configuration 1-5
1.4.3 Future CCW Impoundment Configuration 1-7
1.4.4 Other Impoundments 1-8
15 Previously Identified Safety Issues 1-8
1.6 Site Geology 1-9

Section 2 Field Assessment

21 Visual Observations 2-1
2.2 Reclaim Pond 2-2
2.2.1 Exterior Slope 2-2
2.2.2 Crest 2-2
2.2.3 Interior Slope 2-2
2.2.4 Spillway 2-3
2.2.5 Reclaim Pump Station and Evaporation System 2-3
23 Coal Ash Disposal Pond 2-3
2.3.1 Exterior Slope 2-3
2.3.2 Crest 2-4
2.3.3 Interior Slope 2-4
2.3.4 Intake Structure and Evaporation System 2-4

Section 3 Data Evaluation

31 Design Assumptions 3-1
32 Hydrologic and Hydraulic Design 3-1
3.3 Structural Adequacy and Stability 3-2
3.4 Foundation Conditions 3-3
35 Operations and Maintenance 3-4

Section 4 Conclusions and Recommendation

41 Hazard Classification 4-1
42 Acknowledgement of Impoundment Condition 4-1
43 Maintaining and Controlling Vegetation Growth 4-2
4.4 Erosion Protection and Repair 4-2
4.5 Impoundment Hydraulic and Stability Analysis 4-3
4.6 Instrumentation 4-4

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

4.7 Seepage Control and Closure Dewatering 4-4
4.8 Inspection Recommendations 4-4
49 Operations 4-5
4.10 Closure Recommendations 4-5

Section 5 Closing

Section 6 References

Tables

Table 1 Approximate Precipitation Prior to Site Visit 2-1
Table 2 Minimum Safety Factors Required 3-2
Table 3 Recommended Impoundment Hazard Classification Ratings 4-1

Figures

Figure 1 Locus Plan
Figure 2 Critical Infrastructure Map
Figure 3 Typical Ash Disposal Pond Cross-sections
Figure 4 Typical Reclaim Pond Cross-sections
Figure 5 Aerial Map
Figure 6 Proposed Cap Closure Grading Plan
Figure 7a Cap Cross-sections & Details
Figure 7b Cap Cross-sections & Details
Figure 8 Reclaim Pond Photograph Location Plan
Figure 9 Coal Ash Disposal Pond Photograph Location Plan
Figure 10 FPP Ash Pond Slope Stability Analysis Section A-A'
Figure 11 FPP Ash Pond Slope Stability Analysis Section B-B'

Appendices

Appendix A – USEPA Coal Combustion Dam Inspection Checklist Forms

Appendix B – Photographs

Appendix C – Photo GPS Locations

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Section 1

Introduction & Project Description

1.1 Introduction

CDM was contracted by the United States Environmental Protection Agency (USEPA) to perform site assessments of selected coal combustion waste (CCW) surface impoundments. As part of this contract, CDM performed a site assessment of two CCW impoundments at the Sam Seymour - Fayette Power Project (FPP), co-owned by the Lower Colorado River Authority (LCRA) and the City of Austin~~owned~~ and operated by the ~~Lower Colorado River Authority (~~LCRA~~)~~. The two impoundments assessed were the Coal Ash Pond and Reclaim Pond.

The FPP is located seven (7) miles east of the City ~~of~~ ~~within the Town~~ of La Grange, Fayette County, Texas, as shown on **Figure 1** Locus Map. The State Highway ~~Route~~ 71 Bridge over Cedar Creek and the Colorado River is approximately 2.4 miles and 3.8 miles southwest of the site, respectively, as shown on **Figure 2**

Comment [k1]: Figure 2 only shows the SH 71 bridge over Cedar Creek.

CDM made a site visit to the FPP on June 23 and 24, 2010 to collect relevant information, inventory the impoundments, and perform visual assessments of the impoundments. CDM representatives Michael L. Schumaker and Michael P. Smith were accompanied by the following individuals:

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Company Name and Title	
LCRA	Tommy Latta, P. E., Senior Engineer
LCRA	Ricky Kirkland, P. E., Assistant Plant Manager
LCRA	Russell Lueders, Plant Risk Coordinator
LCRA	Beckie Loeve, Environmental Supervisor
LCRA	Mike Lowe, P.E., Senior Dam Safety Engineer
LCRA	Dan Yates, P.E., Dam Safety Engineer

1.2 State Regulation

The Texas Commission on Environmental Quality (TCEQ) is responsible for the State's dam safety program. It is our understanding that under TCEQ's dam safety regulations 30 Texas Administrative Code (T.A.C.) Chapter ~~§~~ 299, that the impoundments are exempt from the regulations because they are "off-channel impoundments authorized by the commission under Texas Water Code (TWC), Chapter 26."

FPP~~IPA~~ personnel stated there are no State inspection reports for the impoundments at the Fayette Power Project. FPP~~IPA~~ personnel stated TCEQ only requires that a

minimum of two feet of freeboard be maintained in the impoundments.

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1.2.1 Permits

The Fayette Power Project ~~was issued~~holds Texas Pollutant Discharge Elimination System (TPDES)~~a~~ ~~p~~Permit number WQ00020105 authorizing discharge into an unnamed tributary of~~to~~ Cedar Creek ~~under the Texas Pollutant Discharge Elimination System (TPDES)~~, in accordance with effluent limitations, monitoring requirements and other conditions set forth in the permit. ~~The permit number is WQ00020105.~~ It is ~~our~~CDM's understanding that under the TPDES permit ~~seepage from the impoundment is considered an unpermitted discharge.~~, discharges from the Coal Ash Pond and the Reclaim Pond are not authorized. In an emergency situation, LCRA is permitted to discharge from the Reclaim Pond to the Coal Pile Run-off Pond.

In addition to the TPDES permit, the Coal Ash Pond and Reclaim Pond are registered under TCEQ Solid Waste Registration No. 31575. ~~They are registered~~ as Management Unit 002 and Management Unit 009, respectively, in accordance with TCEQ's nonhazardous industrial solid waste rule~~s~~ found at 30 T.A.C. §335.6.

1.3 Datum

Elevations are referenced to National Geodetic Vertical Datum of 1929 (NGVD 29) and are in feet. Directional coordinates are referenced to magnetic north.

1.4 Site Description and Location

1.4.1 Impoundment Construction and Historical Information

FPP consists of three coal-fired generating units capable of producing up to 1,641 megawatts (MW) of electricity. Unit 1 was built in 1979, Unit 2 in 1980, and Unit 3 in 1988. The FPP and the surface impoundments are located next to Cedar Creek Dam and Lake Fayette, a 2,400-acre reservoir from which FPP gets its cooling water. Cedar Creek Dam and Lake Fayette are man-made structures created as part of the FPP development.

The Coal Ash Disposal Pond (CADP) has been accepting fly ash and bottom ash from Unit 1 since 1979. Unit 2 has been producing CCW ~~disposed of~~managed in the CADP since it was brought on line in 1980. In 1985, a dry fly ash handling system was installed for Units 1 and 2, and fly ash that was not sold for beneficial reuse was sluiced to the CADP until the Combustion Byproduct Landfill (CBL) was completed in 1988. Any unsold fly ash was disposed of in the CBL. No CCW from Unit 3 has been disposed of in the CADP.

Construction of the CADP began in late 1975. The embankments for the CADP were constructed approximately 0 to 56 feet above existing grade to a minimum crest elevation of approximately El. 360. The crest of the impoundment rises gradually in the northwest to approximate elevation El. 390

The north embankment of the CADP was constructed at the downstream toe of ~~the~~

Comment [k2]: Clarification provided regarding the TPDES permit and these two impoundments.

Comment [hee3]: Previous referenced as Coal Ash Pond. It is recommended that Coal Ash Pond be used.

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Cedar Creek Dam. A portion of the impoundment's storage volume was created by excavating below the natural ground surface and is commonly referred to as the

incised portion of the~~an~~ impoundment. A typical cross-section of the north embankment is presented on **Figure 3.** The design plans show a typical 20-foot-wide embankment crest with a 1-foot-thick road base ~~gravel~~ surface that is currently used as an access road. The interior slope on the north embankment was designed at 3 Horizontal: 1Vertical (3H: 1V). The crest elevation of the north embankment ranges from El. 360 to 390 and slopes down to a 75-foot-wide bench constructed at existing grade. The interior slope is lined with a fabric formed concrete revetment system. Material excavated from the impoundment pool area in the vicinity of the north embankment was used as borrow fill to construct the remaining embankments. Excavations on the incised portion of the impoundment were graded at a 3H: 1V slope. Seepage collection manholes for the Cedar Creek Dam chimney drain and drainage blanket were located between the north embankment crest and the toe of the Cedar Creek Dam. The area forming the west embankment of the CADP was incised adjacent to one of the plant railroad embankment spurs. The design plans show a 20-foot-wide crest with a 1-foot-thick gravel surface that is used as an access road. The interior slope on the west embankment was designed at a 3H: 1V slope from the crest elevation at El. 360, down to a 75-foot-wide bench constructed at existing grade. Material excavated from the impoundment side of the bench was used as borrow fill to construct the remaining embankments. Excavations below existing grade were shown to be graded at a 3H: 1V slope.

The Coal Pile Run-off Pond was constructed adjacent to the toe of the south embankment exterior slope. A typical cross-section of the south embankment is presented on **Figure 3.** The design plans show a 20-foot-wide crest with a 1-foot-thick gravel surface that is used as an access road. The exterior and interior slope on the south embankment was designed at a 3H:1V from the crest at elevation El. 360, down to a 75-foot-wide bench constructed at existing grade. Material excavated from the impoundment side of the bench was used as borrow fill to construct the remaining embankments. Excavations below existing grade were shown to be graded at a 3H:1V slope.

The east embankment of the CADP was constructed adjacent to the low-level outlet for the Cedar Creek Dam and the unnamed tributary ~~to~~of Cedar Creek. A typical cross-section of the east embankment is presented ~~o~~in **Figure 3.** The design plans show a 20-foot-wide crest with a 1-foot-thick gravel surface that is used as an access road. The exterior slope on the east embankment was constructed at a 3H:1V from the crest at elevation El. 360, down to El. 332. Below elevation El. 332, the slope transitions to 4.5H:1V. The interior slope was designed at 3H:1V. A 4-foot-thick sand chimney drain and drainage blanket w~~as~~ere designed into the embankment to collect seepage from the impoundment. A toe drain consisting of a 6-inch-diameter perforated transit~~e~~ pipe with a gravel filter pack was designed at the toe of the east embankment to collect

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outflow from the chimney drain and drainage blanket. Three discharge pipes are located at the toe of the east embankment.

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A baffle dike was constructed in the middle of the CADP. The baffle dike was constructed with 3H:1V side slope and a 20-foot-wide crest at elevation El. 355.

A concrete intake structure was constructed on the northern side of the baffle dike at the groin with the west embankment interior slope. The intake structure consists of a 17-foot-wide by 59-foot-long concrete pump station with 3-foot-thick concrete walls. The inlet structure has four inline pumps with an invert elevation of El. 335. The pumps convey decant water from the pond to an evaporation spray system.

LCRA records indicate there has been ~~active~~ seepage from the CADP since ~~at least~~ 1984. A sump pit was installed in 1985 to collect seepage from the toe drain in the east embankment. The seepage water is collected and pumped back to the CADP.

Construction of the Reclaim Pond began in 1984. The Reclaim Pond was built in a low lying area between two existing railroad embankments. The north Reclaim Pond embankment was constructed up to 34 feet above existing grade to a crest elevation El. 370. A typical cross-section of the north embankment is presented ~~o~~in **Figure 4.** The design plans show a 28-foot-wide crest with a 20-foot-wide gravel surfaced roadway. A 5-foot-deep key-in trench was constructed at the base along the center line of the embankment. The exterior and interior slope of the north embankment was constructed at a 3H:1V. Prior to embankment construction, a minimum of 12 inches of soil was specified to be stripped and a minimum 12 inches of clay was specified to be recompacted. The interior slope design includes 12 inches of riprap underlain by six (6) inches of bedding material. A 3-foot-thick by 50-foot-wide sand drainage blanket was designed at the toe of the north embankment to collect seepage. An emergency spillway channel was also designed on the eastern portion of the north embankment with a control section invert elevation at El. 369. The spillway is a trapezoidal concrete-lined channel with a base width of 10 feet and 20H:1V side slopes up to the crest at El. 370. The emergency spillway channel lining is 6-inch-thick reinforced concrete.

The existing grade along the west embankment was excavated or filled at a 3H:1V slope from the existing railroad spur down to the crest elevation of El. 370. The design plans show a 15-foot-wide crest with a gravel surface. The west embankment interior slope was excavated at a 3H:1V slope down from existing grade to the bottom of the pond at approximately elevation El. 350. The drawings indicated that vegetation was to be removed and the top 12 inches of in-situ clay was to be recompacted. A 12 inch layer of riprap armor underlain by six (6) inches of bedding material was then to be placed on the slope face.

The east railroad spur embankment was specified to be stripped and excavated in 3-foot vertical steps to about three (3) feet below the bottom of the pond in order to key in or bond the new embankment fill to the exiting soil. A 10-foot-wide key-in trench was also specified to be excavated at the interior toe of the east embankment. Compacted fill was then placed at a 3H:1V slope to reconstruct the Reclaim Pond

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east

embankment. A 12-~~-~~inch layer of riprap armor underlain by six (6) inches of bedding material was then to be placed on the slope face. A stabilization berm was also constructed on the east embankment exterior slope. The drawings indicate the stabilization berm consists of a sand drainage blanket keyed into the existing slope with a toe drain overlain by compacted fill. The compacted fill was graded at an 8H:1V slope from elevation El. 354 down to the existing grade. The toe drain consists of a 6-inch-diameter perforated PVC pipe wrapped in a gravel filter material that discharges into an unnamed tributary ~~to~~of Cedar Creek.

Following the Texas Water Commission's (TWC) approval of the partial closure of the southern portion of the CADP by letter dated November 1, 1988, the southern 39.65 acres was closed in accordance with TCEQ's Technical Guideline No. 3. The closure plan consisted of a minimum 3-foot-thick compact clay cap with a 1-foot-thick layer of topsoil. Finished slope grading on the southern capped portion ranges from about 1% to 2%. In 1994, an additional two (2) feet of material was added to the eastern embankment to meet T~~E~~CEQ's free-board requirements.

Comment [hee4]: Recommend that this paragraph be part of the previous Coal Ash Pond discussion rather than the Reclaim Pond description

1.4.2 Current CCW Impoundment Configuration

Comment [b5]: For clarification, due to the transfer allowed by the TPDES permit between the two surface impoundments, all waste streams mentioned in section 1.4.2 are registered for both management units.

The impoundments at the FPP are currently used as settling ponds for CCW waste and other plant wastes.

CCW waste sluiced into the Coal Ash Pond includes:

Comment [hee6]: As previous noted, the term Coal Ash Pond and Coal Ash Disposal Pond are being used interchangeable. It is recommended that Coal Ash Pond be used.

- Bottom ash;
- Fly ash;
- Boiler slag; and
- Flue Gas Emission Control Residuals:
  - wastewater from Unit 1 & 2 coal combustion byproduct residue sluicing and boiler condensate wastewater
  - waste liquid from high pressure cleaning of air pre-heater baskets to remove ash deposits.

Other plant wastes sluiced into the Coal A~~a~~sh ~~p~~Ponds~~s~~ includes liquids from:

- Wastewater from various plant processes used in scrubber sludge and dust suppression;
- ~~Wastewater from various plant processes used in scrubber sludge and dust suppression;~~
- Water treatment sludge;
- Wastewater from water blasting for paint surface preparation;
- Backwash liquid waste from cleaning of water treatment filters;
- Waste liquid from online lab analyzer for Unit 1, 2 & 3 boiler water, feed water and condensate water; and

- Waste liquid from Unit 1 & 2 condensate polisher.

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CCW ~~waste~~ sluiced into the Reclaim Pond includes:

- Fine particulate (fly ash) that is suspended in water pumped from the CADP; and
- Flue Gas Emission Control Residuals:
  - Fluidized gas desulfurization by-product
  - Sludge from cleaning of reaction tank
  - Sludge, reclaim pond settlement.

Other plant wastes sluiced into the Reclaim Pond include wastewater from various plant processes, e.g. sewage effluent, cleaning liquids, lab waste water, waste water sumps, and other plant processes.

There are currently two surface impoundments at FPP, as shown ~~o~~in **Figure 5** The Coal Ash Pond is approximately 84 acres in total area. Approximately 40 acres of the Coal Ash Pond was capped in the late 1980's and the remaining 44 acres are active. The Reclaim Pond is approximately 30 acres in area.

In 1985, a dry fly ash handling system was installed. The dry fly ash collection system diverts the fly ash from the electrostatic precipitator to a dustless collection silo via pneumatic transport. FPP holds a contract with an Ash Marketer ~~(Marketer)~~ who manages beneficial reuse of all coal combustion products. The contract entitles the Marketer to sell all of the CCW products available from FPP. This contract also holds the Marketer responsible for the movement and management of the CCW in the CADP.

Ash is transported to the CADP by two 12-inch-diameter High Density Polyethylene (HDPE) pipes and discharges into two cast-in-place concrete primary settling basins. In these basins, the bottom ash drops out of suspension. The Marketer removes bottom ash from the settling basins daily, using a front end loader. The ash is stored inside the active impoundment to dewater until it is sold.

After the bottom ash drops out of suspension in the primary settling basin, the lighter fly ash settles out in the secondary settling basin. The remaining water and ash flow into the CADP, where the water is then recycled into the closed loop system and the process is repeated. Dredging of the secondary settling basin and the CADP is performed on an annual basis by a dredging contractor. The CADP is dredged to retain the impoundment storage capacity and to provide excess storm-water storage in the event of a significant rain event. The dredged material is either stored or managed by the Marketer.

The water level of the CADP is actively monitored and recorded twice daily. If the water level reaches elevation El. 359, the water is pumped out of the impoundment

Comment [PAH7]: Recommend the consistent use of names/labels that refer to the same material.

Comment [PAH8]: Reconcile different names/labels.

Comment [PAH9]: Reconcile different names/labels.

Comment [b10]: Asholite. Asholite is a specialty composite metal for ash transfer

Comment [PAH11]: Correct.

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into the Reclaim Pond through a 6-inch-diameter HDPE pipe. The CADP maximum

operating level is elevation El. 360 to allow for adequate volume and to retain the minimum freeboard level of 2 feet.

The volume of ash is estimated annually via aerial survey to determine the remaining impoundment capacity and estimated life of the impoundment.

1.4.3 Future CCW Impoundment Configuration

LCRA is in the process of installing a dry collection and disposal system for bottom ash, economizer ash, and air pre-heater ash for Units 1 and 2 at FPP. The Unit 2 dry collection system was installed in the spring of 2010, and the Unit 1 dry collection system is scheduled to be installed by the fall of 2010. No water or CCW will be disposed of in the CADP after October 2010. At that time and subject to TCEQ approval, LCRA plans close the CADP at FPP in accordance with TCEQ regulations, as shown ~~o~~in **Figures 6 and 7**

Several structures currently used are part of the CADP management and operations, and are located in the active portion of the CADP. These structures include: the concrete pump and motor pit, concrete settling basins, piping, pumps, motors, conduits, cable, fencing, spray headers, and additional water handling equipment. LCRA's closure plan indicates the concrete structures will remain in-place and the other non-concrete structures will be removed, cleaned as necessary, and reused or recycled as applicable.

LCRA's closure plan indicates the active portion of the impoundment will be dewatered to the extent ~~practical~~ practicable before proceeding with other closure activities. The closure plan also indicates that ash sediments in the impoundment will be stabilized using on-site newly generated fly ash or fly ash from the CBL. LCRA performed laboratory bench-scale treatability studies to evaluate the strength of the stabilized ash sediments using new fly ash and/or fly ash from the CBL.

The closure plan indicates fly ash may also be borrowed from the CBL and used as general fill to achieve the lines and grades shown on the closure plan drawings. The proposed cover system will have final grades sloped at 1% to 4.5% to provide positive surface water drainage.

In the closure plan, LCRA states ash fill material will be scarified to a minimum depth of two (2) inches prior to placement of the initial clay layer as part of the cap construction. The compacted clay cap for the closure of the active portion of the impoundment will be constructed using suitable clay material that is specified to have at least 20% passing No. 200 sieve and 90% passing No. 4 sieve, and no particles larger than two (2) inches in diameter. In accordance with TCEQ's Technical

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Guideline (TG) No. 3, the compacted clay cap will be a minimum of three (3) feet thick and will have a maximum permeability of $1x10^{-7}$ cm/sec. LCRA states the material will be placed in 6 to 9 inch thick lifts and be compacted to a minimum 95% of the Standard Proctor maximum dry density per ASTM Method D-698 at a moisture content of 1% or greater above

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optimum to achieve a maximum permeability of $1x10^{-7}$ cm/s. LCRA states an 18-inch-thick uncompacted layer of topsoil will be placed on the compacted clay cap as recommended by TCEQ TG No. 3. The topsoil layer will be seeded with self-sustaining indigenous shallow root grass.

To control surface water run-off, LCRA plans to construct flat-bottom perimeter drainage ditches along the west, north, and east embankment crest where the new cap will tie into the existing embankments. The ditches will be graded to flow towards the northeast corner. In the northeast, a new stormwater spillway structure, similar to the southern spillway structure in the closed portion, will be constructed. In accordance with TCEQ's TG No. 3, all stormwater management features will be designed to handle a 24- hour, 100-year rainfall event.

1.4.4 Other Impoundments

In addition to the Coal Ash Pond and Reclaim Pond, there is a Coal Pile Run-off Pond at the FPP site. The Coal Pile Run-off Pond receives surface water run-off from the coal piles and is located adjacent to the south embankment toe of the Coal Ash Pond. Plant personnel indicated that there is no CCW stored in the Coal Pile ~~r~~Run-off ~~p~~Pond and that there is no direct pipe or other means to introduce CCW to the Coal Pile Run-off ~~p~~Pond.

The Coal Pile ~~r~~Run-off Pond is incised and has a crest at El. 360. The Coal Pile Run-off Pond embankments have a 20-foot-wide crest with 3H:1V side slopes on both the interior and exterior. A sand chimney drain discharges to a lateral toe drain connected to the CADP east embankment toe drain.

Surface water collected in the pond is normally discharged through a low-level outlet pipe consisting of a 12-inch-diameter ductile iron (DI) pipe. There is also an emergency spillway at elevation El. 354. The emergency spillway consists of a fabric formed concrete lined trapezoidal weir with a base width of 20 feet and 1H:1V side slopes.

1.5 Previously Identified Safety Issues

Based on ~~our~~ a review of the information provided to CDM and as reported by EPA, there have been no identified dam(?) safety issues at ~~the~~ FPP within the last ten (10) years.

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1.6 Site Geology

The FPP is located at the edge of the Gulf of Mexico coastal plain, near the contact with the coastal uplands. In the vicinity of the site, the surficial geology consists of Miocene age deposits of the Oakville Formation of the Flemming Group. Typically, the sediments are interbedded sands, silts, and clays with intermixed volcano-clastic and tuffaceous material. In the vicinity of the site, medium stiff to hard calcareous, slickensided clays are predominately encountered from the surface to approximately El. 340, underlain by dense clayey sand and fine sand. The sand is underlain by stiff to hard calcareous, slickensided clay. The clay is underlain by sandstone below elevation El. 165.

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Section 2
Field Assessment

2.1 Visual Observations

CDM performed a visual assessment of the CCW impoundments at Fayette Power Project. The perimeter embankments of the impoundments total approximately 12,442 feet in length and are up to 62 feet high. The assessments were completed following the general procedures and considerations contained in Federal Emergency Management Agency's (FEMA's) Federal Guidelines for Dam Safety (April 2004) relative to observations concerning settlement, movement, erosion, seepage, leakage, cracking, and deterioration. A Coal Combustion Dam Inspection Checklist and CCW Impoundment Inspection Form, developed by USEPA, were completed on-site for each impoundment during the site visit. Copies of these forms are included in **Appendix A**. Photograph location plans are shown ~~e~~in **Figures 8 and 9**, and photographs are included in **Appendix B.**

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It should be noted that tall or thick vegetation in some areas obscured visual observations of the exterior embankments.

CDM visited the site on June 23, 2010 and June 24, 2010 to make visual observations of the impoundments. The weather during the site visit was sunny with high temperatures of approximately 93 and 87 degrees Fahrenheit, respectively. Prior to the site visit, the following precipitation occurred as shown in **Table 1**

Table 1 – Approximate Precipitation Prior to Site Visit

Dates of Site Visit – June 23, 2010 & June 24, 2010		
Day	**Date**	**Precipitation (inches)**
Wednesday	June 16	0.0
Thursday	June 17	0.0
Friday	June 18	0.0
Saturday	June 19	0.0
Sunday	June 20	0.0
Monday	June 21	0.0
Tuesday	June 22	0.0
Wednesday	June 23	0.0
Thursday	June 24	0.04
Total	**Week Prior to Site Visit**	**0.0**
Total	**Month Prior to Site Visit**	**3.05**

Notes:
1. Precipitation data from FPP rainfall measurements.

2.2 Reclaim Pond

2.2.1 Exterior Slope

The Reclaim Pond is incised in the west and south embankment areas.

The exterior slope on the north appears to be in fair condition (Photos 2, 27, 34, 37, 38, 39, 40, 41, and 42). The grass on the north embankment ranged from 12 to 36 inches in height. Some minor brush and huisache ~~pricker~~ bushes were observed on the slope. Brush and trees were observed at the toe of the slope in the drainage ditch. Desiccation cracks up to a 1/2 inch wide and eight (8) inches deep were observed at various locations on the embankment face.

The exterior slope face on the east ~~is~~ embankment is generally poor (Photos 43, 44, 46, 47, 48, 50, and 51).The grass on the east embankment ranged from 12 to 36 inches in height. Brush and mesquite trees as large as 30 inches in diameter were observed on the embankment. Desiccation cracks up to a 1/2 inch wide and 8 inches deep were observed at various locations on the embankment. A flyash surfaced access road was observed on the exterior slope of the embankment (Photos 48 and 50).

Comment [hee12]: Is this meant to be 3 inches in diameter or perhaps 30 inches in circumference?

2.2.2 Crest

The crest of the Reclaim Pond generally appeared to be in fair condition (Photos 3, 6, 7, 8, 10, 13, 14, 15, 16, 20, 23, 26, 35, 45, and 49). The crest was surfaced with compacted gravel around the perimeter of the impoundment and served as an access road. Some minor rutting was observed on the south and west embankment crest. The railroad spur ballast on the east embankment crest is approximately two (2) to three (3) feet above the access road. The water level was at approximate El. 366 and ~~there was~~ about four feet of freeboard was visible at the time of the site visit.

2.2.3 Interior Slope

The visible portions of the interior slope generally appeared to be in fair condition (Photos 1, 4, 5, 9, 11, 12, 14, 17, 18, 19, 20, 21, 22, 24, 25, 33, and 36). The interior slope is protected with riprap armor. Some minor brush was growing between the riprap on the east embankment interior slope. On the west and east embankment, there were some areas with little or missing riprap and there were areas with spar~~es~~e vegetation and bare spots near the crest.

On the east embankment, there was one 2.5-foot-wide erosion rill (Photo 22). There was also an area where an abandoned 12-inch-diameter HDPE pipe from the CADP discharged into the Reclaim Pond. This area of the interior slope was eroded and some of the riprap was missing.

The waste drain trench (Photo 1) on the north embankment that drains into the impoundment was clear of debris and the channel was in good condition. The culvert headwall on the west embankment that discharges into the impoundment appears to

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be in good condition. There was some FGD residue build-up on the apron of the headwall.

The 6-inch-diameter HDPE pipe from the CADP was in good condition. No water from the CADP was being discharged into the Reclaim Pond during the site visit.

2.2.4 Spillway

The emergency spillway appeared to be in fair condition (Photos 28, 29, 30, 31, and 41). The concrete lining was in good condition. The spillway discharge channel had some minor grass growing in the channel. The entrance to the spillway channel had excessive vegetation and there was missing riprap. There was also excessive vegetation in the outlet channel.

2.2.5 Reclaim Pump Station and Evaporation System

The reclaim pond pump station appeared to be in fair condition. The concrete lining was in good condition. One of the return lines from the pump station had a small leak in the line.

There is a manual and electronic staff gauge in Reclaim Pond. The pond water levels are recorded twice a day and reported in a daily status report that is electronically mailed to pertinent staff

The evaporation spray piping system appeared to be in good condition. The system was shut off during the visual inspection of the impoundment.

2.3 Coal Ash Disposal Pond

2.3.1 Exterior Slope

The CADP is incised on the north and west embankments. The south and east exterior slopes appear to be generally in fair condition (Photos 53, 54, 55, 57, 58, 60, 61, 62, 67, 68, 69, 71, 73, 74, 77, 78, and 85). The grass on the embankment was approximately 8 to 12 inches tall and was recently mowed. Trees and brush up to 6 inches in diameter were observed at the toe of the south embankment in the Coal ~~Ash~~ Pile Run-off Pond. There were some bare spots near the middle of the south embankment exterior slope (Photo 81).

CDM observed 16 rodent holes, reportedly made by armadillo~~'~~s, on the east embankment exterior slope. The holes ranged in size from 4 to 8 inches in diameter (Photos 63 and 65). There were also multiple surface depressions that were likely rodent holes that collapsed, possibly as a result of mowing operations (Photos 62, 79, 80, and 84).

Two of the toe drain outlets from the chimney drain on the east embankment were observed (Photos 64 and 66). The toe drain shown in Photo No. 66 also connects to a third toe drain (not photographed) that collects drainage from the portion of the

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chimney drain associated with the Coal Pile Run-off Pond embankment. Both of these toe drains ~~One of the toe drain outlets~~ discharge~~s~~ into a seepage collection sump pit, referred to as the Lateral Drain Sump. Water collected in the Lateral Drain Sump is ~~The sump pit~~ pumped~~s water~~ back ~~up~~ into the impoundment.

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Seepage was not observed in the sump pit during the site visit. The ground around the other discharge pipe (Photo No. 64) was damp, although no significant seepage was observed.

An active seep on the south embankment exterior slope was observed (Photos 82 and 83). LCRA has constructed a containment structure to collect the seepage water. The estimated flow from the seep typically ranges from 8 to 11 gallons per day based on review of information provided by LCRA personnel.

2.3.2 Crest

The crest of the CADP appeared to be generally in fair condition (Photos 53, 56, 59, 72, 75, 86, 89, 90, 91, 99, 100, 101, 102, 103, and 104). The crest surface consisted of road base~~flyash~~ and was used as an access road. Some minor rutting and depressions were observed on the east and west embankment crest. A tension crack in the previously raised portion of the crest was observed on the north embankment (Photo 99). The chain link fence and posts appeared to be holding the raised section of the crest preventing it from sloughing. The water level was at about El. 355 and ~~there was~~ approximately seven (7) feet of freeboard was visible at the time of the site visit.

2.3.3 Interior Slope

The majority of the interior slope was not visible since the impoundment was filled with ash to nearly the crest elevation. The southern portion of the impoundment is capped and the slopes are covered with grass. Northern portions of the interior slopes are typically covered with CCW and grass has grown onto the material. The visible portions of the interior slope generally appeared to be in fair condition (Photos 59, 76, 87, 88, 90, 91, 94, 95, 96, 97, 98, 103, 104, and 105). The grass on the inside of the embankment was approximately 8 to 12 inches tall and was recently mowed.

Comment [b13]: Photo 76 is a photo of the interior of the Coal Pile Run Off Pond and should be excluded from this paragraph

The primary settling basin area appeared to be in good condition. Two sets of two (2) 12-inch-diameter HDPE discharge pipes sluice CCW into the settling basins. CCW is sluiced into one basin at a time. The Marketer responsible for beneficial reuse of the ash is also responsible for dredging the settling basins and stockpiling the CCW material to dewater. The Marketer has dredged and stockpiled CCW inside the impoundment to create a stream to lengthen the settling time before entering the main pool area. The stockpiles of CCW observed were up to 15 feet higher than the crest of the perimeter embankment. Some of the stockpiled material is within 100 feet of the crest.

Comment [b14]: Asholite composite

2.3.4 Intake Structure and Evaporation System

The intake structure for the evaporation system appeared to be in fair condition. The concrete was not cracked or spalled. The pumps were off during the visual inspection of the impoundment.

On the northwest corner of the intake structure there are two manual staff gauges in the CADP (Photos 92 and 93). The pond water levels are recorded twice a day and

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reported in a daily status report that is electronically mailed to pertinent staff.

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Section 3
Data Evaluation

3.1 Design Assumptions

~~CDM was provided some of the original design assumptions for the CCW impoundments.~~ CDM has reviewed information provided~~made available~~ by LCRA related to the original design assumptions~~and analysis~~, which included analyses completed subsequent to the original design of the CCW impoundments.

3.2 Hydrologic and Hydraulic Design

LCRA provided CDM ~~was provided~~ with the hydrologic and hydraulic analyses for the CADP. Bechtel (1976) evaluated the hydraulic capacity of the original impoundment to store a design storm event consisting of the Probable Maximum Flood (PMF). The original contributory drainage area for the CADP was 112 acres for the 83.87 acre impoundment. Bechtel evaluated the impoundment's ability to store the PMF event - which would result~~ed~~ in approximately 45.3 inches of rainfall that would need to be stored.

The southern 39.65 acres of the CADP were capped in 1988, and surface water flow ~~i~~has been directed away from the impoundment. The remaining drainage area is approximately 72.35 acres, resulting in surface runoff of 273.12 acre-ft flowing into the active impoundment. Currently, the available pond area is approximately half that of the active impoundment resulting in 22.11 acres of storage area. Assuming the impoundment is normally operated at elevation El. 355, the impoundment can store approximately 154.77 acre-feet of runoff. Therefore, until the CADP is capped, the impoundment does not have enough capacity to safely store a PMF event and would be overtopped.

TCEQ requires a minimum of two (2) feet of freeboard to be maintained. Bechtel (1976) determined that a minimum of 3.7 feet of freeboard is required to accommodate wave-action. (The 3.7 feet was based on wave-action resulting from an 80 MPH wind.)

LCRA did not provide CDM ~~was not provided~~ with the hydrologic and hydraulic analyses for the Reclaim Pond. CDM completed a preliminary evaluation of the hydraulic capacity of the impoundment to estimate whether~~if~~ the pond is adequately sized to store or pass the design storm event. Based on ~~the~~ Texas Administrative Code ~~t~~Title 30 Chapter 299 (Dams and Reservoirs) ~~(Code)~~, the impoundments would be categorized as intermediately sized, low hazard structures. Such structures with drainage areas less than 10 square miles are required to pass 25 to 50% of the Probable Maximum Flood (PMF), for a minimum 1-hour storm event based on ~~the Code~~Chapter 299 and "Hydrologic and Hydraulic Guidelines for Dams in Texas", TCEQ, January 2007 (HHG).

The drainage area contributing to the Reclaim Pond is approximately 40 acres plus

additional routed flow from plant areas. The contributing drainage area is significantly less than ten (10) square miles. The HHG indicates that for drainage areas less than ten (10) square miles, the PMF is to be developed by applying the total depth of the

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Probable Maximum Precipitation (PMP) from Hydrometeorological Reports 51 and 52 (HMR-51 and HMR-52) to the entire drainage area for all storm durations. The six~~6~~-hour, ten (10) square mile PMP is approximately 31 inches. CDM assumed that the PMP is equal to the PMF for the purpose of evaluating impoundment storm capacity. Based on a normal pool level of El. 365, preliminary evaluations indicate that there is enough storage capacity and freeboard in both impoundments to store a 100% of the PMF event without being overtopped.

3.3 Structural Adequacy and Stability

~~The~~ Texas Administrative Code T~~t~~itle 30, Chapter 299 (Dams and Reservoirs) ~~(Code)~~ requires new and existing dams be evaluated under standard design guidelines. CCW~~W~~W impoundments, however, are exempt~~cept~~ from the above-referenced ~~Code~~ regulations.

The CCW~~W~~W impoundments at FPP are registered Class 2 waste management units according to the TCEQ. The TCEQ requires Class 2 waste management units to:

- Prevent washout, release, or exposure of waste;
- Have a minimum factor of safety for slope stability of 1.3; and
- Be hydrostatically and hydrodynamically stable against storms and floods.

In addition to the above requirements, procedures established by the United States Army Corps of Engineers (USACE), the United States Bureau of Reclamation, the Federal Energy Regulatory Commission, and the United States Natural Resources Conservation Service are generally accepted engineering practice. Minimum required factors of safety outlined by the USACE in EM 1110-2-1902, Table 3-1 and seismic factors of safety by FEMA Federal Guidelines for Dam Safety, Earthquake Analyses and Design of Dams (pgs. 31, 32 and 38, May 2005) are provided in **Table 2**

Table 2 – Minimum Safety Factors Required

Load Case	Minimum Required Factor of Safety
Steady-State Condition at Normal Pool or Maximum Storage Pool Elevation	1.5
Rapid Drawdown Condition from Normal Pool Elevation	1.2
Maximum Surcharge Pool (Flood) Condition	1.4
Seismic Condition from at Normal Pool Elevation	1.0
Liquefaction	1.3

Freese and Nichols, Inc. (FNI) in conjunction with Fugro Consultants, Inc. (FCI) prepared a Condition Assessment on the slope stability of the CADP east embankment, dated July 22, 2009. Analyses were performed for long-term steady-state conditions at normal pool level for the active and capped portion of the east embankment. Soil parameters used for the analyses and analysis results are presented

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in **Figure 109 and 1110** The results on Figure 109 and 1110 indicate the factor of safety against

Comment [k15]: Note incorrect figure reference.

slope stability was about 1.60 and 1.70 for the active and capped portion of the east embankment exterior slope, respectively.

LCRA discovered a~~the~~ seep on the south embankment exterior slope of the CADP in March 2010. In response, LCRA contracted FNI to perform three (3) test borings on the crest of the south embankment, install monitoring wells, and perform additional slope stability analyses to evaluate the stability of the embankment. At the time of the site visit, LCRA had not received the results of the additional stability analysis from FNI. LCRA personnel stated they expected the results from FNI in July.

Although the embankment was stable under normal loading conditions, FNI's evaluation did not consider the following load cases:

- Maximum surcharge pool (flood) condition;
- Rapid drawdown condition;
- Seismic loading; or
- Liquefaction.

No stability analysis results were provided for the Reclaim Pond.

3.4 Foundation Conditions

Based on the original 24 test borings performed by National Soil Services, Inc., and three (3) recent test borings performed by Fugro, the embankments for the CADP were constructed over surface deposits of medium stiff to hard, sandy clay underlain by medium dense, clayey sand and fine sand. The clayey soils ranged in thickness from 5 to greater than 20 feet and ranged in permeability from 4.0×10^{-9} cm/sec to 5.92×10^{-7} cm/sec. The drawings and geotechnical report prepared by Bechtel indicate the site was to be stripped prior to constructing the embankments. Based on the documents reviewed, the in-situ soil was intended to be used to construct pond liners. The design report by Bechtel indicated the subgrade was to be scarified, disked, and compacted prior to placement of the first lift of fill. Loose thickness of each lift of fill was to be limited to the maximum which would result in a compacted thickness not greater than nine inches. The fill was specified to be compacted to at least 95% of the "Bechtel" modified density and within minus 2% to plus 3% of the optimum moisture content. The design report also indicated that at least six passes of rolling equipment were required, provided that the specified density ~~i~~was developed.

Based the original eight (8) test borings performed by National Soil Services, Inc., and 36 test borings later performed by McCelland Engineers, Inc., the embankments for the Reclaim Pond were constructed over surface deposits of medium stiff to hard, sandy

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clay underlain by medium dense, clayey sand and fine sand. The railroad embankments were constructed based on Bechtel's 1976 design recommendations,

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described above. The impoundment drawings prepared by Black & Veatch in 1989 indicate the site was to be stripped a minimum of 12 inches prior to constructing the embankments. Based on the documents, the in-situ soil was intended to be reused to construct a pond liner with permeability ranging from $2.5x10^{-9}$ cm/sec to $3.2x10^{-7}$ cm/sec. The drawings indicated a minimum of 12 inches of the subgrade was to be recompacted prior to placement of the first lift of fill. The fill was specified to be compacted to at least 95% of the standard Proctor, ASTM D 698.

3.5 Operations & Maintenance

LCRA indicated that they have written operating plans for the impoundments. The operators are also provided with formal training classes before being assigned their duties relative to the impoundments, and junior operators are partnered with senior operators as part of the training process. The Operator~~'~~s perform visual inspections twice a day (one per shift) and record the water levels in the impoundments. Observations are reported in a daily status report sent out via electronic mail. Trained plant personnel also perform quarterly inspections and document inspection results on a formal written inspection record. The inspection record includes instructions and guidance for the inspector's use. Monitoring well water levels are ~~periodically~~ recorded quarterly. Areas of concern identified during inspections are physically flagged in the field, documented, and photographed. Corrective action is taken as necessary to remedy the identified issues. Significant issues are given high priority and repaired as soon as possible. An in-house professional dam engineer also performs a detailed annual inspection.

Routine maintenance performed includes mowing grass and other activities as needed to address other observed conditions such as erosion, rodent burrows, and revegetation. Mowing is subcontracted and is typically performed at least four (4) times per year.

LCRA has no formal emergency action plan (EAP) for the impoundments.

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Section 4
Conclusions/Recommendations

4.1 Hazard Classification

The Fayette Power Project impoundments currently do not have a TCEQ- developed Hazard Potential Classification. Based on the USEPA classification system, as presented on page 2 of the USEPA check list (Appendix A) recommended hazard ratings have been assigned to the impoundments, summarized in Table 3, below.

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Table 3 – Recommended Impoundment Hazard Classification Ratings

Impoundment	Recommended Hazard Rating	Basis
Coal Ash Disposal Pond	Low Hazard	• A breach would have an environmental impact on Cedar Creek and possibly the Colorado River. • A failure or misoperation could cause the Coal Pile Run-off Pond to fail. • A failure or misoperation could cause the Cedar Creek Dam to fail. • A breach or misoperation is anticipated to result in no probable loss of life, low economic and/or environmental losses, and losses are anticipated to be principally limited to the owner's property.
Reclaim Pond	Low Hazard	• A breach would have an environmental impact on the wetland areas east of the impoundment and may have an environmental impact on Cedar Creek. • A breach could impact the facility's railroad tracks. • A breach or misoperation is anticipated to result in no probable loss of life, low economic and/or environmental losses, and losses are anticipated to be principally limited to the owner's property.

4.2 Acknowledgement of CCW Impoundment Condition

CDM acknowledges that the management units (Coal Ash Disposal Pond and Reclaim Pond) referenced herein were assessed by Michael L. Schumaker, and Michael P. Smith.

The Coal Ash Disposal Pond appeared to be in fair condition based on site observations and design documentation provided by LCRA. Acceptable performance is expected under normal loading conditions and LCRA is preparing to close the impoundment in the near future. Based on the site visit and review of documentation, LCRA attempts and maintains a proactive maintenance program at this

impoundment. These efforts should be continued. However, some additional analyses should be performed and documented to verify that the embankments are stable under various loading conditions. Therefore, the Coal Ash Disposal Pond is judged to be in **SATISFACTORY** condition.

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The Reclaim Pond appears to be generally in fair condition, with exception of the east embankment. There is also a lack of documentation relative to the design and construction of this impoundment. It is not known if critical studies or investigations (complete stability analyses, hydrologic, hydraulic, seismic evaluations) have been performed to confirm that potential safety deficiencies do not exist. Therefore, the Reclaim Pond is judged to be in **POOR** condition. Additional documentation and future studies performed to confirm the condition and performance of these impoundments may be sufficient to substantiate an improved condition assessment.

Discussed in the following sections are deficiencies and recommendations for further studies~~,~~. ~~m~~Maintenance and monitoring may further improve the condition of these impoundments.

4.3 Maintaining and Controlling Vegetation Growth

Tall vegetation, brush, and trees up to 30 inches in diameter obscured visual observations on the east embankment exterior slope and at the toe of the north embankment at the Reclaim Pond. Some small trees and brush were observed at the toe of the CADP south embankment. CDM recommends that vegetation be cut on a regular basis to ensure that adequate visual observations can be made by LCRA personnel during routine inspections.

Comment [hee16]: There are no trees present 30 inches in diameter. Is this meant to read 3 inches in diameter or perhaps 30 inches in circumference?

~~Mesquite~~ Huisache trees up to 30 inches in diameter were observed on the embankments. CDM recommends the ~~mesquite~~ huisache trees (including the root ball) be removed and filled with compacted fill~~ed~~ under the supervision of a qualified dam engineer. CDM also recommends continued maintenance and brush removal.~~-~~

Comment [PAH17]: See comment above regarding 30 inch diameter trees.

4.4 Erosion Protection and Repair

Tractor ruts were observed at various locations along the crest of the Reclaim Pond. On the interior slopes, there were some areas with little or no riprap armor. The east embankment interior slope of the Reclaim Pond had an eroded area at the abandoned pipe outlet from concentrated water flow. The spillway approach channel had some riprap missing and was overgrown. Erosion features should be filled in with compacted material and otherwise stabilized. CDM recommends on-going maintenance to reduce erosion from run-off including minor grading to divert surface runoff, establishment of vegetative cover, or other measures. CDM also recommends replacing riprap in areas with little or no armor.

Multiple rodent holes were observed on the exterior slopes of the CADP east embankment. Multiple surface depressions~~,~~ (that are likely collapsed rodent holes) were also observed. Animal control measures should be implemented to reduce embankment disturbance. All affected areas should be backfilled with compacted fill, graded to match the surrounding topography, and be seeded with _____.

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4.5 Impoundment Hydraulic and Stability Analysis

LCRA did not provide CDM with a current hydraulic analysis of the CADP demonstrating the ability of the impoundments to ~~store~~ safely pass or store the applicable design storm, which appears to be the 50% PMF event. However, LCRA has submitted a closure plan to TCEQ and the impoundment is ~~going~~ planned for closure. The cap for the impoundment is ~~reportedly~~ being designed to handle a 24-hour, 100-year rainfall event.

LCRA did not provide CDM with a hydraulic analysis of the Reclaim Pond demonstrating the ability of the impoundments to ~~store~~ safely pass or store the applicable design storm, which appears to be the 50% PMF event. However, a preliminary evaluation performed by CDM suggests there is enough storage capacity at the current operating pool levels to safely store precipitation from the full PMP. CDM recommends LCRA perform a detailed study to confirm this conclusion and update the study if operating levels of the pond change in the future.

Based on CDM's review of available information for the impoundments, the following analyses are recommended to be performed to confirm that the embankments are adequately stable under the loading conditions outlined in Section 3.

Coal Ash Disposal Pond

- Evaluate the stability of the embankment under seismic conditions, including an evaluation of liquefaction potential of stored fines, at proposed water levels after closure.

Reclaim Pond

- Evaluate the stability of the north and east embankment under various appropriate loading conditions. Representative cross-sections of the embankment should be evaluated.
- Evaluate the stability of the embankments under normal pool and maximum surcharge pool (flood) conditions.
- Evaluate the stability of the interior and exterior slopes under seismic loading, including an evaluation of the liquefaction potential of stored fines~~,~~ and steady state seepage loading conditions.
- Perform a liquefaction potential analysis.
- Evaluate the stability of the interior slope under rapid drawdown loading conditions. While a rapid drawdown is not a scenario that has a high probability of occurrence, demonstration that this condition meets the industry recommended factor of safety in the event that a catastrophic

condition develops in one of the embankments whereby a rapid drawdown situation occurs.

Comment [TAJ18]: Incomplete sentence – please clarify.

4.6 Instrumentation

Water levels in the impoundments are recorded twice daily by LCRA personnel. Plant personnel also record water levels in the monitoring wells on a quarterly basis. CDM recommends that an updated monitoring well network plan be prepared to identify the locations of all functioning wells so that they can be utilized to monitor future water levels.

Four monitoring wells are reportedly located on the crest of the CADP east embankment. CDM recommends the monitoring wells be located in the field and returned to service or that they be properly abandoned.

4.7 Seepage Control and Closure Dewatering

Minor amounts of seepage were observed at the CADP, including the seep which is currently being contained. LCRA's current seepage containment system does not appear to be a viable long-term solution once the impoundment is closed. An alternative method of collecting and managing the seepage should be evaluated as part of the closure plans.

In addition, CDM recommends LCRA investigate the hydraulic connection between the impoundment and the Cedar Creek Dam as part of the closure design in order to evaluate potential impacts resulting from changes in ground-water levels and pore water pressures. Where the impoundment is built on the downstream slope of the dam, dewatering activities performed to stabilize the CCW and construct the cap may impact the phreatic level within the embankment of the dam. Changes to the phreatic level in the Cedar Creek Dam ~~can~~may result in potentially unstable slopes, settlement, or other undesirable consequences. Dewatering of CCW during closure activities should be staged to prevent excess pore pressure build-up and conducted in a manner to prevent significant seepage gradients, which could affect the stability of the Cedar Creek Dam. LCRA should also evaluate the anticipated long-term seepage from the Cedar Creek Dam into the impoundment and its impact on closure.

4.8 Inspection Recommendations

Based on the information reviewed by CDM, it appears LCRA has adequate inspection practices for the CADP. Inspections are performed routinely and documented via daily status reports. Detailed inspections are documented and are completed for the CADP on a quarterly basis. Annual inspections are completed by an engineer. LCRA should also ~~be~~ perform~~ing~~ inspections in a similar manner for the Reclaim Pond. It is recommended that the quarterly inspection records be retained at the facility for a minimum of three (3) years.

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4.9 Operations

There is no emergency action plan (EAP) for the impoundments. A detailed emergency action plan should be developed based on TCEQ's guidelines. LCRA should include in the EAP procedures to coordinate operation of the Cedar Creek Dam in the event of an unintended release or breach of the CADP.

Comment [k19]: There is duplicative text in this paragraph and the last paragraph of this section.

There is no formal operations and maintenance manual for the impoundments. CDM recommends that written operations and maintenance guidelines ~~are~~be developed outlining procedures for the maintenance of the embankments and operational procedures for the impoundments and appurtenant structures.

There is no formal emergency action plan (EAP) for the impoundments. Both impoundments have a low hazard classification. However, failure or misoperation of the impoundments could result in a condition that needs to be managed from an environmental and property damage standpoint. Detailed emergency action procedures should be developed to identify roles and responsibilities and to facilitate internal and external communication necessary to manage an impoundment failure. The procedures should include coordination with Cedar Creek Dam operations in event of an unintended release ~~of~~or breach ~~in~~of the impoundments, since failure of the Coal Ash Pond or the Coal Pile Run-off Pond could have adverse effects on the dam.

4.10 Closure Recommendations

The closure plan indicates proposed grades for the new cap will range from 1% to 4.45%. TCEQ TG No. 3 recommends final covers are graded with sufficient slopes to provide positive drainage, typically between 3% and 5%. Common practice is to create a minimum of a 2% slope to allow for surface water conveyance and prevent pooling. In addition, a 1% grade is difficult to construct and differential settlement in the CCW could result in low areas and subsequent pooling if such a small grade is used. CDM recommends that LCRA evaluate the slope of the cap and potential future settlement to ensure that the cap functions as intended.

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Section 5
Closing

The information presented in this report is based on visual field observations and review of reports and data provided to CDM by LCRA for the Fayette Power Project surface impoundments. The conclusions and recommendations presented are based, in part, on limited information available at the time of this report. This report has been prepared in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made. Should additional information become available or changes in field conditions occur, the conclusions and recommendations provided in this report should be re-evaluated by a qualified professional engineer.

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Section 6

Reports and References

The following is a list of reports and drawings that were reviewed during the preparation of this report and the development of the recommendations presented herein.

1. AMEC Geomatrix, April 30, 2010, Proposed Monitoring Well and Piezometer Location Plan

2. AMEC Geomatrix, May 14, 2010, Potentiometric Surface Map of Middle Sand July 2009

3. Bechtel Power Corporation, October 20, 1976, Drawing No. A-C-230-G19, "Ash Disposal Pond Plan"

4. Bechtel Power Corporation, October 20, 1976, Drawing No. A-C-230-G20, "Ash Disposal Sections"

5. Bechtel Power Corporation, February 13, 1976, Drawing No. A-C-230-G21, "Ash Disposal Sections"

6. Bechtel Power Corporation, March 26, 1976, Drawing No. A-C-230-G22, "Ash Pond Dike Profiles and Details"

7. Bechtel Power Corporation, June 22, 1977, Drawing No. I-M-816-112," Piping Plan Ash Water Pumphouse Area"

8. Bechtel Power Corporation, November 30, 1976, Drawing No. A-C-653-C01, "Ash Pond Intake Structure Conc. Plan, Section & Details – Sheet 1"

9. Bechtel Power Corporation, November 30, 1976, Drawing No. A-C-653-C02, "Ash Pond Intake Structure Conc. Plan, Section & Details – Sheet 2"

10. Bechtel Power Corporation, August 27, 1976, System Description Ash Pond and Coal Runoff Pond

11. Bechtel Power Corporation, May 20, 1977, Letter to Texas Water Quality Board

12. Black & Veatch, May 1, 1989, Drawing No. B-C-00G-022, "Site Grading Plans, Sections and Details"

13. Black & Veatch, May 1, 1989, Drawing No. B-C-00G-013, "Site Grading, Drainage, Roads, and Parking Area 2"

14. Black & Veatch, May 1, 1989, Drawing No. B-C-00G-014, "Site Grading, Drainage, Roads, and Parking Area 3"

Comment [TAJ20]: Was this the actual title, or just a typo?

15. Federal Emergency Management Agency, March 3, 2008, Risk Prioritization Tool for Dams, Users Manual

16. Federal Emergency Management Agency, April 2004, Federal Guidelines for Dam Safety, Hazard Potential Classification System for Dams

17. Freese and Nichols, Inc , Ash Pond Interim Observation Memorandum LCR10205

18. Freese and Nichols, Inc., July 22, 2009, Ash Pond Containment Dam Integrity Assessment Memorandum

19. Furgo, June 14 and 15, 2010, Preliminary Ash Pond Seep Boring Logs

20. LCRA, June 24, 2010, FPP Daily Status Report

21. LCRA, January 29, 2009, Ash Pond History

22. LCRA, May 20, 2010, Ash Pond Seep Statement of Work

23. LCRA, updated June 23, 2010, Ash Pond Seep Record Spreadsheet

24. LCRA, April 23, 2009Ash Pond Closure Charter

25. LCRA, Ash Pond Embankment Inspection Documentation Form

26. LCRA, March 24, 2009, EPA Request for Information

27. TCEQ, March 10, 2009 , Compliance Evaluation Investigation

28. LCRA, February 28, 2008, Reclaim Pond and Coal Pond Bathymetric Survey

29. LCRA, Ash Pond Impoundment Management Plan

30. LCRA, January 1, 2009 through December 31, 200, FPP CCP Operating Report

31. LCRA, July 14, 2009, Notice of Registration

32. LCRA, September 29, 2000, Proof of Deed Recordation for Solid Waste Management Unit # 002 (Ash Pond) Industrial Solid Waste Registration # 32575 Fayette Power Project, La Grange, Texas,

33. LCRA, Ash Pond Partial Closure

34. LCRA, June 12, 2009, TPDES WW Permit WQ0002105000

35. LCRA, April 30, 2009, Contract for Grounds Maintenance: Mowing and Shedding

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36. LCRA, February 22, 1996, Units 1, 2 & 3 Plan Water Balance Plan

37. LCRA, 2009, Aerial Survey Pond Volume Calculations

38. LCRA, February 22, 1996, Storm water drainage plan (Figure 4)

39. LCRA, 2009, Aerial Survey Ash Pond

40. LCRA, 2009, Aerial Survey Coal Run-off Pond

41. McCelland Engineers, Inc, May 1983, Geotechnical Investigation Report, Reclaim Pond

42. National Soil Services, Inc., August 12, 1977, Soils Investigation Report, Ash Disposal Pond

43. National Soil Services, Inc., January 15, 1975, Foundation Investigation

44. Texas Administrative Code, Title 30, Chapter 299, Dams and Reservoirs

45. Texas Commission on Environmental Quality, August 2009, RG-473, Design and Construction Guidelines for Dams in Texas, Dam Safety Program

46. Texas Commission on Environmental Quality, January 2007, GI-364, Hydrologic and Hydraulic Guidelines for Dams in Texas, Dam Safety Program

47. Texas Water Development Board, February 2006, Chapter 2, Geology of the Gulf Coast Aquifer, Texas, Report 365: Aquifers of the Gulf Coast of Texas

48. Texas Water Development Board, February 2010, Hydrostratigraphy of the Gulf Coast Aquifer from the Brazos River to the Rio Grande

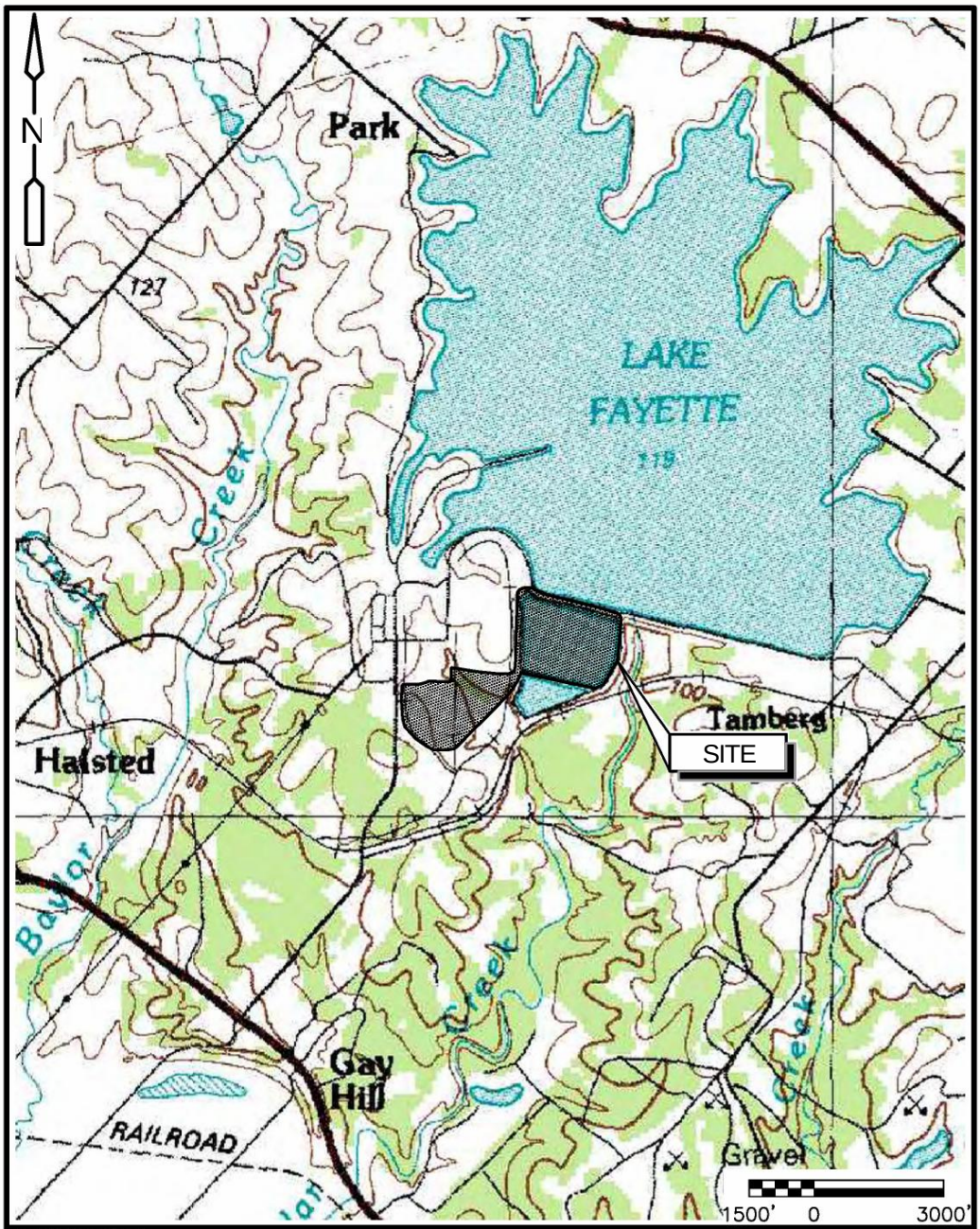
49. URS Corporation, July 2010, Ash Pond Closure Plan Fayette Power Project Solid Waste Registration #31575 Waste Management Unit #002

50. US Army Corps of Engineers, April 2008, National Inventory of Dams Methodology, State and Federal Agency Manual, Version 4.0

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

Figures



USGS TOPOGRAPHIC MAPS
FAYETTE VILLAGE & LA GRANGE EAST QUADRANGLE MAPS
CONTOURS AND ELEVATIONS IN METERS

TOWN OF LA GRANGE, TEXAS
FAYETTE POWER PROJECT
LOWER COLORADO RIVER AUTHORITY

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LOCUS PLAN
JULY 2010 FIGURE 1

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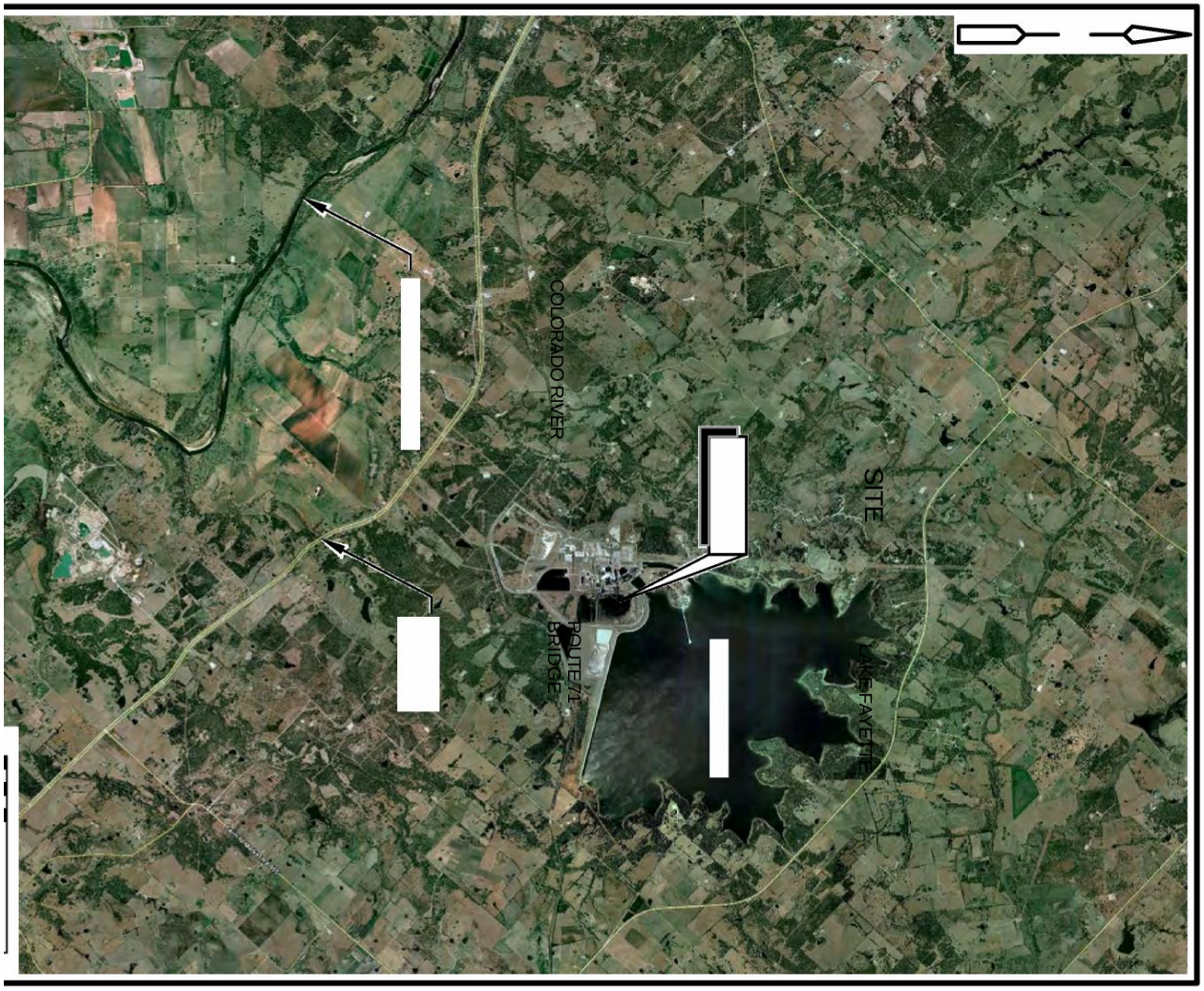

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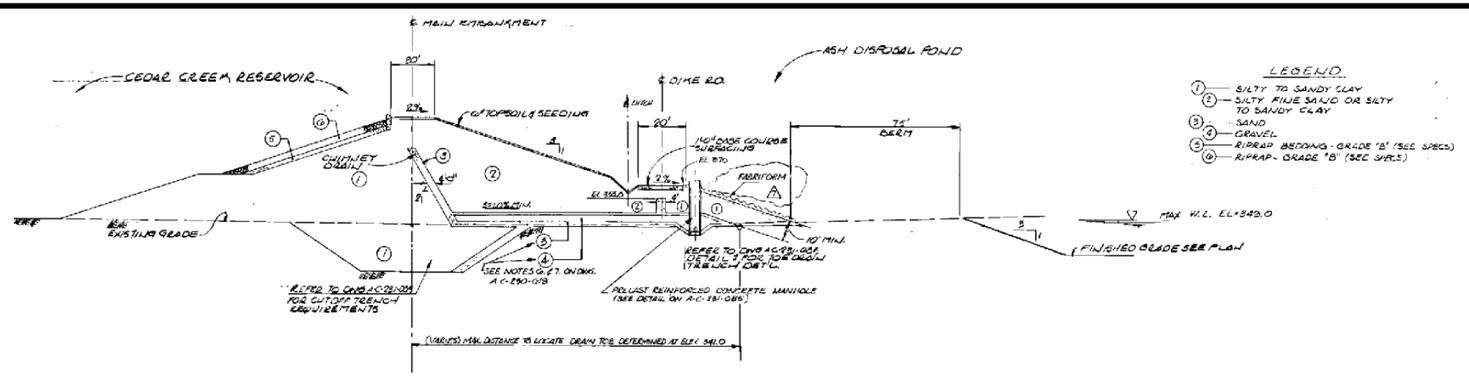
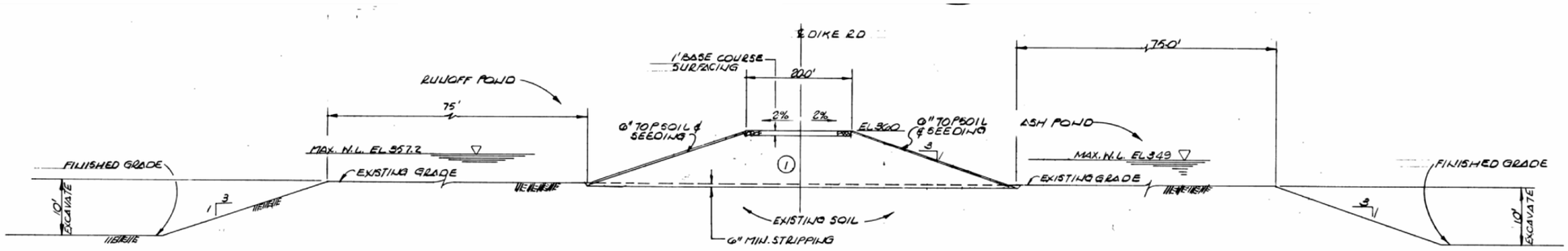


TYPICAL CROSS-SECTION NORTH EMBANKMENT



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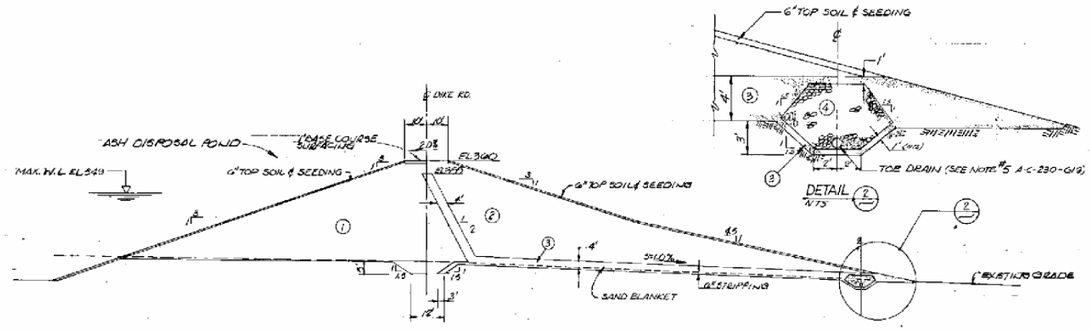

TYPICAL CROSS-SECTION EAST EMBANKMENT

NOTES:

1. TYPICAL SECTIONS OBTAINED FROM ASH DISPOSAL SECTIONS PREPARED BY BECHTEL, DATED 12/12/75.
2. SECTIONS NOT TO SCALE.

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LA GRANGE, TEXAS

TYPICAL ASH DISPOSAL POND CROSS-SECTIONS
FIGURE 3

US EPA ARCHIVE DOCUMENT
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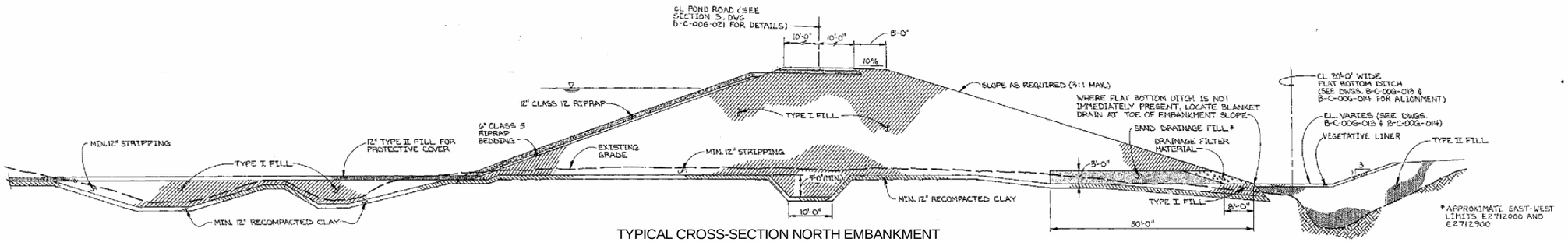
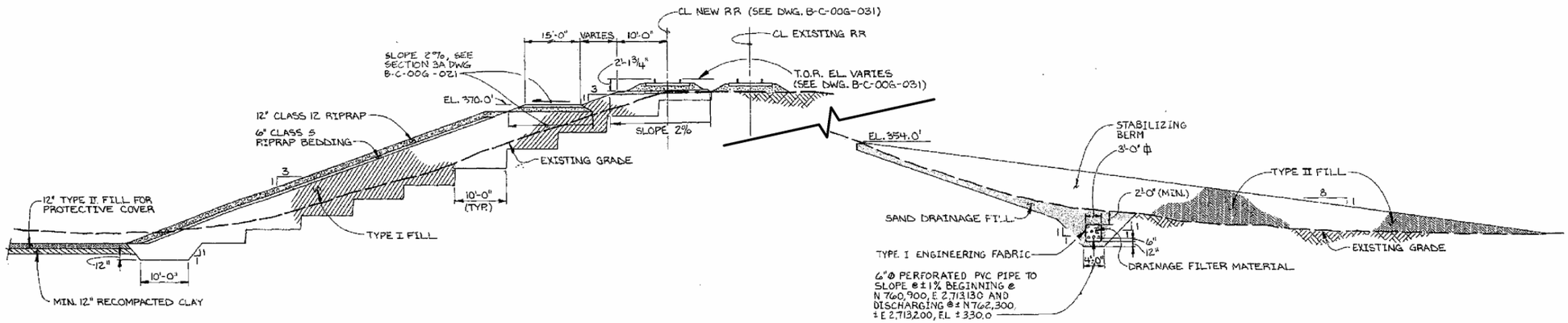


TYPICAL CROSS-SECTION NORTH EMBANKMENT



TYPICAL CROSS-SECTION EAST EMBANKMENT

NOTES:

1. TYPICAL SECTIONS OBTAINED FROM SITE GRADING PLANS, SECTIONS, AND DETAIL PREPARED BY BLACK & VEATCH, DATED 5–1–89.
2. SECTIONS NOT TO SCALE.

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LA GRANGE, TEXAS

TYPICAL RECLAIM POND CROSS SECTIONS

AERIAL PHOTOGRAPH SOURCE:
GOOGLE EARTH PRO.

TOWN OF LA GRANGE, TEXAS
FAYETTE POWER PROJECT
LOWER COLORADO RIVER AUTHORITY

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AERIAL MAP
JULY 2010 FIGURE 5

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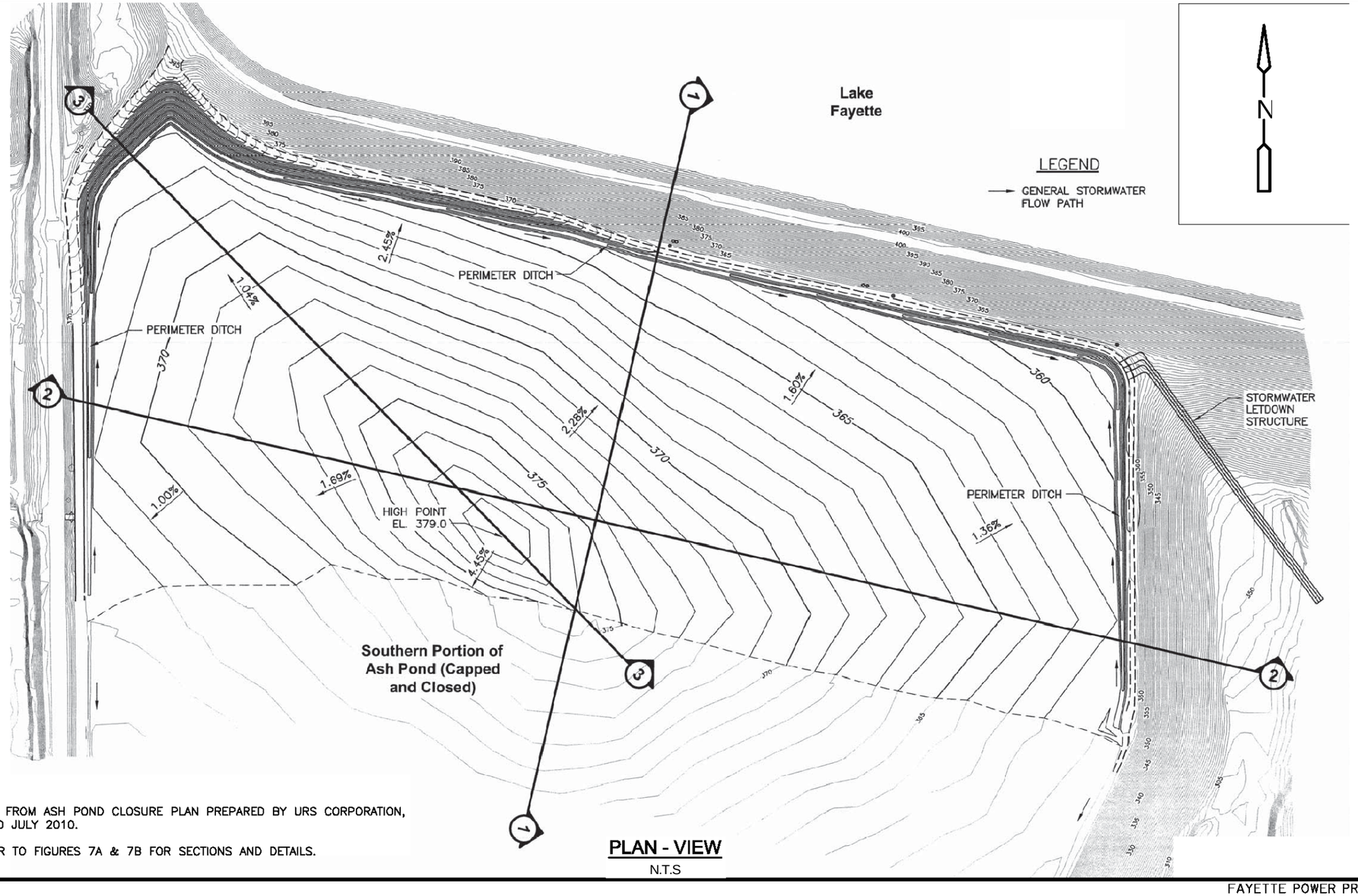

NOTES:

1. PLAN FROM ASH POND CLOSURE PLAN PREPARED BY URS CORPORATION, DATED JULY 2010.
2. REFER TO FIGURES 7A & 7B FOR SECTIONS AND DETAILS.

PLAN - VIEW
N.T.S

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LOWER COLORADO RIVER AUTHORITY
LA GRANGE, TEXAS

PROPOSED CAP CLOSURE GRADING PLAN
FIGURE 6

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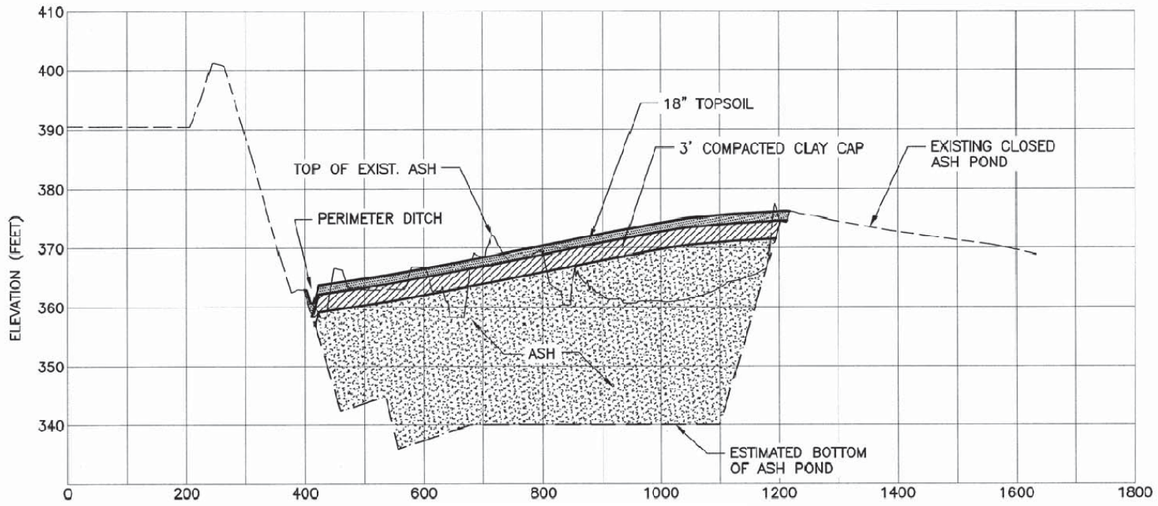
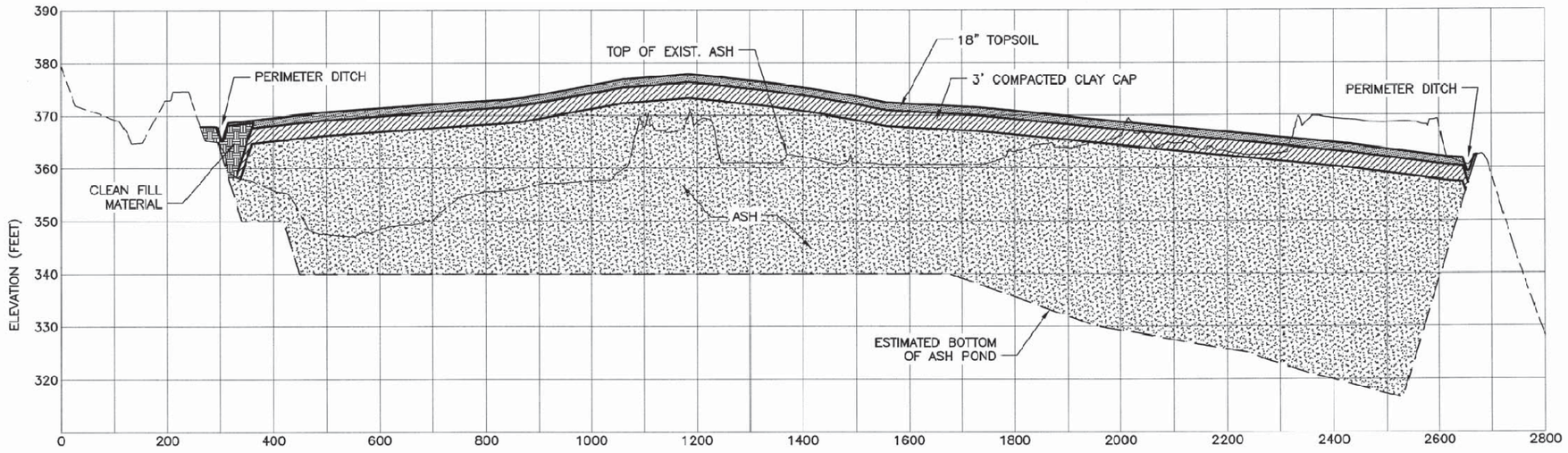


CROSS-SECTION 1

N.T.S

NOTES:

1. SEE FIGURE 6 NOTE 1.
2. REFER TO FIGURE 6 FOR PLAN VIEW.



CROSS-SECTION 2

N.T.S

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LOWER COLORADO RIVER AUTHORITY
LA GRANGE, TEXAS

CAP CROSS-SECTIONS & DETAILS

FIGURE 7A

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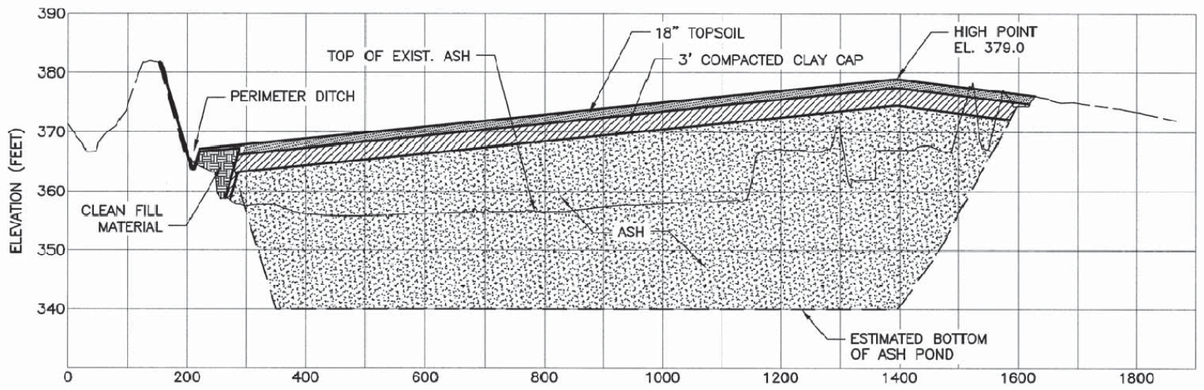
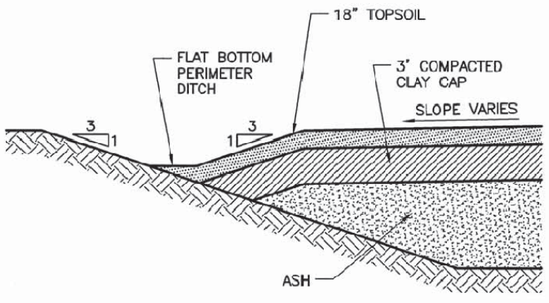


CROSS-SECTION 3

N.T.S



TYPICAL CAP SECTION

N.T.S

NOTES:

1. SEE FIGURE 6 NOTE 1.
2. REFER TO FIGURE 6 FOR PLAN VIEW.

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LA GRANGE, TEXAS

CAP CROSS-SECTIONS & DETAILS

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US EPA ARCHIVE DOCUMENT

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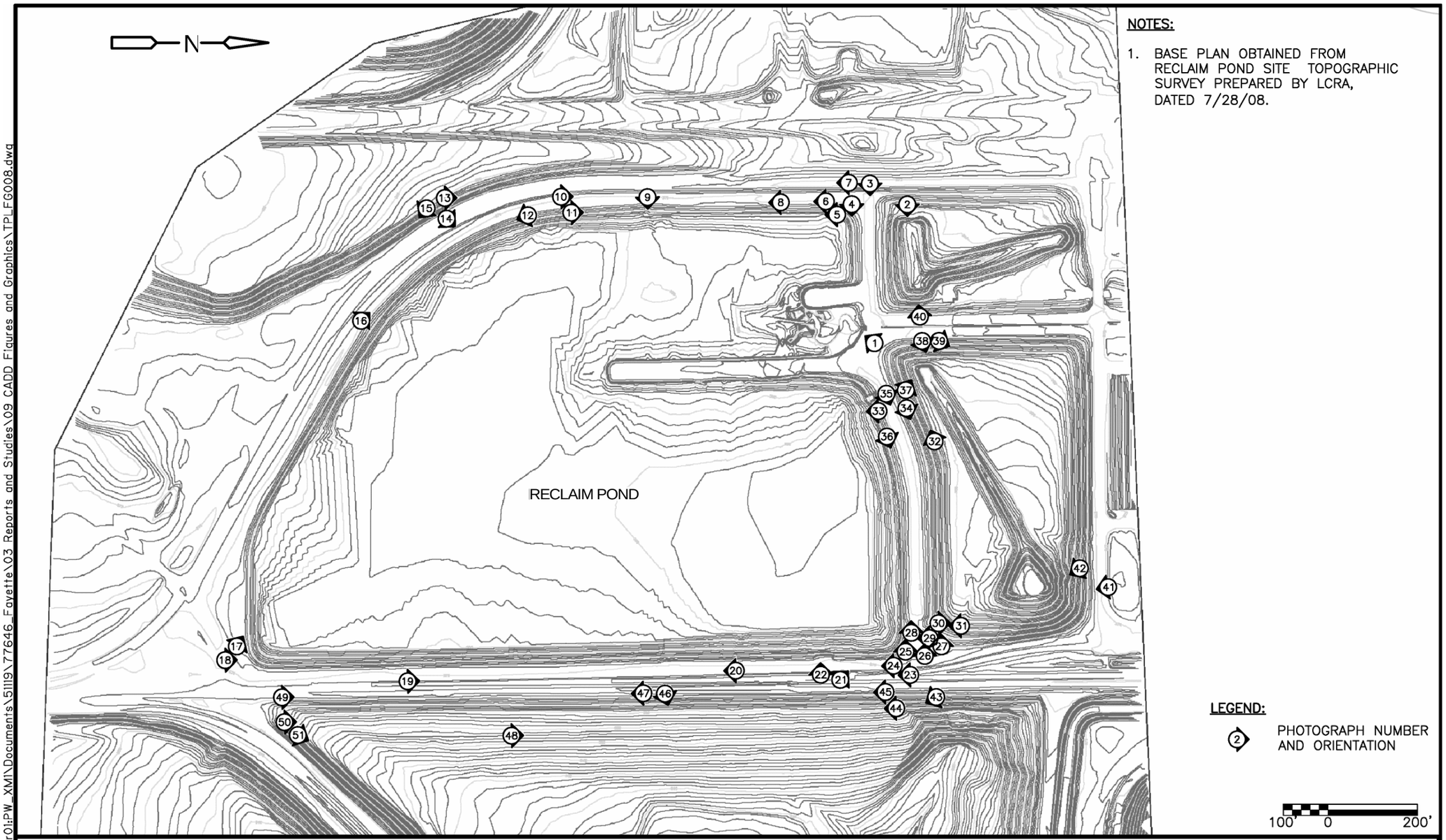

NOTES:

1. BASE PLAN OBTAINED FROM RECLAIM POND SITE TOPOGRAPHIC SURVEY PREPARED BY LCRA, DATED 7/28/08.

LEGEND:

② PHOTOGRAPH NUMBER AND ORIENTATION

100' 0 200'

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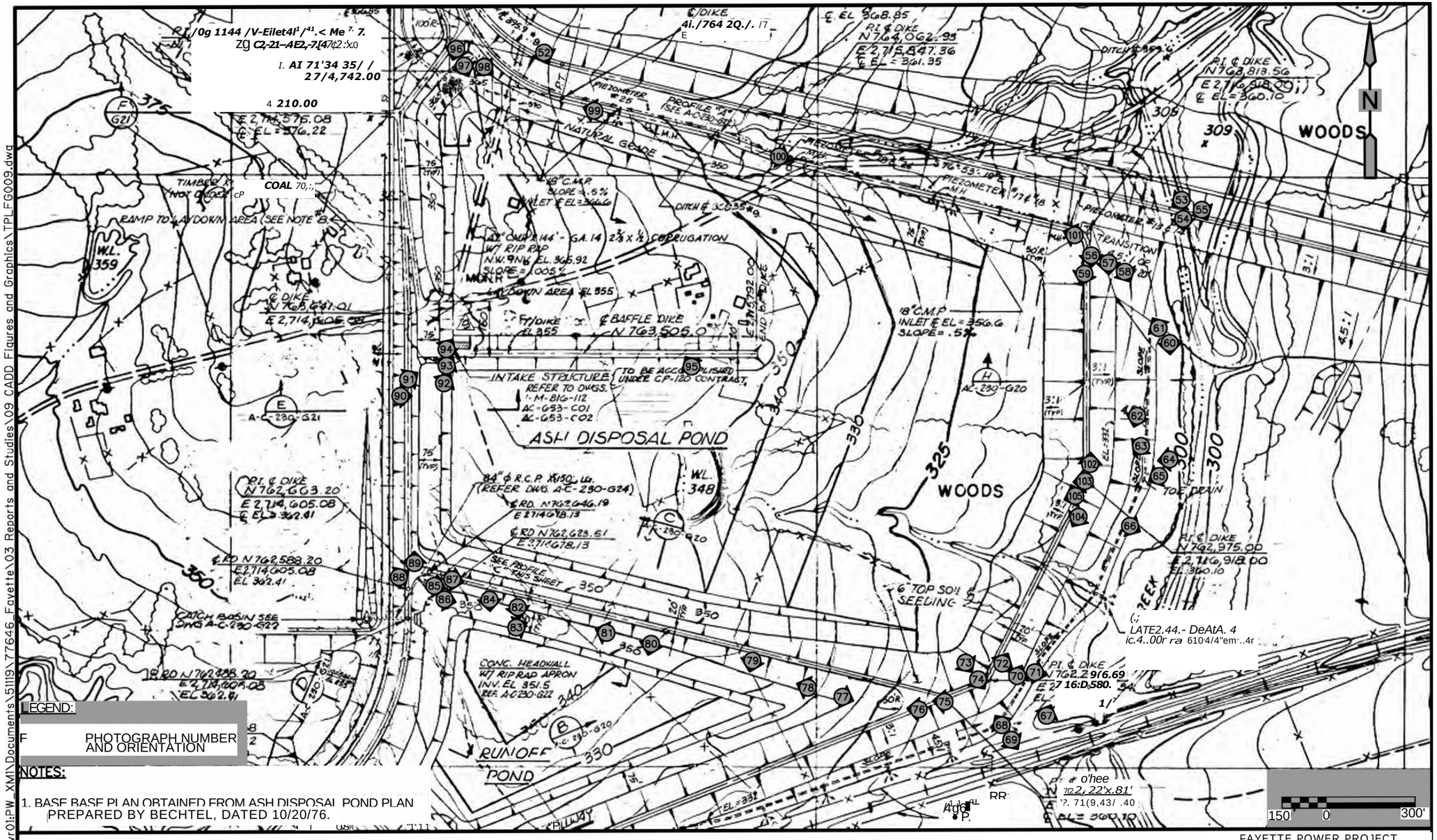
LA GRANGE, TEXAS

RECLAIM POND PHOTOGRAPH LOCATION PLAN

FIGURE 8

US EPA ARCHIVE DOCUMENT



LEGEND:

F PHOTOGRAPH NUMBER AND ORIENTATION

NOTES:

1. BASE BASE PLAN OBTAINED FROM ASH DISPOSAL POND PLAN PREPARED BY BECHTEL, DATED 10/20/76.

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COAL ASH DISPOSAL POND PHOTOGRAPH LOCATION PLAN

FIGURE 9

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US EPA ARCHIVE DOCUMENT

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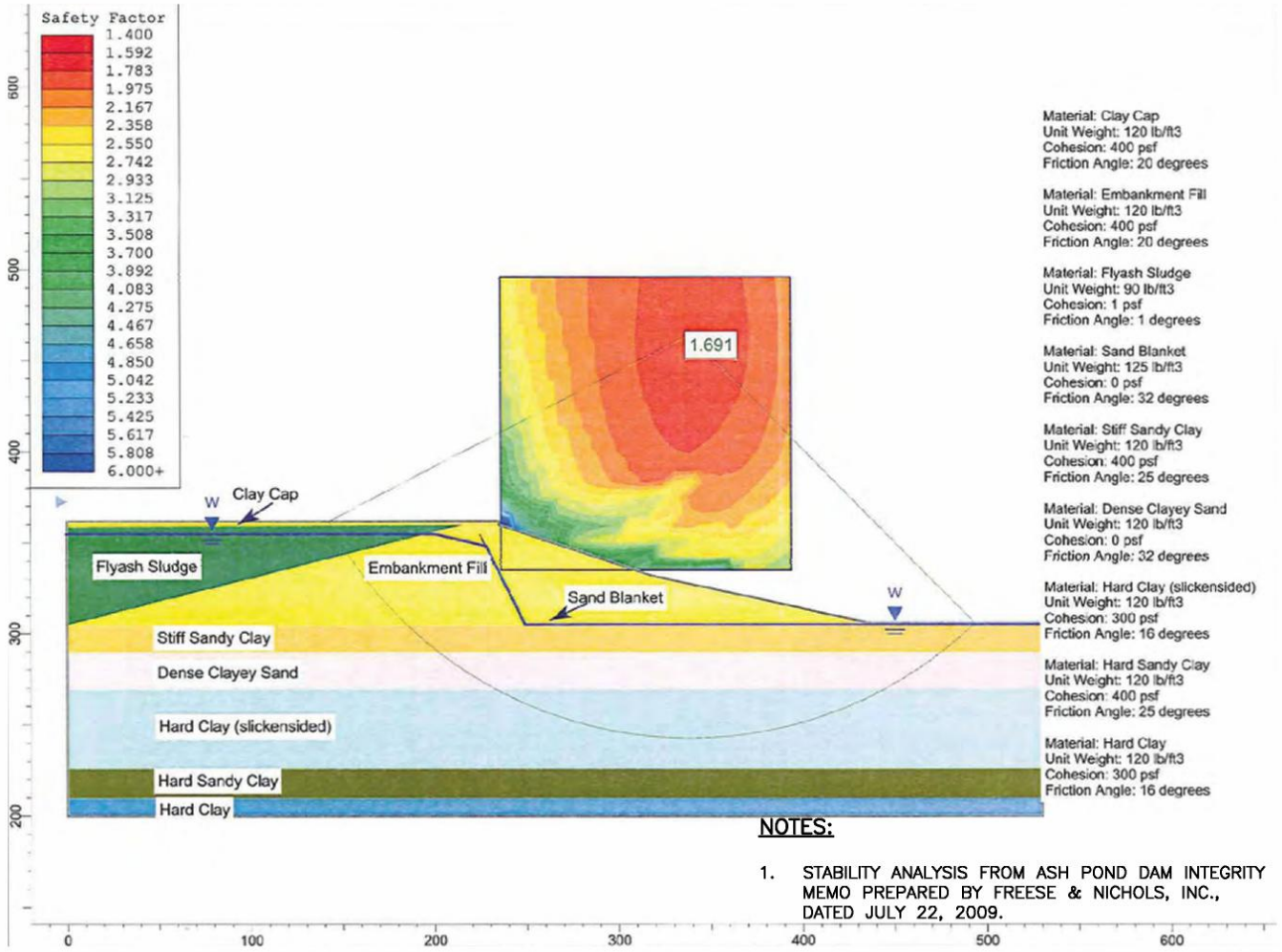

NOTES:

1. STABILITY ANALYSIS FROM ASH POND DAM INTEGRITY MEMO PREPARED BY FREESE & NICHOLS, INC., DATED JULY 22, 2009.

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LA GRANGE, TEXAS

FPP ASH POND DAM SLOPE STABILITY ANALYSIS SECTION A-A'

FIGURE 10

US EPA ARCHIVE DOCUMENT

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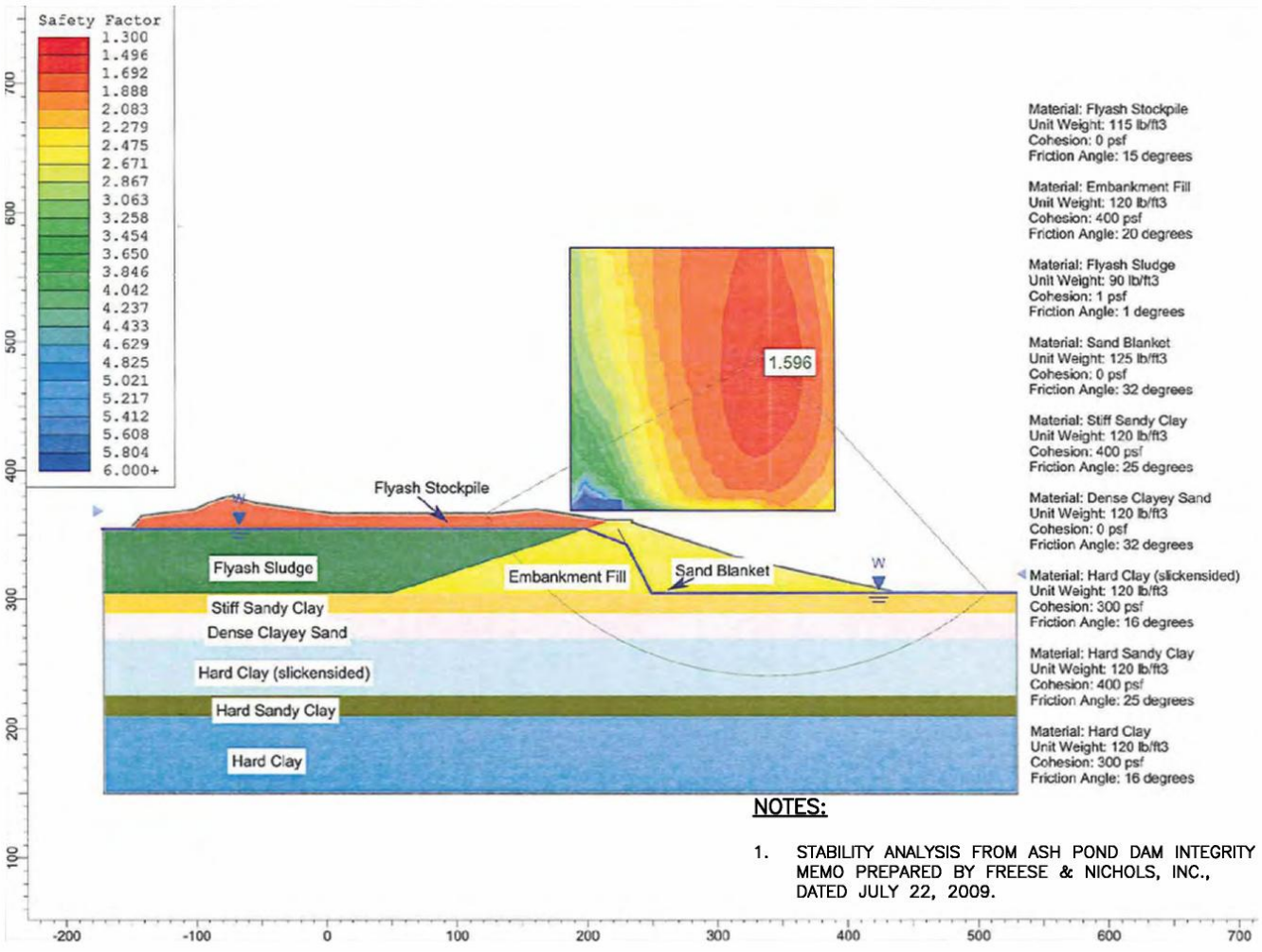

Material: Flyash Stockpile
Unit Weight: 115 lb/ft3
Cohesion: 0 psf
Friction Angle: 15 degrees

Material: Embankment Fill
Unit Weight: 120 lb/ft3
Cohesion: 400 psf
Friction Angle: 20 degrees

Material: Flyash Sludge
Unit Weight: 90 lb/ft3
Cohesion: 1 psf
Friction Angle: 1 degrees

Material: Sand Blanket
Unit Weight: 125 lb/ft3
Cohesion: 0 psf
Friction Angle: 32 degrees

Material: Stiff Sandy Clay
Unit Weight: 120 lb/ft3
Cohesion: 400 psf
Friction Angle: 25 degrees

Material: Dense Clayey Sand
Unit Weight: 120 lb/ft3
Cohesion: 0 psf
Friction Angle: 32 degrees

Material: Hard Clay (slickensided)
Unit Weight: 120 lb/ft3
Cohesion: 300 psf
Friction Angle: 16 degrees

Material: Hard Sandy Clay
Unit Weight: 120 lb/ft3
Cohesion: 400 psf
Friction Angle: 25 degrees

Material: Hard Clay
Unit Weight: 120 lb/ft3
Cohesion: 300 psf
Friction Angle: 16 degrees

NOTES:

1. STABILITY ANALYSIS FROM ASH POND DAM INTEGRITY MEMO PREPARED BY FREESE & NICHOLS, INC., DATED JULY 22, 2009.

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LOWER COLORADO RIVER AUTHORITY
LA GRANGE, TEXAS

FPP ASH POND DAM SLOPE STABILITY ANALYSIS SECTION B-B'

Appendix A
USEPA Coal Combustion Dam Inspection Checklist Forms

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Date:

Unit Name: Operator's Name:

Unit I.D.: Hazard Potential Classification: **High Significant Low**

Inspector's Name:

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?			18. Sloughing or bulging on slopes?		
2. Pool elevation (operator records)?			19. Major erosion or slope deterioration?		
3. Decant inlet elevation (operator records)?			20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?			Is water entering inlet, but not exiting outlet?		
5. Lowest dam crest elevation (operator records)?			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

US EPA ARCHIVE DOCUMENT

U. S. Environmental Protection Agency

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # _____ INSPECTOR_
Date _____

Impoundment Name _____

Impoundment Company _____
EPA Region _____
State Agency (Field Office) Addresss
_____

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?		
Is water or ccw currently being pumped into the impoundment?		

IMPOUNDMENT FUNCTION: _____

Nearest Downstream Town :
Name_____
Distance from the impoundment_____
Impoundment
Location: Longitude_____ Degrees_____ Minutes _____Seconds
Latitude _____ Degrees_____Minutes _____Seconds
State _____ County _____

Does a state agency regulate this impoundment? YES _____NO _____

If So Which State Agency?_____

US EPA ARCHIVE DOCUMENT

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.

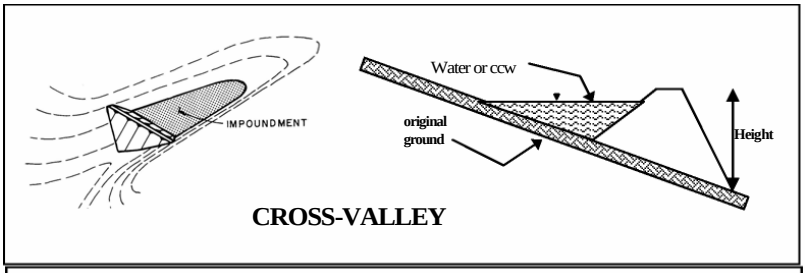
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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.

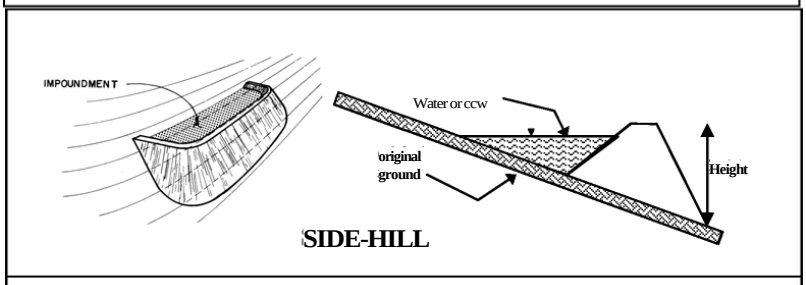
_____ **HIGH HAZARD POTENTIAL:** Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

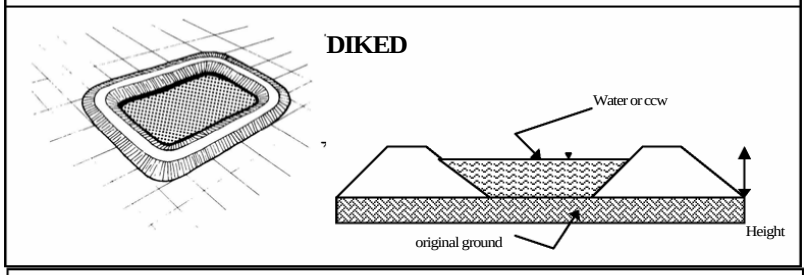
DESCRIBE REASONING FOR HAZARD RATING CHOSEN:

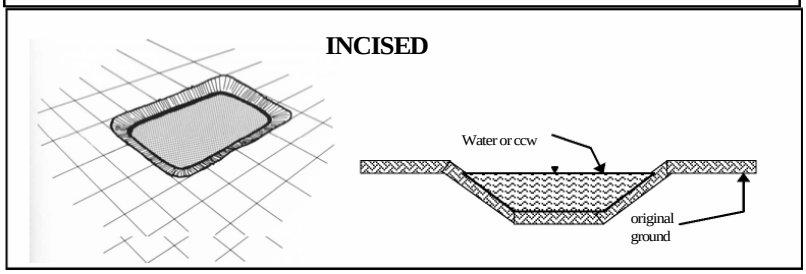
US EPA ARCHIVE DOCUMENT

CONFIGURATION:









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

Embankment Height _____ feet Embankment Material _____
Pool Area _____ acres Liner _____
Current Freeboard_____ feet Liner Permeability

TYPE OF OUTLET (Mark all that apply)

_____ **Open Channel Spillway**

_____ Trapezoidal

_____ Triangular

Rectangular

_____ Irregular

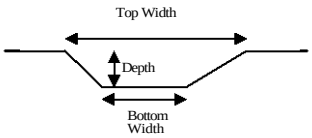
_____ depth

bottom (or average) width

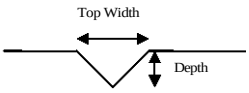
_____ top width

_____

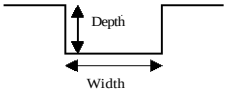
TRAPEZOIDAL



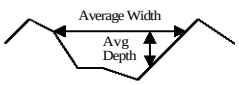
TRIANGULAR



RECTANGULAR

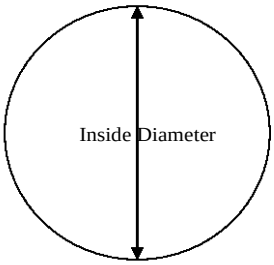


IRREGULAR



_____ **Outlet**

_____ inside diameter



Material

corrugated metal

welded steel

_____ 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 _____

_____

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

If So When? _____

If So Please Describe : _____

US EPA ARCHIVE DOCUMENT

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

If So When?_____

IF So Please Describe: _____

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

If so, which method (e.g., piezometers, gw pumping,...)? If so Please Describe :

Coal Combustion Dam Inspection Checklist Form

US Environmental Protection Agency

Site Name: Date:

Unit Name: Operator's Name:

Unit I.D.: Hazard Potential Classification: **High Significant Low**

Inspector's Name:

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?			18. Sloughing or bulging on slopes?		
2. Pool elevation (operator records)?			19. Major erosion or slope deterioration?		
3. Decant inlet elevation (operator records)?			20. Decant Pipes:		
4. Open channel spillway elevation (operator records)?			Is water entering inlet, but not exiting outlet?		
5. Lowest dam crest elevation (operator records)?			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

US EPA ARCHIVE DOCUMENT

Coal Combustion Waste (CCW)
Impoundment Inspection

Impoundment NPDES Permit # _____ INSPECTOR_
Date _____

Impoundment Name _____

Impoundment Company _____
EPA Region _____
State Agency (Field Office) Addresss
_____

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?		
Is water or ccw currently being pumped into the impoundment?		

IMPOUNDMENT FUNCTION: _____

Nearest Downstream Town :
Name_____
Distance from the impoundment_____
Impoundment
Location: Longitude_____ Degrees_____ Minutes _____Seconds
Latitude _____ Degrees_____Minutes _____Seconds
State _____ County _____

Does a state agency regulate this impoundment? YES _____NO _____

If So Which State Agency?_____

US EPA ARCHIVE DOCUMENT

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.

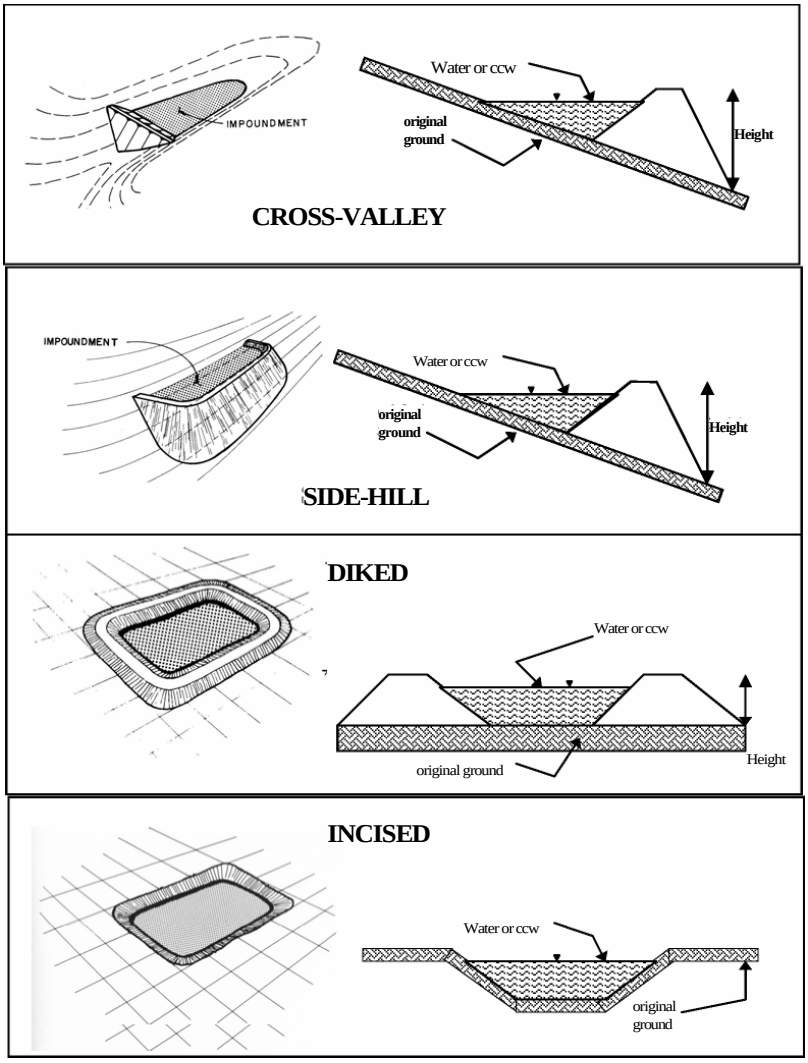
_____ **SIGNIFICANT HAZARD POTENTIAL:** Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or can impact other concerns. 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:

US EPA ARCHIVE DOCUMENT

CONFIGURATION:



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

Embankment Height _____ feet Embankment Material _____
Pool Area _____ acres Liner _____
Current Freeboard_____ feet Liner Permeability

TYPE OF OUTLET (Mark all that apply)

_____ **Open Channel Spillway**

_____ Trapezoidal

_____ Triangular

Rectangular

_____ Irregular

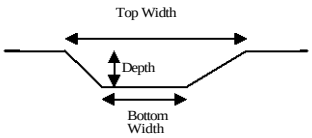
_____ depth

bottom (or average) width

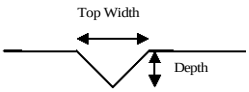
_____ top width

_____

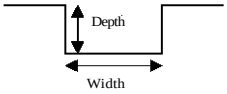
TRAPEZOIDAL



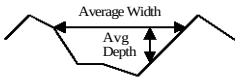
TRIANGULAR



RECTANGULAR

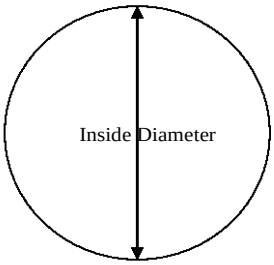


IRREGULAR



_____ **Outlet**

_____ inside diameter



Material

corrugated metal

welded steel

_____ 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 _____

_____

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

If So When? _____

If So Please Describe : _____

US EPA ARCHIVE DOCUMENT

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

If So When?_____

IF So Please Describe: _____

US EPA ARCHIVE DOCUMENT

US EPA ARCHIVE DOCUMENT

If so, which method (e.g., piezometers, gw pumping,...)? If so Please Describe :

US EPA ARCHIVE DOCUMENT

Appendix B
Photographs

Photo No. 1: Reclaim Pond – Overview of waste drain trench outlet at the north embankment interior slope.

Photo No. 2: Reclaim Pond – North embankment exterior slope, looking east.

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

Photo No. 3: Reclaim Pond – North embankment crest, looking east

Photo No. 4: Reclaim Pond – North embankment interior slope, looking east

Photo No. 5: Reclaim Pond – West embankment interior slope, looking south.

Photo No. 6: Reclaim Pond – West embankment crest, looking south.

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

Photo No. 7: Reclaim Pond – Overview of west embankment from railroad spur, looking south.

Photo No. 8: Reclaim Pond – West embankment, looking south at typical bare spots and tractor ruts on crest and interior slope.

Photo No. 9: Reclaim Pond – Overview of stormwater outlet structure on west embankment interior slope. Stormwater is from FGD residue silos and truck wash area.

Photo No. 10: Reclaim Pond – West embankment crest, looking north at typical surface erosion and rutting.

Photo No. 11: Reclaim Pond – West embankment interior slope, looking north.

Photo No. 12: Reclaim Pond – South embankment interior slope, looking

Photo No. 13: Reclaim Pond – Overview of western portion of impoundment, looking north.

Photo No. 14: Reclaim Pond – Overview of impoundment, looking northeast.

Photo No. 15: Reclaim Pond – Overview of south embankment, looking southeast.

Photo No. 16: Reclaim Pond – South embankment, looking northwest at a low area on the crest

Photo No. 17: Reclaim Pond – Overview of south embankment, looking northwest.

Photo No. 18: Reclaim Pond – East embankment interior slope, looking north. Small woody growth and minor surface erosion noted.

Photo No. 19: Reclaim Pond – East embankment interior slope, looking at a 4-inch-diameter

Photo No. 20: Reclaim Pond – East embankment interior slope, looking south at rutting and

Photo No. 21: Reclaim Pond – East embankment interior slope, looking at abandoned 12-inch-diameter HDPE discharge pipe from the CADP. Note the embankment has been eroded at the discharge pipe.

Photo No. 22: Reclaim Pond – East embankment interior slope, looking at 2.5'W erosion rill.

Photo No. 23: Reclaim Pond – East embankment crest, looking south.

Photo No. 24: Reclaim Pond – East embankment interior slope, looking south. Note occasional mesquite trees growing on interior slope.

Photo No. 25: Reclaim Pond – North embankment interior slope, looking west.

Photo No. 26: Reclaim Pond – North embankment crest, looking west.

Photo No. 27: Reclaim Pond – North embankment exterior slope, looking west.

Photo No. 28: Reclaim Pond – North embankment, looking at emergency spillway channel entrance.

Photo No. 29: Reclaim Pond – North embankment, looking south at spillway channel entrance.

Photo No. 30: Reclaim Pond – North embankment, looking north at spillway discharge channel.

Photo No. 31: Reclaim Pond – North embankment exterior slope, looking south at spillway discharge channel.

Photo No. 32: Reclaim Pond – North embankment exterior slope, looking at typical desiccation cracks.

Photo No. 33: Reclaim Pond – North embankment interior slope, looking at staff gage at

Photo No. 34: Reclaim Pond – North embankment exterior slope, looking east.

Photo No. 35: Reclaim Pond – North embankment crest, looking east.

Photo No. 36: Reclaim Pond – North embankment interior Slope, looking east. Note 6-inch-

Photo No. 37: Reclaim Pond – North embankment exterior slope, looking north at two 8-foot-

Photo No. 38: Reclaim Pond – Overview of north embankment exterior slope and downstream area, looking east. Note small trees and brush at the bottom of the slope growing in the drainage ditch.

Photo No. 39: Reclaim Pond – Overview of north embankment downstream area, looking north.

Photo No. 40: Reclaim Pond – Overview of north embankment exterior slope and downstream area, looking west

Photo No. 41: Reclaim Pond – Overview of north embankment spillway and railroad embankment, looking south. Note small trees growing at the toe in the drainage ditch.

Photo No. 42: Reclaim Pond – Overview of triple arch culverts under railroad embankment. Note small trees and vegetation in the drainage ditch and debris in the arch culverts.

Photo No. 43: Reclaim Pond – East embankment downstream area, looking southeast.

Photo No. 44: Reclaim Pond – East embankment exterior slope, looking south.

Photo No. 45: Reclaim Pond – East embankment crest, looking south. Note crest has two railroad spurs and an access road.

Photo No. 46: Reclaim Pond – East embankment exterior slope, looking east at downstream area. Note railroad embankment in background.

Photo No. 47: Reclaim Pond – East embankment exterior slope, looking south.

Photo No. 48: Reclaim Pond – East embankment exterior slope, looking north.

Photo No. 49: Reclaim Pond – East embankment crest, looking north.

Photo No. 50: Reclaim Pond – East embankment exterior slope, looking north. Note access road to monitoring wells.

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

Photo No. 51: Reclaim Pond – Overview of east embankment downstream area. Note railroad embankment to the right side of photo.

Photo No. 52: CADP – Overview of final settling basin, looking southeast. Note evaporation

Photo No. 53: CADP – Overview of active portion of impoundment, looking southwest.

Photo No. 54: CADP – Overview of east embankment and downstream area, looking south.

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

Photo No. 55: CADP – Overview of east embankment downstream area, looking southeast.

Photo No. 56: CADP – East embankment crest, looking south. Note the fence has been pushed over from raising the crest 2 feet.

Photo No. 57: CADP – East embankment exterior slope, looking south.

Photo No. 58: CADP – East embankment exterior slope, looking southeast at groin with

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

Photo No. 59: CADP – East embankment interior slope, looking southwest.

Photo No. 60: CADP – East embankment exterior slope looking southwest.

Photo No. 61: CADP – East embankment exterior slope, looking northwest at groin with Cedar Creek Dam.

Photo No. 62: CADP – East embankment exterior slope, looking at 3'Wx3'Lx1'D depression. Possible collapsed rodent burrow.

Photo No. 63: CADP – East embankment exterior slope, looking at a 6-inch-diameter rodent

Photo No. 64: CADP – East embankment exterior slope, looking at toe drain

Photo No. 65: CADP – East embankment exterior slope, looking at an 8-inch-diameter rodent

Photo No. 66: CADP – East embankment exterior slope, looking at toe drain seepage collection sump pit. Seepage water from the toe drain is pumped back to the impoundment.

Photo No. 67: CADP – East embankment exterior slope, looking north.

Photo No. 68: CADP – East embankment exterior slope, looking west at stormwater discharge channel from capped portion of the impoundment.

Photo No. 69: CADP – East embankment exterior slope, looking south at stormwater discharge channel from capped portion of the impoundment.

Photo No. 70: CADP – East embankment exterior slope, looking north.

Photo No. 71: CADP – Overview of east embankment downstream area, looking east.

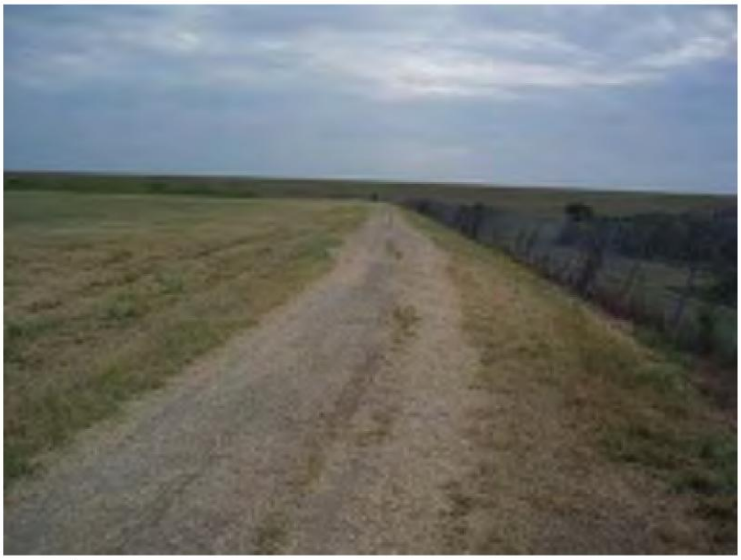


Photo No. 72: CADP – East embankment crest, looking north.

Photo No. 73: CADP - East embankment, looking south at approach to discharge channel inlet control section from capped portion of the impoundment.

Photo No. 74: CADP - East embankment, looking south at stormwater control section outlet

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

Photo No. 75: CADP – South embankment crest and capped area, looking west.

Photo No. 76: CADP – Groin of south embankment exterior slope and Coal Pile Run-off Pond interior slope, looking west. Note water, brush and small trees at toe of slope.

Photo No. 77: CADP – South embankment exterior slope, looking east at groin with Coal Pile Run-off Pond. Note water, brush and small trees at toe of slope.

Photo No. 78: CADP – South embankment exterior slope, looking west.

Photo No. 79: CADP – South embankment exterior slope, looking at 3'Wx4'Lx2'D depression at toe of slope. Possible collapsed rodent burrow

Photo No. 80: CADP – South embankment exterior slope, looking at 4'Wx5'Lx2'D depression at toe of slope. Possible collapsed rodent burrow.

Photo No. 81: CADP – South embankment exterior slope, looking west. Note sparse vegetation near crest.

Photo No. 82: CADP – South embankment exterior slope, looking at seep containment system.

Photo No. 83: CADP – South embankment exterior slope, looking at seep. Note liner down slope of seep to collect water. Flow ~8 gallons per day.

Photo No. 84: CADP – South embankment exterior slope, looking at 2'Wx4'Lx1'D depression at toe of slope. Possible collapsed rodent burrow.

Photo No. 85: CADP – South embankment exterior slope, looking east.

Photo No. 86: CADP – South embankment crest, looking east.

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

Photo No. 87: CADP – South embankment, looking east at capped portion of impoundment.

Photo No. 88: CADP – Overview of capped area, looking northeast from southwest corner of

Photo No. 89: CADP – West embankment crest, looking north.

Photo No. 90: CADP – overview of transition between the active and the capped portion of

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

Photo No. 91: CADP – Overview of the active portion of the impoundment, looking

Photo No. 92: CADP – West embankment interior slope, looking at staff gage on intake structure.

Photo No. 93: CADP – West embankment interior slope, close up of staff gage on intake structure.

Photo No. 94: CADP – Overview of final settling basin area, looking

Photo No. 95: CADP – Overview of two primary settling basins where CCW is sluiced into the impoundment. Settling basins are alternated and cleaned out when full.

Photo No. 96: CADP – West embankment interior slope, looking south.

Photo No. 97: CADP – Overview of active portion of impoundment, looking southeast.

Photo No. 98: CADP – North embankment interior slope, looking east. Note Cedar Creek Dam on left side of photo.

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

Photo No. 99: CADP – North embankment crest, looking at tension crack in road base

Photo No. 100: CADP – North embankment crest, looking east. Note trees growing inside the fence limits. Trees are in the area of the toe of the Cedar Creek Dam.

Photo No. 101: CADP – North embankment crest, looking west.

Photo No. 102: CADP – East embankment crest, looking north.

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

Photo No. 103: CADP – Looking west at transition from active portion to capped portion of impoundment from east embankment crest.

Photo No. 104: CADP – East embankment crest, looking south.

Photo No. 105: CADP – Overview of capped portion of impoundment from northeast corner, looking southwest.

CDM	Lower Colorado River Authority Fayette Power Project Station La Grange, TX
CDM Project No.: 77646.1801.035.SIT.FAYET	June 23 and 24, 2010

US EPA ARCHIVE DOCUMENT

Appendix C
Photo GPS Locations

US EPA ARCHIVE DOCUMENT

Appendix C

Site: Fayette Power Project
System: US State Plane 1983
Zone:Texas South Central 4204
Datum: NAD 1983 (Consus)
Coordinate Units: Feet

Photo No.	Northing	Easting
1	13,885,629	2,680,650
2	13,885,680	2,680,366
3	13,885,639	2,680,371
4 and 5	13,885,608	2,680,374
6	13,885,598	2,680,346
7	13,885,590	2,680,317
8	13,885,411	2,680,344
9	13,885,136	2,680,353
10, 11, and 12	13,884,901	2,680,355
13, 14, and 15	13,884,631	2,680,355
16	13,884,466	2,680,617
17 and 18	13,884,186	2,681,369
no photo	13,884,218	2,681,406
19	13,884,636	2,681,397
20	13,885,275	2,681,398
21 and 22	13,885,541	2,681,393
23, 24, and 25	13,885,706	2,681,397
26 and 27	13,885,768	2,681,357
28	13,885,719	2,681,331
29 and 30	13,885,732	2,681,311
31	13,885,791	2,681,293
32	13,885,753	2,680,865
33	13,885,662	2,680,806
34, 35, 36, and 37	13,885,675	2,680,774
38 and 39	13,885,715	2,680,655
40	13,885,710	2,680,616
41	13,886,140	2,681,204
42	13,886,074	2,681,169
43	13,885,756	2,681,450
44	13,885,680	2,681,472
45	13,885,666	2,681,438
46 and 47	13,885,142	2,681,456
48	13,884,807	2,681,538
49, 50, and 51	13,884,295	2,681,454
52	13,887,869	2,683,435
53, 54, and 55	13,887,351	2,685,610
56, 57, 58, and 59	13,887,209	2,685,333
60 and 61	13,886,965	2,685,530
62	13,886,649	2,685,429
63	13,886,552	2,685,444
64	13,886,502	2,685,530
65	13,886,481	2,685,526
66	13,886,238	2,685,461
67	13,885,627	2,685,125

US EPA ARCHIVE DOCUMENT

Appendix C

Site: Fayette Power Project
System: US State Plane 1983
Zone:Texas South Central 4204
Datum: NAD 1983 (Consus)
Coordinate Units: Feet

Photo No.	Northing	Easting
68 and 69	13,885,570	2,684,997
70 and 71	13,885,767	2,685,001
72	13,885,800	2,684,989
73	13,885,786	2,684,911
74	13,885,750	2,684,921
75	13,885,720	2,684,832
76	13,885,700	2,684,764
77 and 78	13,885,786	2,684,382
79	13,885,838	2,684,130
80	13,885,918	2,683,788
81	13,885,978	2,683,663
82	13,886,046	2,683,375
83	13,886,013	2,683,342
84	13,886,040	2,683,247
85	13,886,097	2,683,053
86	13,886,121	2,683,061
87	13,886,140	2,683,053
88	13,886,129	2,682,953
89	13,886,148	2,682,991
90 and 91	13,886,850	2,682,950
92 and 93	13,886,989	2,683,150
94	13,886,987	2,683,115
95	13,886,821	2,683,930
96, 97, and 98	13,887,883	2,683,144
99	13,887,720	2,683,535
100	13,887,601	2,684,064
101	13,887,283	2,685,299
102, 103, 104, and 105	13,886,450	2,685,305