M E M O R A N D U M

TO: Jana Englander

FROM: Jerry Strauss

cc:

Date: December 29, 2011

SUBJECT: AEP NRG Energy, Limestone Electric Station, Response to Comments

NRG contracted with 2 engineering companies to perform hydrologic and structural stability studies of the dikes for the two ponds that receive CCR. The reports were completed in June, but Dewberry did not receive them until early December. (Their letter says the reports were sent by UPS to the Dewberry Lead Engineer – Andy Cueto. Andy indicated he did not receive the documents.) As a result of the studies both ponds were given a revised rating of Satisfactory. Note the ponds are in a very low seismic area and have quite high Factors of Safety under static conditions. A seismic analysis is not warranted in this case.

EPA Comments:

- Report now reflects the new studies
- Editorial comments were addressed.
- Revised referenced section numbers
- Rationale provided for why the 2 ponds (DSDA and ST-18) were assessed and their sizes
- We deleted blank pages in Appendix A;

NRG Comments:

- Dewberry received a track changes version of the draft report. After reviewing the changes – all were accepted. Mostly editorial and corrections to data values.
- NRG also sent a slightly revised response to their "Rich Kinch"/EPA data request from 2009. The letter included the DSDA Pond and 2 below grade sumps (ST-9 and ST-10) that are not addressed in the CCR report. ST-9 is a 35 ft diameter sump; ST-10 is a 40-ft dia sump.

NOTE

Subject: EPA Comments on NRG Texas Limestone,
Jewett, TX
Round 9 Draft Assessment Report

To: File

Date: August 9, 2011

1. Page 1-2: "The facility is satisfactory with the exception of providing a Breach Analysis and Inundation Map including a Hydraulic and Hydrologic analysis. Therefore, the Management Units is rated **POOR** for continued safe and reliable operation until the receipt of the deficient documentation." reword "...the management units are rated poor..."

2. On p. 1-3: the report states: "**1.2.3 Recommendations Regarding the Surveillance and Monitoring Program -** It is recommended that a document outlining maintenance and operations procedures be developed. Also note the recommendations in Section 1.2.6." No section 1.2.6 exists in the report. The conclusions section indicated that Maintenance and Operations were adequate. The label for this is Surveillance and Monitoring Program, not maintenance and operations.

3. On p. 2-1: Section 2.1, the second paragraph includes the following statement: "The material handling area includes the solid waste disposal area active landfill, bottom ash and FGD processing areas, and several clay-lined runoff/sedimentation ponds. Two ponds receive CCR byproducts: DSDA and ST- 18. Note the ponds are not used for CCR disposal, but the CCR is added for water treatment due to its high pH in one pond, and is a runoff contaminant in the other, as described below." The survey response includes seven distinct units in which ST-18 is not included. There needs to be a discussion in this section, after this paragraph, which identifies each of the units in the survey, and the rationale for not assessing some of the units (For example, Bottom-Ash Cooling Water Pond (K-Pond), Stormwater Ponds A & B, Flue Gas Desulfurization Emergency Pond (E Pond), ST-9 and ST-10-- all below grade.), and the reason ST-18 was not included in the survey.

4. According to the report: "ST-18 receives CCR byproducts as a result of stormwater runoff from a transfer station concrete hardstand. Fly ash is pneumatically conveyed to the hardstand to be loaded via frontend loaders into trucks and then either transported dry for beneficial reuse or disposed of in the solid waste disposal area. Stormwater runoff washes the CCR into the detention basin during an event. The CCR settles and the supernatant is decanted off to the wastewater processing plant. The pond is primarily dry and cleaned out when needed via a bobcat. Sludge is transported dry to the solid waste

disposal area." And "8.1.2 *ST-18* - This facility is operated as a stormwater collection basin. Once the pond level exceeds 2 feet, sump pumps are activated manually or automatically to lower the water level in the pond. Solids are dewatered via evaporation and then hauled to the landfill." This 24 foot high pond appears to be more than just a stormwater run-off pond, please confirm/clarify.

5. On p. 2-2: Section 2.2.1, item number 1 – replace comma with a period at end of sentence.

6. On p. 2-3: Section 2.2.4, item number 2 – replace comma with a period at end of sentence.

7. On p. 2-3: Section 2.3, for the size of the unit, the document refers to "the dam" rather than stipulating the size for each of the two units identified: DSDA and ST-18.

8. On p. 7-1: Section 7.1.1, the report states: "In March 2011 AEP awarded a Slope Stability Analysis and Hydrologic Analysis contract to Tolunay-Wong Engineers, Inc. for the two ponds." The utility is NRG, not AEP, please correct. Also: is the slope stability analysis and H&H not yet complete? Do we expect it to be complete before the final report is issued, possibly improving the condition rating for the impoundments?

9. Remove blank pages: 272-274.

June 3, 2011

Mr. Stephen Hoffman
US Environmental Protection Agency (5304P)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

SUBJECT: Coal Combustion Residue Impoundment
Round 9 - Draft Dam Assessment Report
Limestone Electric Generating Station
DSDA & ST-18 Ponds
NRG Texas Power LLC
Comments on Draft Report

Dear Mr. Hoffman:

On May 5, 2011, United States Environmental Protection Agency (EPA) sent NRG Texas Power LLC (NRG) the above referenced draft report to review and provide comments. Comments are attached as a Microsoft Word document, utilizing track changes for suggested comments. In addition to the comments, NRG is submitting a Geotechnical Study, Hydrologic Study, Innundation Map, and photos demonstrating completion of a recommendation made as a result of the inspection. Due to the size of these documents, they are being sent to EPA and Dewberry & Davis LLC (Mr. Andrew Cueto) via UPS.

If you have questions regarding the submittal information, please contact Ted Long (713) 537-2149.

Sincerely,

Ted Long
Manager, Water Resources
NRG Texas Power LLC

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Coal Combustion Residue Impoundment
Round 9 - Dam Assessment Report

Limestone Generating Station
DSDA & ST-18 Ponds

NRG Texas Power LLC
Jewett, Texas

Prepared for:

United States Environmental Protection Agency
Office of Resource Conservation and Recovery

Prepared by:

Dewberry & Davis, LLC
Fairfax, Virginia

Under Contract Number: EP-09W001727
April 2011

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INTRODUCTION, SUMMARY CONCLUSIONS AND RECOMMENDATIONS

The release of over five million cubic yards of coal combustion waste from the Tennessee Valley Authority's Kingston, Tennessee facility in December 2008 flooded more than 300 acres of land, damaging homes and property. In response, the U.S. EPA is assessing the stability and functionality of coal combustion ash impoundments and other management units across the country and, as necessary, identifying any needed corrective measures.

This assessment of the stability and functionality of two Limestone Generating Station impoundment structures: the Dewatered Sludge Disposal Area (DSDA) pond and Secondary Dewatering Area pond (ST-18) Pond were based on a review of available documents and on the site assessment conducted by Dewberry personnel on Tuesday, February 22, 2011. We found the supporting technical documentation adequate (Section 1.1.3). As detailed in Section 1.2.5, there are three (3) recommendations based on field observations that may help to maintain a safe and trouble-free operation.

In summary, the Limestone Generating Station's DSDA and the ST-18 Ponds are rated **POOR** for continued safe and reliable operation. These ratings are based only on the lack of critical studies and investigations available to the assessors to determine the inundation potential of the dams and potential for dam safety deficiencies. For each of the ponds the following recent and current information, studies and analysis are needed: a breach analysis and inundation map including hydraulic and hydrological studies for each of the drainage areas. Upon receipt of data showing adequate hydraulic and structural soundness the rating can be changed to satisfactory.

Comment [N1]: NRG has submitted a slope stability study, hydrologic study, and inundation mapping to Dewberry on June 3, 2011 and to EPA. These studies are being sent on a CD via UPS.

PURPOSE AND SCOPE

The U.S. Environmental Protection Agency (EPA) is embarking on an initiative to investigate the potential for catastrophic failure of Coal Combustion Surface Impoundments (i.e., management unit) from occurring at electric utilities in an effort to protect lives and property from the consequences of a dam failure or the improper release of impounded slurry. The EPA initiative is intended to identify conditions that may adversely affect the structural stability and functionality of a management unit and its appurtenant structures (if present); to note the extent of deterioration (if present), status of maintenance and/or a need for immediate repair; to evaluate conformity with current design and construction practices; and to determine the hazard potential classification for units not currently classified by the management unit owner or by a state or federal agency. The initiative will address management units that are classified as having a Less-than-Low, Low, Significant or High Hazard Potential ranking. (For Classification, see pp. 3-8 of the 2004 Federal Guidelines for Dam Safety.)

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In early 2009, the EPA sent its first wave of letters to coal-fired electric utilities seeking information on the safety of surface impoundments and similar facilities that receive liquid-borne material that store or dispose of coal combustion residue. This letter was issued under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 104(e), to assist the Agency in assessing the structural stability and functionality of such management units, including which facilities should be visited to perform a safety assessment of the berms, dikes, and dams used in the construction of these impoundments.

EPA requested that utility companies identify all management units including surface impoundments or similar diked or bermed management units or management units designated as landfills that receive liquid-borne material used for the storage or disposal of residuals or by-products from the combustion of coal, including, but not limited to, fly ash, bottom ash, boiler slag, or flue gas emission control residuals. Utility companies provided information on the size, design, age and the amount of material placed in the units. The EPA used the information received from the utilities to determine preliminarily which management units had or potentially could have High Hazard Potential ranking.

The purpose of this report is **to evaluate the condition and potential of residue release from management units for hazard potential classification**. This evaluation included a site visit. Prior to conducting the site visit, a two-person team reviewed the information submitted to EPA, reviewed any relevant publicly available information from state or federal agencies regarding the unit hazard potential classification (if any) and accepted information provided in person and via telephone communication with the Management Units owner. Also, after the February 22, 2011 field visit, additional information was received on March 16, 2011 by Dewberry & Davis LLC about the Limestone Generating Station's DSDA and ST-18 Pond that was reviewed and used in preparation of this report.

Factors considered in determining the hazard potential classification of the management units included the age and size of the impoundment, the quantity of coal combustion residuals or by-products that were stored or disposed of in these impoundments, its past operating history, and its geographic location relative to down gradient population centers and/or sensitive environmental systems.

This report presents the opinion of the assessment team as to the potential of catastrophic failure and reports on the condition of the management unit(s).

LIMITATIONS

The assessment of dam safety reported herein is based on field observations and review of readily available information provided by the owner/operator of the subject coal combustion residue management unit(s). Qualified Dewberry engineering personnel performed the field observations and review and made the assessment in conformance with the required scope of work and in accordance with reasonable and acceptable engineering practices. No other warranty, either written or implied, is made with regard to our assessment of dam safety.

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APPENDIX A

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Doc 02:	Cross Sections
Doc 03:	Final Elevation Map
Doc 04:	Original Design Drawings
Doc 05:	Original Design Analysis
Doc 06:	Wastewater and Solid Waste Operations and Disposal Narrative
Doc 07:	Original Geologic and Hydrogeologic Assessments
Doc 08:	Monitoring Well Locations
Doc 09:	Original Design Specifications
Doc 10:	Impoundment Surveillance Procedure
Doc 11:	Emergency Action Plan
Doc 12:	5 Mile Adjacency Map

APPENDIX B

Doc 13:	Coal Combustion Dam Inspection Checklist Form

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1.0 CONCLUSIONS AND RECOMMENDATIONS

1.1 CONCLUSIONS

Conclusions are based on visual observations from a one-day site visit on February 22, 2011, and review of technical documentation provided by NRG Texas Power LLC.

1.1.1 Conclusions Regarding the Structural Soundness of the Management Unit(s)

The impoundment embankments appear to be structurally sound based on a review of the engineering data provided by the owner's technical staff and Dewberry engineers' observations during the site visit.

1.1.2 Conclusions Regarding the Hydrologic/Hydraulic Safety of the Management Unit(s)

No hydrologic or hydraulic analyses were provided to Dewberry. Therefore, no determination can be made regarding Hydrologic/Hydraulic Safety of the Management Units.

Comment [N2]: Study submitted to Dewberry/EPA on June 3, 2011.

1.1.3 Conclusions Regarding the Adequacy of Supporting Technical Documentation

The supporting technical documentation is adequate with the exception of a Hydrologic/Hydraulic safety assessment of the Management Units. Engineering documentation reviewed is referenced in Appendix A.

Comment [N3]: Study submitted to Dewberry/EPA on June 3, 2011.

1.1.4 Conclusions Regarding the Description of the Management Unit(s)

The description of the Management Units provided by the owner was an accurate representation of what Dewberry observed in the field.

1.1.5 Conclusions Regarding the Field Observations

Dewberry staff was provided access to all areas in the vicinity of the management units required to conduct a thorough field observation. The visible parts of the embankment dikes and outlet structure were observed to have no signs of overstress, significant settlement, shear failure, or other signs of instability. Embankments appear structurally sound. There are no apparent indications of unsafe conditions or conditions needing remedial action.

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1.1.6 Conclusions Regarding the Adequacy of Maintenance and Methods of Operation

The current maintenance and methods of operation appear to be adequate for the DSDA pond and the ST-18 pond. There was no evidence of significant embankment repairs or prior releases observed during the field inspection. However, there was extensive brushy vegetation and trees on the ST-18 pond embankments. Trees and brushy vegetation should be cleared, although remaining stumps and root balls may become an issue once deterioration begins.

Comment [N4]: Brush and trees have been cleared, photo attached.

1.1.7 Conclusions Regarding the Adequacy of the Surveillance and Monitoring Program

The surveillance program appears to be adequate. Groundwater monitoring wells were installed in 1988. MW-6 was installed down-gradient of the DSDA and MW-4 down-gradient of the ST-18 pond. Semi-annual samplings are conducted by taking static water level measurements and groundwater samples.

1.1.8 Classification Regarding Suitability for Continued Safe and Reliable Operation

The facility is satisfactory with the exception of providing a Breach Analysis and Inundation Map including a Hydraulic and Hydrologic analysis. Therefore, the Management Units is rated **POOR** for continued safe and reliable operation until the receipt of the deficient documentation.

Comment [N5]: Study submitted to Dewberry/EPA on June 3, 2011.

1.2 RECOMMENDATIONS

1.2.1 Recommendations Regarding the Hydrologic/Hydraulic Safety

It is recommended that the operator conduct a Hydraulic and Hydrologic study that would include a Breach Analysis and Inundation Map.

1.2.2 Recommendations Regarding the Maintenance and Methods of Operation

The following recommendations are warranted:

1. Clear brushy vegetation and trees from ST-18 pond's outer embankment.

~~1.~~2. Observe remaining tree stumps and root balls for deterioration.

Comment [N6]: Brush and trees have been cleared, photo attached.

Comment [N7]: Observations on pond/embankment are made on routine inspections. Deficiencies are corrected in a timely fashion.

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~~1.~~3. Excavate deteriorated organic matter, fill and compact as needed with select material with high Bentonite content.

Comment [N8]: NRG is not clear on this recommendation. There did not appear to be deteriorated organic material on the sides of either pond.

1.2.3 Recommendations Regarding the Surveillance and Monitoring Program

It is recommended that a document outlining maintenance and operations procedures be developed. Also note the recommendations in Section 1.2.6.

Comment [N9]: There is not a Section 1.2.6. A manual will be created. The elements of the manual, inspection procedures, emergency action plan, etc. are developed, but we will combine the information into one document.

1.2.4 Recommendations Regarding Continued Safe and Reliable Operation

No recommendations appear warranted at this time, other than the actions cited above.

1.3 PARTICIPANTS AND ACKNOWLEDGEMENT

1.3.1 List of Participants

Ted Long, NRG ~~Energy Corporation~~
David Burton, NRG ~~Limestone Engineering Manager~~
Bob Eyeington, NRG ~~Limestone~~
Gary Mechler, NRG ~~Limestone~~

Chris ~~Vasquel~~Vasquez, NRG
Bill Odom, NRG
Charles Little, NRG
Jeffery Davis, NRG
Kyle Shepard, P.E., PSA-Dewberry Inc.
Andrew Cueto, P.E., Dewberry

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1.3.2 Acknowledgement and Signature

I acknowledge that the Management Units referenced herein have been assessed on February 22, 2011.

_____

Andrew Cueto, P.E., PMP
TX PE # 68920

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2.0 DESCRIPTION OF THE COAL COMBUSTION RESIDUE MANAGEMENT UNIT(S)

2.1 LOCATION AND GENERAL DESCRIPTION

The Limestone Generating Station is located in Limestone and Freestone Counties, northwest of Jewett, Texas. The plant is operated by NRG Texas Power LLC. The ST-18 and Dewatered Sludge Disposal Areas are located directly east of the generating station. An aerial photograph of the impoundments is provided in Appendix A – Doc 01.

The plant property covers a total of approximately 3,800 acres and includes a main plant yard and a materials handling area. The main plant yard includes two generating units, a switch yard, a ~~lignite~~ coal storage yard, two cooling towers, an FGD system, a bottom ash cooling pond, an ash handling area, and several wastewater treatment systems. The material handling area includes the solid waste disposal area active landfill, bottom ash and FGD processing areas, and several clay-lined runoff/sedimentation ponds. Two ponds receive CCR byproducts: DSDA and ST-18. Note the ponds are not used for CCR disposal, but the CCR is added for ~~water treatment due to its high pH~~for stabilization of FGD wastewater in one pond, and is a runoff contaminant in the other, as described below.

Limestone Generating Station adds a fly ash product to the DSDA pond to stabilize ~~high chloride~~FGD wastewater from the ~~cooling tower~~FGD blowdown. ~~Fly ash is introduced into the wastewater to bind up the waste into a stable sludge.~~ The sludge is then windrowed and dewatered via evaporation and absorption. Once ~~water content drops below 25%, the sludge~~the mixture is stabilized and would pass a paint-filter test, the sludge is transported to the solid waste disposal area. Sludge removal and disposal is performed about ~~twice~~ 2 to 4 times per year.

ST-18 receives CCR byproducts as a result of stormwater runoff from a transfer station concrete hardstand. Fly ash is pneumatically conveyed to ~~the hardstand~~silos ~~to be loaded via frontend loaders into trucks~~ and then either transported dry for beneficial reuse or ~~disposed~~ processing with FGD sludge ~~of~~ in the solid waste disposal area. The processed mixture is conveyed to a hardstand and loaded into trucks with a front end loader to be taken to the landfill. Stormwater runoff washes some of the CCR into the detention basin during an event. The CCR settles and the supernatant is decanted ~~off to the wastewater processing plant~~for reuse in the FGD system. The pond is primarily dry and cleaned out when needed, at least once per year, via a ~~bobcat~~backhoe and dump trucks. Sludge is transported dry to the solid waste disposal area.

The DSDA pond has a random fill (unclassified material) embankment that impounds flue gas desulfurization sludge, a fly ash product, ~~cooling tower sludge,~~ and stormwater pond sludge. It was designed on July 10, 1985 and constructed

shortly thereafter in December 1985 as noted in Document 04 of Appendix A. The ST-18 pond has a random fill (unclassified material) embankment. It was designed on April 26, 1982 and constructed shortly thereafter in December 1982 as noted in Document 04 of Appendix A.

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The table below provides the dimensions of the embankments:

Table 2.1: Summary of Dam Dimensions and Size		
	DSDA	**ST-18**
Dam Height (ft)	24 feet	24 feet
Crest Width (ft)	21 feet	22 feet
Length (ft)	1730 feet	500 feet
Side Slopes (upstream) H:V	3 : 1	3 : 1
Side Slopes (downstream) H:V	3 : 1	3 : 1

2.2 COAL COMBUSTION RESIDUE HANDLING

2.2.1 Fly Ash

The Fly Ash disposal process is a dry train procedure.

1. The fly ash is pneumatically conveyed to ~~a hardstand~~silos,

~~1.~~2. The ash is then picked up via truck (third party) to be transported offsite for beneficial use or to the generating station's ~~landfill~~ FGD waste processing area, located in the northeast quadrant of the facility.

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2.2.2 Bottom Ash

The Bottom Ash disposal process is a wet train procedure.

1. The bottom ash is wet conveyed via conduit to conical dewatering units.

~~1.~~2. The bottom ash is then sold for beneficial use and picked up via truck and transported offsite.

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~~1.~~3. The bottom ash that remains is loaded into trucks (third party) for transport to the generating station's landfill.

2.2.3 Boiler Slag

Comment [N10]: Limestone does not have a "boiler slag" waste stream. Waste products from combustion are either bottom ash or fly ash. This section can be deleted.

The Boiler Slag disposal process is a wet train procedure.

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1. The boiler slag is wet conveyed via conduit to conical dewatering units.

~~1.~~2. The slag is then sold for beneficial use and picked up via truck and transported offsite.

~~1.~~3. The slag that remains is loaded into trucks (third party) for transport to the generating station's landfill.

2.2.4 Flue Gas Desulfurization Sludge

The Flue Gas Desulfurization (FGD) Sludge disposal process is a wet train procedure.

1. The FGD sludge is wet conveyed to a belt press and centrifuge dewatering units.

~~1.~~2. The sludge is then sold as gypsum for beneficial uses, being transported offsite via truck,

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2.3 SIZE AND HAZARD CLASSIFICATION

The classification for size, based on the height of the dam ~~is~~ is less than "Small" and based on the storage capacity is also less than "Small" in accordance with the USACE Recommended Guidelines for Safety Inspection of Dams ER 1110-2-106 criteria summarized in Table 2.2a.

Table 2.2a: USACE ER 1110-2-106 Size Classification

Category	Impoundment	
	Storage (Ac-ft)	**Height (ft)**
Small	50 and < 1,000	25 and < 40
Intermediate	1,000 and < 50,000	40 and < 100
Large	> 50,000	> 100

The State of Texas maintains a Dam Safety program through the Texas Commission on Environmental Quality. Neither of the embankments for the DSDA nor the ST-18 at the NRG Texas Power LLC Limestone Generating Station are on the National Inventory of Dams, and based on their size, were not required to be registered. ~~and t~~Therefore, there is ~~do~~ not ~~have~~ an established hazard classification.~~.~~

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Dewberry conducted a qualitative hazard classification based on the 2004 Federal Guidelines for Dam Safety classification system (shown in Table 2.2b).

Table 2.2b: FEMA Federal Guidelines for Dam Safety Hazard Classification		
	Loss of Human Life	**Economic, Environmental, Lifeline Losses**
Low	None Expected	Low and generally limited to owner
Significant	None Expected	Yes
High	Probable. One or more expected	Yes (but not necessary for classification)

Loss of human life is not probable in the event of a catastrophic failure of the embankment; a failure of the embankment is expected to have a low economic and environmental impact. Therefore, Dewberry evaluated both impoundments as "**low hazard potential**."

2.4 AMOUNT AND TYPE OF RESIDUALS CURRENTLY CONTAINED IN THE UNIT(S) AND MAXIMUM CAPACITY

The data reviewed by Dewberry did not include the volume of residuals stored in the DSDA or the ST-18 at the time of inspection.

Table 2.3: Maximum Capacity of Unit		
	DSDA	**ST-18**
Surface Area (acre)[1]	3.96	0.92
Current Storage Capacity (cubic yards)[1]	N/A *	N/A *
Current Storage Capacity (acre-feet)	N/A *	N/A *
Total Storage Capacity (cubic yards)[1]	1,057,300	369,000
Total Storage Capacity (acre-feet)	24.3	8.5
Crest Elevation (feet)	483.41 (measured)	438.00 (design)
Normal Pond Level (feet)	478.00 (measured)	433.00 (measured)

* *Each unit is cleaned out of CCR sludge periodically. Units are not used as storage units but rather as process units.*

2.5 PRINCIPAL PROJECT STRUCTURES – DEWATERED SLUDGE DISPOSAL AREA

2.5.1 Earth Embankment

Embankment is earthen filled with random fill (unclassified) with a 3-foot layer of clay compacted to 95% standard proctor on the upstream slope of the impoundment. Approximate crest width is 15 feet. Approximate embankment height is 13 feet.

2.5.2 Outlet Structure

Water generated by the DSDA is contained within the embankment boundaries. It has no outlet. DSDA water is stored until it evaporates from this pond.

2.6 PRINCIPAL PROJECT STRUCTURES – ST-18

2.6.1 Earth Embankment

Embankment is earthen filled with random fill (unclassified) with a 3-foot layer of clay compacted to 95% standard proctor on the upstream slope of the impoundment. Approximate crest width is 15 feet. Approximate embankment height is 13 feet.

2.6.2 Outlet Structure

The water level in the ST-18 is controlled by sump pumps that can be either automatically or manually operated. The utility provided a Standard Operating Procedure Manual for the ST-18 Pond operations for review.

2.7 CRITICAL INFRASTRUCTURE WITHIN FIVE MILES DOWN GRADIENT

The NRG Texas Power LLC Limestone Generating Station is located upstream of the Lambs Creek arm of Lake Limestone. Lake Limestone is a Brazos River Authority reservoir that is primarily fed by the Navasota River. The DSDA and ST-18 are off channel impoundments from Lynn Creek which outfalls to Lambs Creek. Regional maps provided by NRG Texas Power LLC shows a number of petroleum or natural gas well sites downstream as well as an impoundment for the Texas Westmoreland Coal Company Jewett Mine, but there do not appear to be any

inhabited structures between the impoundments and Lake Limestone. Lake Limestone falls within the 5-mile downstream gradient.

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3.0 SUMMARY OF RELEVANT REPORTS, PERMITS, AND INCIDENTS

Summary of Reports on the Safety of the Management Units

- Field Evaluation of the Co-management of Utility Low-Volume Wastes with High-Volume Coal Combustion By-Products: LS Site, TR 108422, WO 4147 and 9055, Final Report, August 1997, Prepared By: GEI Consultants, Inc. and Battelle Pacific Northwest National Laboratories.
- TCEQ Exit Interview Form: Potential Violations and/or Records Requested, December 7, 2010, Prepared By: Texas Commission on Environmental Quality.
- Work Scope and Schedule for Geotechnical Investigations and Hydrologic Analysis, DSDA and ST-18 Ponds, March 8, 2011, Prepared By: Tolunay-Wong Engineers, Inc – for future Hydraulic and Hydrologic and Breach Analysis including an inundation map.

3.1 SUMMARY OF LOCAL, STATE, AND FEDERAL ENVIRONMENTAL PERMITS

While the State of Texas has a Dam Safety Program that is the responsibility of the Texas Commission on Environmental Quality (TCEQ), this embankment is not permitted by the TCEQ.

Stormwater discharges from the DSDA and the ST-18 ponds are regulated by the TCEQ. These are covered under TCEQ Permit Number TXR05V737. The impoundment has been issued a National Pollutant Discharge Elimination System Permit, TPDES Permit No. 02430, and has been issued an EPA I.D., No. TX0082651.

3.2 SUMMARY OF SPILL/RELEASE INCIDENTS

Data reviewed by Dewberry did not indicate any spills, unpermitted releases, or other performance related problems with the dam over the last 10 years.

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4.0 SUMMARY OF HISTORY OF CONSTRUCTION AND OPERATION

4.1 SUMMARY OF CONSTRUCTION HISTORY

4.1.1 Original Construction

The Limestone Generating Station DSDA was constructed in 1985. The original design did not include an overflow structure.

The Limestone Generating Station ST-18 was constructed in 1982. The original crest elevation was 438.00. (See Appendix A – Doc 04).

4.1.2 Significant Changes/Modifications in Design since Original Construction

DSDA - A number of changes have occurred to this impoundment since it was designed on July 10, 1985.

- The maximum impoundment capacity has been reduced from 29.0 acre-feet to 24.3 acre-feet.
- The minimum freeboard elevation has been reduced from 483.50 to 481.00.
- The minimum dam crest elevation has been reduced from 485.50 to 483.41.
- The minimum crest width has been increased from 15.00 feet to 21.00 feet.
- The average crest width has been increased from 15.00 feet to 22.50 feet.

ST-18 - A number of changes have occurred to this impoundment since it was designed on April 26, 1982.

- The minimum freeboard elevation has been increased from 438.00 to 441.00.
- The maximum dam height has been increased from 15.00 feet to 24.00 feet.
- The minimum dam crest elevation has been increased from 440.00 to 443.00.

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- The minimum crest width has been increased from 12.8 feet to 22 feet.
- The average crest width has been increased from 15 feet to 26 feet.
- The emergency spillway shown on the design drawings has been eliminated. No overflow structure exists for this embankment.

4.1.3 Significant Repairs/Rehabilitation since Original Construction

No information was provided by the utility that described repairs or rehabilitation completed since the original construction.

4.2 SUMMARY OF OPERATIONAL PROCEDURES

4.2.1 Original Operational Procedures

DSDA - NRG Texas Power LLC provided documents describing the operation of the DSDA. (See Appendix A – Doc 05 and Doc 06.)

ST-18 - NRG Texas Power LLC provided documents describing the operation of the ST-18. (See Appendix A – Doc 05 and Doc 06.)

4.2.2 Significant Changes in Operational Procedures and Original Startup

No documents were provided by the utility to indicate any operational procedures have been changed.

4.2.3 Current Operational Procedures

Current operational process and procedures are described in the documents referenced in Section 4.2.1.

4.2.4 Other Notable Events since Original Startup

No additional information was provided to Dewberry of other notable events that have impacted either impoundment's operations.

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5.0 FIELD OBSERVATIONS

5.1 PROJECT OVERVIEW AND SIGNIFICANT FINDINGS

Dewberry personnel Andrew Cueto, P.E. and Kyle Shepard, P.E. performed a site visit on Tuesday, February 22, 2011 in company with the participants.

The site visit began at 8:30 AM. The weather was partly sunny and cool. Photographs were taken of conditions observed. Please refer to the Dam Inspection Checklist in Appendix B for additional information obtained during the site visit. Selected photographs are included here for ease of visual reference. All pictures were taken by Dewberry personnel during the site visit.

The overall assessment of the embankments was that both were in satisfactory condition and no significant findings were noted.

5.2 DSDA EMBANKMENT

5.2.1 Crest

The embankments' crests showed no signs of depressions, tension cracks, or other indications of settlement or shear failure, and appeared to be in satisfactory condition. Vegetation, for the most part, was not present due to high amount of vehicular traffic (sludge haul trucks and process equipment). Figure 5.2.1-1 shows the typical conditions of the embankments crests.

Figure 5.2.1-1 Photo showing the lack of vegetation on the crest of the embankment.

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5.2.2 Upstream/Inside Slope

The impoundment's inside slope is generally bare earth, with the exception of a small corner of the east cell. Figures 5.2.2-1 and 5.2.2-2 show examples of these areas.

Figure 5.2.2-1. Inside slope bare earth.

Figure 5.2.2-2. Sporadic area of vegetation on an inside slope.

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5.2.3 Downstream/Outside Slope and Toe

There were no observed scarps, sloughs, bulging, cracks, or depressions indicating slope instability or signs of erosion. The outside slope of this impoundment was uniformly graded and covered with mowed grass. The outside slope and toe appear to be in satisfactory condition. Figure 5.2.3-1 shows the general condition of the outside slope and toe.

Figure 5.2.3-1 Outside slope condition.

5.2.4 Abutments and Groin Areas

There were no observed abutments or groins for this area.

5.3 ST-18 EMBANKMENT

5.3.1 Crest

The crest of the ST-18 embankment showed no signs of depressions, tension cracks, or other indications of settlement or shear failure, and appeared to be in satisfactory condition. Vegetation was not present. Figure 5.3.1-1 shows the conditions of the embankment's crest on the west side.

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Figure 5.3.1-1 Crest condition on the west side of the embankment.

5.3.2 Upstream/Inside Slope

The embankment's inside slope is generally clear of any vegetation, with the exception of around the inlet pipe. Figure 5.3.1-1 shows the inside slope condition.

Figure 5.3.1-1. Figure showing the embankment's inside slope condition.

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5.3.3 Downstream/Outside Slope and Toe

There were no observed scarps, sloughs, bulging, cracks, or depressions indicating slope instability or signs of erosion. While the outside slope of the embankment was uniformly graded, it was covered with various forms of vegetation including heavy woody brush and trees. Figure 5.3.3-1 shows the general condition of the outside slope and toe of the embankment.

Figure 5.3.3-1 Photo shows the general condition of the embankment's outside slope and toe.

5.3.4 Abutments and Groin Areas

There were no observed scarps, sloughs, bulging, cracks, or depressions indicating slope instability or signs of erosion. While the groin area of the embankment was uniformly graded and transitioned smoothly into the slope, it was covered with grassy vegetation. Figure 5.3.4-1 shows the general condition of the groin areas of the embankment.

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Figure 5.3.4-1 General condition of the embankment in groin area.

5.4 DSDA OUTLET STRUCTURE

5.4.1 DSDA Overflow Structure

The DSDA does not have an overflow structure.

5.4.2 Outlet Conduit

The outlet pipe shown in the original design drawings appears to have been removed. No outlet pipe was observed during Dewberry's inspection.

5.4.3 Emergency Spillway

The DSDA does not have an emergency spillway.

5.4.4 Low Level Outlet

No low level outlet is present.

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5.5 ST-18 OUTLET STRUCTURE

5.5.1 ST-18 Overflow Structure

ST-18 does not have an overflow structure.

5.5.2 Outlet Conduit

The level of ST-18 is controlled through the operation of sump pumps. Water is discharged into the plant's wastewater system. There were no observed cracks or depressions indicating concrete instability or signs of failure. Figure 5.5.2-1 shows the general condition of the ST-18 Outlet Structure.

Figure 5.5.2-1 General condition of the ST-18 Outlet Structure

5.5.3 Emergency Spillway

ST-18 does not have an emergency spillway.

5.5.4 Low Level Outlet

No low level outlet is present.

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6.0 HYDROLOGIC/HYDRAULIC SAFETY

6.1 SUPPORTING TECHNICAL DOCUMENTATION

6.1.1 Flood of Record

DSDA (DSDA). The historical maximum pond elevation provided by the utility was 19.00 feet (date not noted).

ST-18. The historical maximum pond elevation provided by the utility was 8.00 feet (date not noted).

6.1.2 Inflow Design Flood

No documentation has been provided for either impoundment.

6.1.3 Spillway Rating

Not applicable. Neither impoundment has a spillway.

6.1.4 Downstream Flood Analysis

No downstream flood analysis data was provided for review.

6.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Little documentation has been provided. Therefore, the supporting documentation reviewed by Dewberry is inadequate.

6.3 ASSESSMENT OF HYDROLOGIC/HYDRAULIC SAFETY

No documentation has been provided. Therefore, no assessment can be made.

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7.0 STRUCTURAL STABILITY

7.1 SUPPORTING TECHNICAL DOCUMENTATION

7.1.1 Stability Analyses and Load Cases Analyzed

Original stability and load case design analyses were not provided by the utility. In March 2011 ~~AEP~~ NRG awarded a Slope Stability Analysis and Hydrologic Analysis contract to Tolunay-Wong Engineers, Inc. for the two ponds.

7.1.2 Design Parameters and Dam Materials

Documentation provided to Dewberry for review included the following documents for the DSDA:

- EBASCO Design Assumptions (Appendix A – Doc 05)
- EBASCO Civil Design Criteria, CDC-2, Site Investigations, Excavation, and Foundation Design Parameters (Appendix A – Doc 09)

Documentation was not provided by the utility for the ST-18.

7.1.3 Uplift and/or Phreatic Surface Assumptions

No documentation of uplift calculations was provided to Dewberry for review. Based on the geotechnical borings (See Appendix A – Doc 07) the initial phreatic surface was assumed to be at the elevation measured in the borings.

7.1.4 Factors of Safety and Base Stresses

No documentation of slope stability safety factors were provided to Dewberry for review.

7.1.5 Liquefaction Potential

The documentation reviewed by Dewberry did not include an evaluation of liquefaction potential. Foundation soil conditions do not appear to be susceptible to liquefaction.

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7.1.6 Critical Geological Conditions

A report (Appendix A - Doc 07) prepared by Espey, Huston & Associates, Inc. in May 1986 assessed the geologic and hydrogeologic conditions of the proposed Limestone Generating Station site. This assessment was provided for review by the utility.

7.2 ADEQUACY OF SUPPORTING TECHNICAL DOCUMENTATION

Structural stability documentation is inadequate.

7.3 ASSESSMENT OF STRUCTURAL STABILITY

Visually the structural stability of both embankments appear to be satisfactory based on the following observations made during the February 22, 2010 field visit by Dewberry:

- The crest appeared free of depressions and no significant vertical or horizontal alignment variations were observed,
- There were no major scarps, sloughs, or bulging along the embankments, and
- Boils, sinks, or uncontrolled seepage were not observed along the slopes, groins, or toes of the embankments.

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8.0 ADEQUACY OF MAINTENANCE AND METHODS OF OPERATION

8.1 OPERATING PROCEDURES

8.1.1 *DSDA*

The facility is operated as a sludge disposal area with two cells. ~~Fly~~ A fly ash product~~, bottom ash, pyrites,~~ and flue gas desulfurization sludges are ~~pneumatically or~~ hydraulically conveyed to the basins for disposal. Sludge is stored until moisture evaporates and the sludge hardens. Once the disposal cells are filled, they are cleaned out and solids are hauled to the landfill and new cells are opened for processing.

8.1.2 *ST-18*

This facility is operated as a stormwater collection basin. Once the pond level exceeds 2 feet, sump pumps are activated manually or automatically to lower the water level in the pond. Solids are dewatered via evaporation and then hauled to the landfill.

8.2 MAINTENANCE OF THE DAM AND PROJECT FACILITIES

While no maintenance plan was supplied to Dewberry for review, based upon observations made during the February 22, 2010 site visit and discussions with plant representatives, embankment maintenance for both impoundments appears to be adequate.

8.3 ASSESSMENT OF MAINTENANCE AND METHODS OF OPERATIONS

8.3.1 Adequacy of Operating Procedures

Operational procedures were supplied to Dewberry for review for both impoundments (Appendix A – Doc 06). These procedures were found to be adequate.

8.3.2 Adequacy of Maintenance

No record of maintenance was supplied to Dewberry for review. However, a verbal description of maintenance procedures and methods were presented at the time of inspection. It was observed that the existing operating procedures adequately maintain the management units. It was recommended that these procedures be documented and put into checklists.

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9.0 ADEQUACY OF SURVEILLANCE AND MONITORING PROGRAM

9.1 SURVEILLANCE PROCEDURES

Emergency Action Plan

NRG Texas Power LLC provided a written Emergency Action Plan for Extended Rainfall Events and Impoundment Failure that applies to the DSDA and the ST-18 (Appendix A – Doc 11). The impoundment embankments are visually inspected following any rainfall event greater than ½ inch or a minimum of once a week for signs of wind or water erosion (Appendix A – Doc 10).

9.2 INSTRUMENTATION MONITORING

The Limestone Generating Station DSDA and the ST-18 embankments each have a monitoring well downstream. Water level measurements are collected semi-annually.

9.3 ASSESSMENT OF SURVEILLANCE AND MONITORING PROGRAM

9.3.1 Adequacy of Inspection Program

Based on the data reviewed by Dewberry, including observations during the site visit, the inspection program is adequate.

9.3.2 Adequacy of Instrumentation Monitoring Program

Based on the data reviewed by Dewberry, including observations during the site visit, the instrumentation monitoring program appears to be adequate.

PAPE-DAWSON ENGINEERS

NRG ENERGY, INC

LIMESTONE ELECTRIC GENERATING STATION

LIMESTONE COUNTY, TEXAS

HYDROLOGIC ANALYSIS FOR DSDA POND AND ST-18 POND

May 2011

NRG ENERGY, INC

LIMESTONE ELECTRIC GENERATING STATION

LIMESTONE COUNTY, TEXAS

HYDROLOGIC ANALYSIS FOR DSDA POND AND ST-18 POND

STATE OF TEXAS
ROBERT M. PREISS
92978
LICENSED
PROFESSIONAL ENGINEER

May 2011

5.4.11

Texas Board of Professional Engineers, Firm Registration # 470

PAPE-DAWSON ENGINEERS

INTRODUCTION

Pape-Dawson Engineers, Inc. was contracted to conduct a hydrologic analysis of the Dewatered Sludge Solids Waste Disposal Area (DSDA) and ST-18 ponds within the Limestone Electric Generating Station located in Limestone County near Jewett, Texas. Mr. Chris Vasquez with NRG Energy, Inc. provided direction to evaluate the capacity of each pond for potential bank overtopping during a 100-yr (1% exceedence probability) and 25-yr (4% exceedence probability) storm event. More specifically, NRG requested that Pape-Dawson evaluate the ability of a 2-foot freeboard within the DSDA pond to contain the 100-yr and 25-yr storm events without overtopping the top of bank and to determine whether the ST-18 pond has sufficient capacity to retain a 100-yr and 25-yr storm event while maintaining the same 2-feet of freeboard. The analysis was prepared using information provided by the Client; namely, electronic topographic maps of current site conditions and the existing site plans prepared by EBASCO Services Incorporated, dated April 26, 1982. The assumptions, constraints and results of each pond has been outlined and detailed below.

DSDA POND ANALYSIS

According to information provided by the Client, we understand that the DSDA pond is an impoundment facility for sludge materials consisting of fly ash, bottom ash, boiler slag and/or flue gas emission control residuals. The sludge material is retained within the DSDA pond until it is stabilized into a product suitable for land fill disposal. The pond is not hydraulically connected to any adjacent system; therefore the pond does not receive storm water runoff other than direct rainfall accumulation and surface water runoff from the perimeter maintenance berm. According to the topographic data provided by the Client, a minimum top of bank elevation of 483.41-feet is located at the northwest corner of the facility. The existing total depth of the pond is approximately 12-feet, measured from the minimum top of bank elevation to the bottom of the pond.

According to the rainfall depths vs. frequency values for Texas Counties (NWS TP-40), the total depth of rainfall for the 100-yr and 25-yr 24-hour rainfall events for Limestone County are

10.58-inches and 8.01-inches, respectively. According to the topographic information supplied, the drainage area contributing to the DSDA pond is approximately 4.23-acres. The total volume of runoff the DSDA pond is receiving as a result of direct rainfall accumulation assuming an effective impervious cover of 100% (wet pond) is summarized in the following table:

Storm Frequency	Total Rainfall (Inches)	Drainage Area (Acres)	Total Volume (Acre-foot)
25-yr (4%)	8.01	4.23	2.82
100-yr (1%)	10.58	4.23	3.73

The capacity of the DSDA pond is summarized in the following table and is based upon topographic information provided by NRG Energy, Inc. dated April 14, 2011.

DSDA Pond Capacity			
WS Elev	Volume[1] Cubic Feet	Volume[1] Acre-foot	
471.50	0	0.00	◀Bottom of Pond
472.00	7,572	0.17	
473.00	72,934	1.67	
474.00	167,075	3.84	
475.00	270,159	6.20	
476.00	380,418	8.73	
477.00	497,712	11.43	
478.00	622,269	14.29	
479.00	754,326	17.32	
480.00	894,117	20.53	
481.00	1,043,745	23.96	
481.41	1,109,121	25.46	◀Storage at 2-foot of freeboard
482.00	1,205,172	27.67	
482.16	*1,231,877*	*28.28*	◀*WSE 25-yr event*
482.39	*1,271,516*	*29.19*	◀*WSE 100-yr event*
483.00	1,373,820	31.54	
483.41	1,445,036	33.17	◀Minimum Top of Bank Elevation

1. The volumes were obtained by evaluating the existing topographic information and performing surface volume calculations utilizing surface modeling software by Autodesk's Land Development Software.

The DSDA pond has a total storage capacity of 33.17 acre-feet. However the effective storage capacity of the pond is 25.46 acre-feet if the pond is operated to maintain 2-feet of freeboard from the minimum top of bank elevation. This provides 7.71 acre-feet of storage in the freeboard area, which is equivalent to over two times the volume of runoff from a 100-yr, 24-hour rainfall storm event.

ST-18 POND ANALYSIS

The ST-18 pond is a storm water runoff pond collecting runoff from the Secondary Dewatering and Waste Holding System area. An underground storm water collection system conveys storm water runoff to the pond from an approximately 6.40-acre area within the Secondary Dewatering Waste Holding area. The surface area of the pond is approximately 1.92-acres; therefore the total contributing area the pond is receiving storm water from is approximately 8.32-acres. According to information provided by the Client, a minimum top of bank elevation of 443.00-feet is located at the western portion of the facility. The existing depth of the pond is approximately 19-feet, measured from the minimum top of bank to the bottom of the pond.

The total volume of runoff the ST-18 pond receives as a result of runoff from the Secondary Dewatering Waste Holding area, direct rainfall accumulation from the pond surface and runoff from the perimeter maintenance berm is summarized in the following table (conservatively assuming an effective impervious cover of 100% for the hard packed ground and wet pond):

Storm Frequency	Total Rainfall (Inches)	Drainage Area (Acres)	Total Volume (Acre-foot)
25-yr (4%)	8.01	8.32	5.56
100-yr (1%)	10.58	8.32	7.34

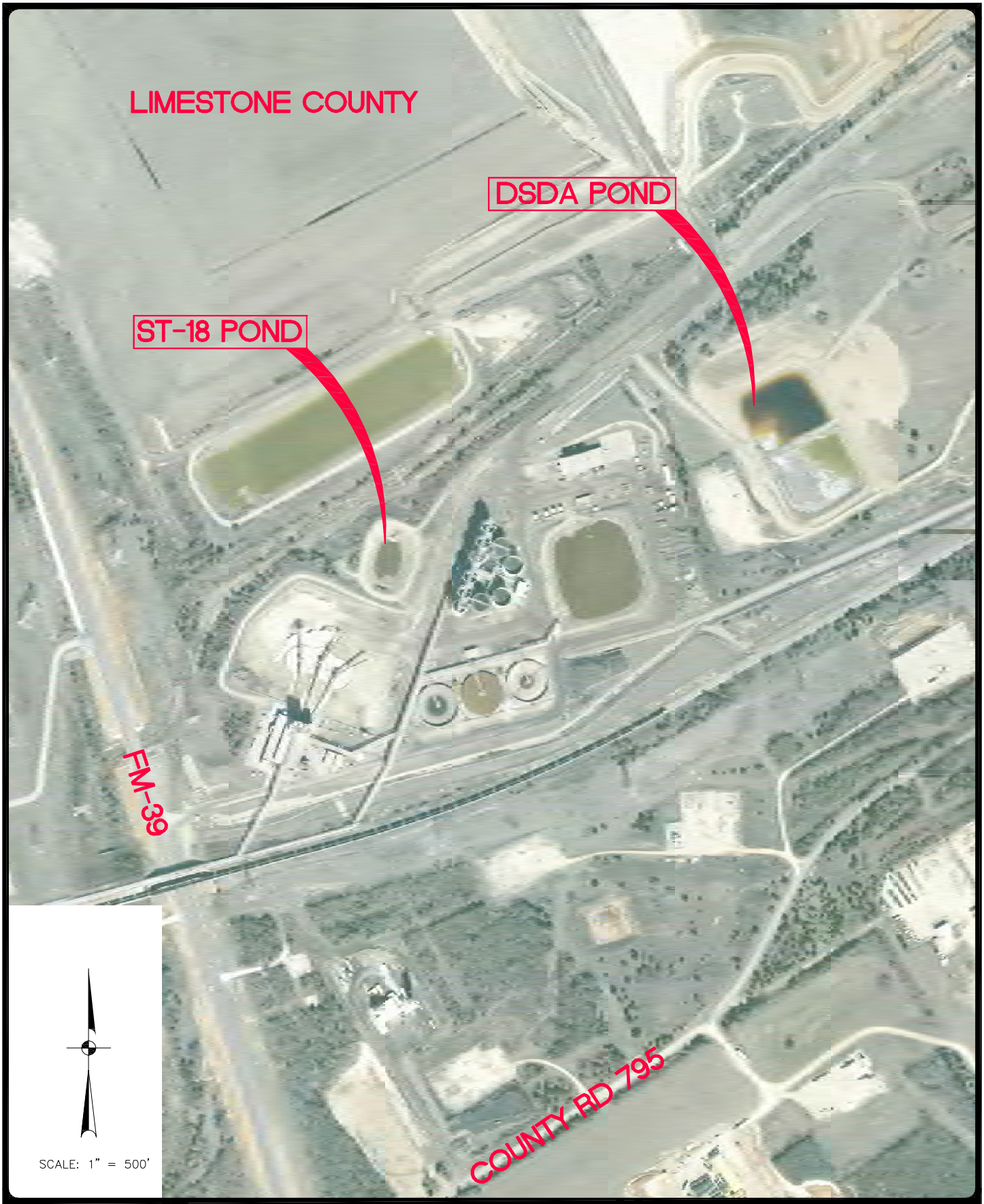
The ST-18 pond capacity is summarized in following table based on topographic information provided by NRG Energy, Inc., April 14, 2011.

ST-18 Pond Capacity			
	Volume		
WS Elev	Cubic Feet	Acre-foot	
424.00	0	0.00	◀Bottom of Pond
425.00	635	0.01	
426.00	3,209	0.07	
427.00	7,683	0.18	
428.00	13,656	0.31	
429.00	21,336	0.49	
430.00	30,918	0.71	
431.00	42,398	0.97	
432.00	55,848	1.28	
433.00	71,378	1.64	
434.00	89,060	2.04	
435.00	108,834	2.50	
436.00	130,684	3.00	
437.00	154,469	3.55	
438.00	180,116	4.13	
439.00	207,715	4.77	
440.00	237,343	5.45	
440.15	*242,194*	*5.56*	◀*WSE 25-yr Event (retained, no pumps)*
441.00	269,077	6.18	◀Storage at 2-foot of freeboard
442.00	302,983	6.96	
442.46	*319,730*	*7.34*	◀*WSE 100-yr Event (retained, no pumps)*
443.00	339,166	7.79	◀Minimum Top of Bank Elevation

1. The volumes were obtained by evaluating the existing topographic information and performing surface volume calculations utilizing surface modeling software by Autodesk's Land Development Software.

The ST-18 pond has a total storage capacity of 7.79 acre-feet. The total runoff volume the pond receives during a 100-yr and 25-yr 24-hr rainfall event is 7.34 acre-feet and 5.56 acre-feet, respectively, resulting in approximately 0.45 acre-feet of available storage prior to the pond being overtopped. However, in order for the pond to maintain 2-feet of freeboard from the minimum top of bank elevation, the effective storage of the pond is then reduced to 6.18 acre-feet. The pond is equipped with two (2) 250-gpm pumps to drain the pond. Therefore during the course of a 100-yr storm event both pumps will need to operate for at least twelve and a half (12.5) hours to maintain the minimum 2-feet of freeboard.

EXHIBITS



JOB NO. 40010-00

DATE APRIL 2011

DESIGNER CNH

CHECKED RMP DRAWN ARH

SHEET 1

NRG ENERGY, INC.

LOCATION MAP

LIMESTONE COUNTY, TEXAS

PAPE-DAWSON ENGINEERS

10333 RICHMOND AVE SUITE 900 | HOUSTON, TEXAS 77042 | PHONE: 713.428.2400 FAX: 713.428.2420

TEXAS BOARD OF PROFESSIONAL ENGINEERS, FIRM REGISTRATION # 470

Date: May 04, 2011, 9:22am User ID: CHarris
File: K:\projects\400\NRG-Hdro-Data\TIN Complete.DWG

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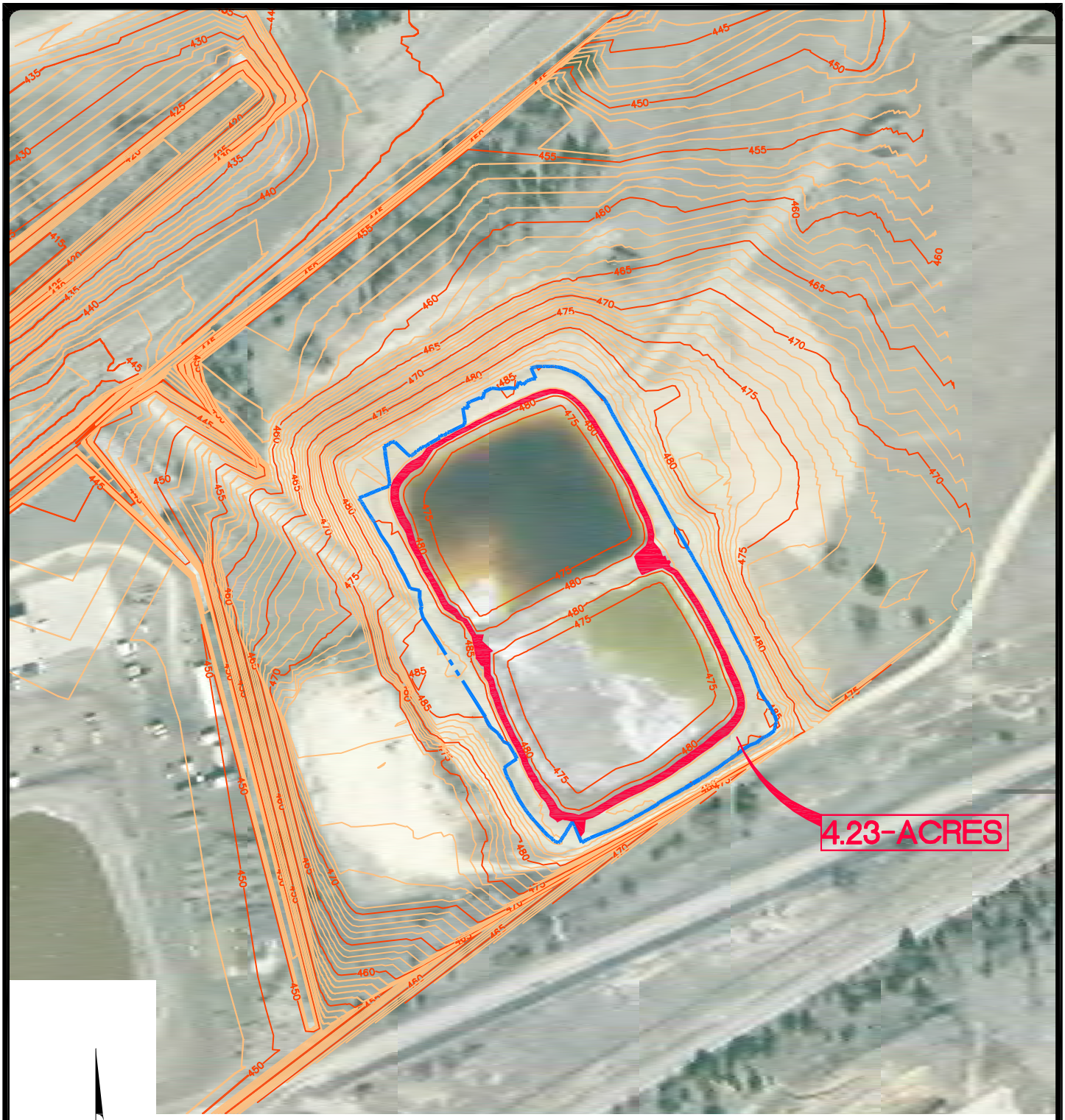

SCALE: 1" = 200'

LEGEND

- DELINEATED DRAINAGE AREA
- EXISTING CONTOURS (1' ELEV.)
- 480 EXISTING CONTOURS (5' ELEV.)
- 2' FREEBOARD

JOB NO.	40010-00
DATE	APRIL 2011
DESIGNER	CNH
CHECKED RMP	DRAWN ARH
SHEET	2

NRG ENERGY, INC.
DSDA HYDROLOGIC ANALYSIS
LIMESTONE COUNTY, TEXAS

PAPE-DAWSON ENGINEERS
10333 RICHMOND AVE SUITE 900 | HOUSTON, TEXAS 77042 | PHONE: 713.428.2400 FAX: 713.428.2420
TEXAS BOARD OF PROFESSIONAL ENGINEERS, FIRM REGISTRATION # 470

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File: K:\projects\400\NRG-Hdro-Data\TIN Complete.DWG

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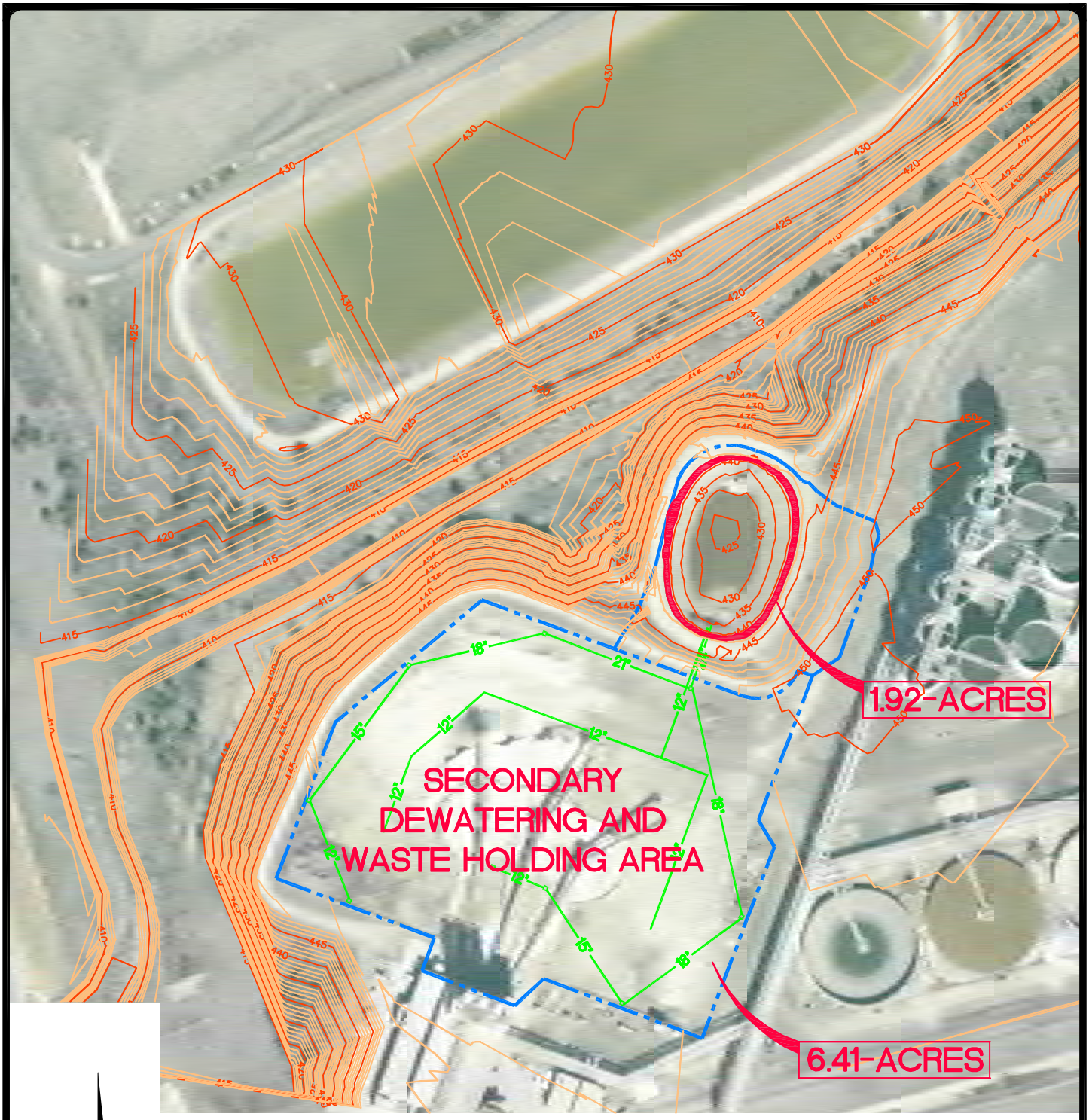

SCALE: 1" = 200'

LEGEND

- DELINEATED DRAINAGE AREA
- EXISTING CONTOURS (1' ELEV.)
- 50 — EXISTING CONTOURS (5' ELEV.)
- 24" INLET — EXISTING STORM SEWER FACILITIES
- 2' FREEBOARD

JOB NO.	40010-00
DATE	APRIL 2011
DESIGNER	CNH
CHECKED RMP	DRAWN ARH
SHEET	3

NRG ENERGY, INC.

ST-18 HYDROLOGIC ANALYSIS

LIMESTONE COUNTY, TEXAS

PAPE-DAWSON ENGINEERS

10333 RICHMOND AVE SUITE 900 | HOUSTON, TEXAS 77042 | PHONE: 713.428.2400 FAX: 713.428.2420

TEXAS BOARD OF PROFESSIONAL ENGINEERS, FIRM REGISTRATION # 470

Date: May 04, 2011, 9:23am User ID: CHarris
File: K:\projects\400\NRG-Hdro-Data\TIN Complete.DWG

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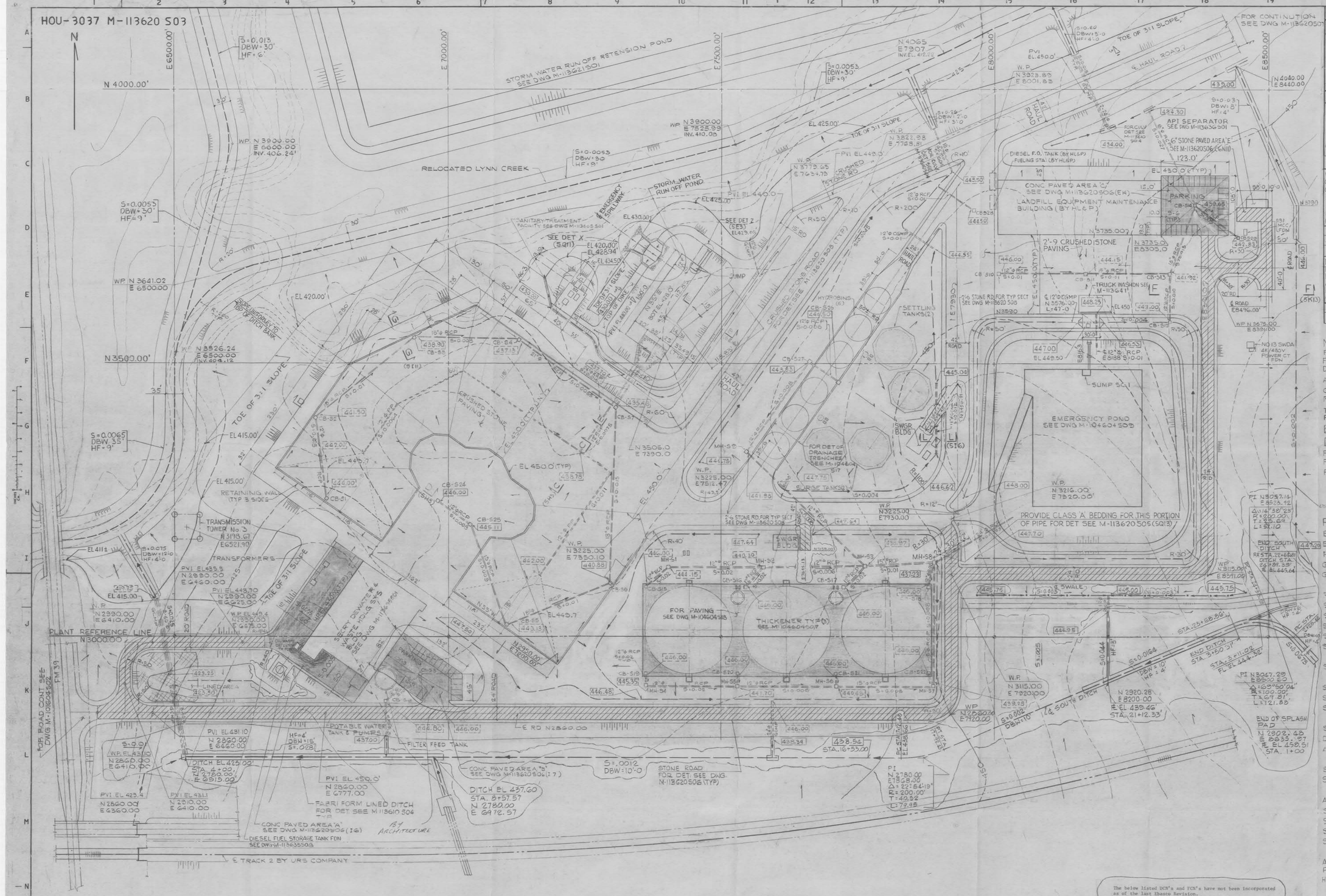
APPENDIX

HOU-3037 M-113620 S03



PLAN - SLUDGE STABILIZATION FACILITY

NO	DATE	REVISION	BY	CH	APPROVED
1	7-21-82		PSH	HM	JK

REV: (H12, H14) ROAD; (I7, I19) DRAINAGE, (G3) CREEK WIDTH; (D8, G4) LOC. OF SAN WASTE TREAT PLANT; (B19, I2, D19 THRU I19) DITCH; (E18, G9, J8) PIPE; (J4) HP EL; (D18, E15, E16, F17, I9, J8, J9, L10, L17) SLOPE & INV EL. ADD: (H12) DRAINAGE; (H14) SWGR. BLDG; (C14) NOTE: (K2) LINED AREA; (J5, J12) DWG NO.; (L20) REF DWG; (K5) PIPE; (A16, B14, B17, K19, L2, L12, L14, M6) DITCH & COORD; (I11, I15, J15 THRU J18, K9) SLOPE & INV EL. DEL: (E13) NOTE N.R.

NO	DATE	REVISION	BY	CH	APPROVED
2	12-29-82		B.F	SKB	JK

REV: DCN'S C-235, C-275, C-313 & FCN-059 INCORP.; (H4, H8, K10, J10 ~ J14) DRAIN PIPE; (J14 ~ J18, H14, D14, D2, C4, B4) DITCH; (G2, C9 ~ C13) LYNN CREEK SLOPE & INV. (F8) SAN TREAT. FAC AREA; (G14, H13 ~ H14) ROAD RAD & W.P. ADD: (H4) CULV: (F11) SUMP; (F11) NOTE - N.R.; (E3) TRANSMISSION TWR; (G20) NOTE. DEL: (F11) POND DISCHARGE & OVERFLOW PIPES; (H16) W.P.

NO	DATE	REVISION	BY	CH	APPROVED
3	5-16-83		PSH	HM	JK

DCN "C-534 & FCN "168 INCORP. REV: (D14) CRUSHED STONE PVMT. (D14, (E16, H18) LOC. OF CULV; DIESEL FUEL STORAGE TK. (F18, I18) RC PAVED RD & COORD; (K9) DITCH, (I11) INV EL; (F9 TO 14) SLOPE EDGE & TOE LINE. ADD: (E23) DWG NO; (D19) CONC PAVED AREA "E"; (I20) REF DWGS; (E9) ACCESS, (D15) CB-529, (D19) RC PAVED RD. & COORD. CB-529; (N10) SCOPING NOTE; (J3, M4) DIESEL FUEL STORAGE TK. DEL: (G18) GASOLINE TANK; (I19) EQUIP & FACILITY BY HL & P

NO	DATE	REVISION	BY	CH	APPROVED
4	6-29-83		B.F	SKB	JK

ADD: (D9) EMERGENCY SPILLWAY, (N20) REF DWG. DEL: (K3, D10) NOTE - N.R.

NO	DATE	REVISION	BY	CH	APPROVED
5	12-9-83		HM	SKB	JK

DCN C-745; C-758; C-779 & C-797 INCORP. REV: ROAD PAVEMENT AS PER HL & P'S REQUEST; (E8) SAN TREAT FACIL.; (E16) DRAINAGE; (C18-D16; F20) NOTE; (H15) DITCH INV. (J4) DG ROOM SIZE. ADD: (E16) TRUCK WASH-DOWN AREA; (E20, G20, I16, J16, E15) NOTES; (C14) DIM; (N20) REF DWG; (D19) 13 I MCC FDN; (F19) POWER CT FDN; (K7, D18) NOTE - NR. DEL: (E20) XGTY; (H16, I14) NOTE.

NO	DATE	REVISION	BY	CH	APPROVED
6	2-14-84		PSH	HM	JK

REV: (L11, N20) NOTE. DEL: (K7, D18) NOTE - NR.

NOTES

FOR QUANTITIES SEE M-113620 S05 & S06

FOR ROADS AND CONCRETE PAVING SEE NOTES ON DWG M-101604 S01.

ALL VERTICAL CURVES FOR ROADS TO BE 100' LONG.

GEODETIC EL 450.00' CORRESPONDS TO PLANT REFERENCE EL 100.00'.

TOP OF DITCH BANK TO BE AT LEAST 1'-0 ABOVE TOP OF FABRIFORM LINING (HF).

DENOTES 6" CRUSHED STONE ROAD OR PAVING

DENOTES CONCRETE PAVING

FOR HAUL ROAD DUST CONTROL PAVING SEE M-113620S07

FOR GRADING NOTES SEE DWG M-113600 S04

FOR DRAINAGE NOTES SEE DWG M-101600 S01

REFERENCE DRAWINGS:

BAR BENDING SCHEDULE	B-148620-130
ENLARGED SITE PLAN PLANT AREA (MECH)	M-001600
PLOT PLAN SH 3 (MECH)	M-001601S03
GRADING & DRAINAGE-GENERAL PLAN	M-101600S01
GRADING & DRAINAGE PLANT AREA SECTS & DETS SH. 1	M-101602S01
ROADS - PLAN	M-101604S01
SITE - PLAN	M-101605
SWDA-GRADING PLAN	M-113600S04
SWDA-DRAINAGE PLAN	M-113610S03
SWDA-RAILROAD SPUR PLAN SECTS & DETS	M-113620S04
SWDA-SLUDGE STABILIZATION FACILITY DRAINAGE-SECTS & DETS	M-113620S05
SWDA-SLUDGE STABILIZATION FACILITY ROADS AND PAVING-PLAN, SECTS & DETS	M-113620S06
SWDA-HAUL ROADS PLAN	M-113620S07
SWDA-HAUL ROADS SECTS & DETS	M-113620S08
SWDA-RUNOFF POND AREA 1 PLAN, SECTS & DETS	M-113621S01
SWDA-DEWATERED SLUDGE SOLIDS DISPOSAL AREA-PLAN SECTS & DETS	M-113621S03
AQCS SWDA DRAINAGE TRENCHES PLAN, SECTS, DETS.	M-104604S17
SWDA DRAINAGE SECT & DET SH 1	M-113610S04
SWDA SECONDARY DEWATERING & WASTE HANDLING SYSTEM SH 1	M-113635S01
AQCS-SWDA THICKENER FOUNDATION SH 1	M-104604S01
SWDA-SANITARY TREATMENT FACILITY	M-113605S01
SWDA-API SEPARATOR-MASONRY	M-113636S01
SWDA-API SEPARATOR AREA MISC EQUIP FDNS	M-113636S03
SWDA-STORM WATER RUN OFF POND STACK AREA SUMP STRUCTURE	M-113622S01
AQCS SWDA THICKENER AREA PAVING PLAN, SECTS & DETAILS	M-104604S18
HYDROBIN SWGR BLDG-PLAN & SECT (HVAC)	M-057789

ALL WORK BY SWDA FDN CONTRACTOR EXCEPT AS NOTED

The below listed DCN's and FCN's have not been incorporated as of the last Ebasco Revision.
NONE

NO	DATE	REVISION	BY	CH	APPROVED
7	9-7-84		VP	SKB	JK

FCNS: C68, I28 & I62 INCORP. REV: (L2-L15) DRAINAGE DITCH; (K4) TANK LOC. & GRADING; (K14-K19) GRADING & DRAINAGE DITCHES. (J15, J17, J18) DITCH EL & SLOPE. ADD: (P13, N16) NOTES DEL: (J16) CATCH BASIN TRANSFER REVISION TO HL&P

After Rev. 7 dated 9/7/84 of this drawing, full responsibility for the maintenance of this drawing and for subsequent modifications made or required to be made to this drawing is assumed by Houston Lighting and Power Company (HL&P). Ebasco Services Incorporated has no responsibility for maintenance and modifications after the above referenced revision. Revisions to this drawing made by HL&P subsequent to the above referenced revision have been considered for the current or prior revisions of this drawing are identified in the drawing revision blocks. All DCN's and above field originated changes identified to Ebasco, which have not yet been incorporated on this drawing, have been identified by drawing note.

8	5-1-85	ADD'TNL. ROADS INCORP.			

REV	DATE	CONSTRUCTION CONTRACT ISSUES	BY
		PBOA AWARD	
		PBOA BID	
		FUG AWARD	
		FUG BID	
		SITE PREP AWARD	
1A	5-26-82	SITE PREP BID EAST	PSH

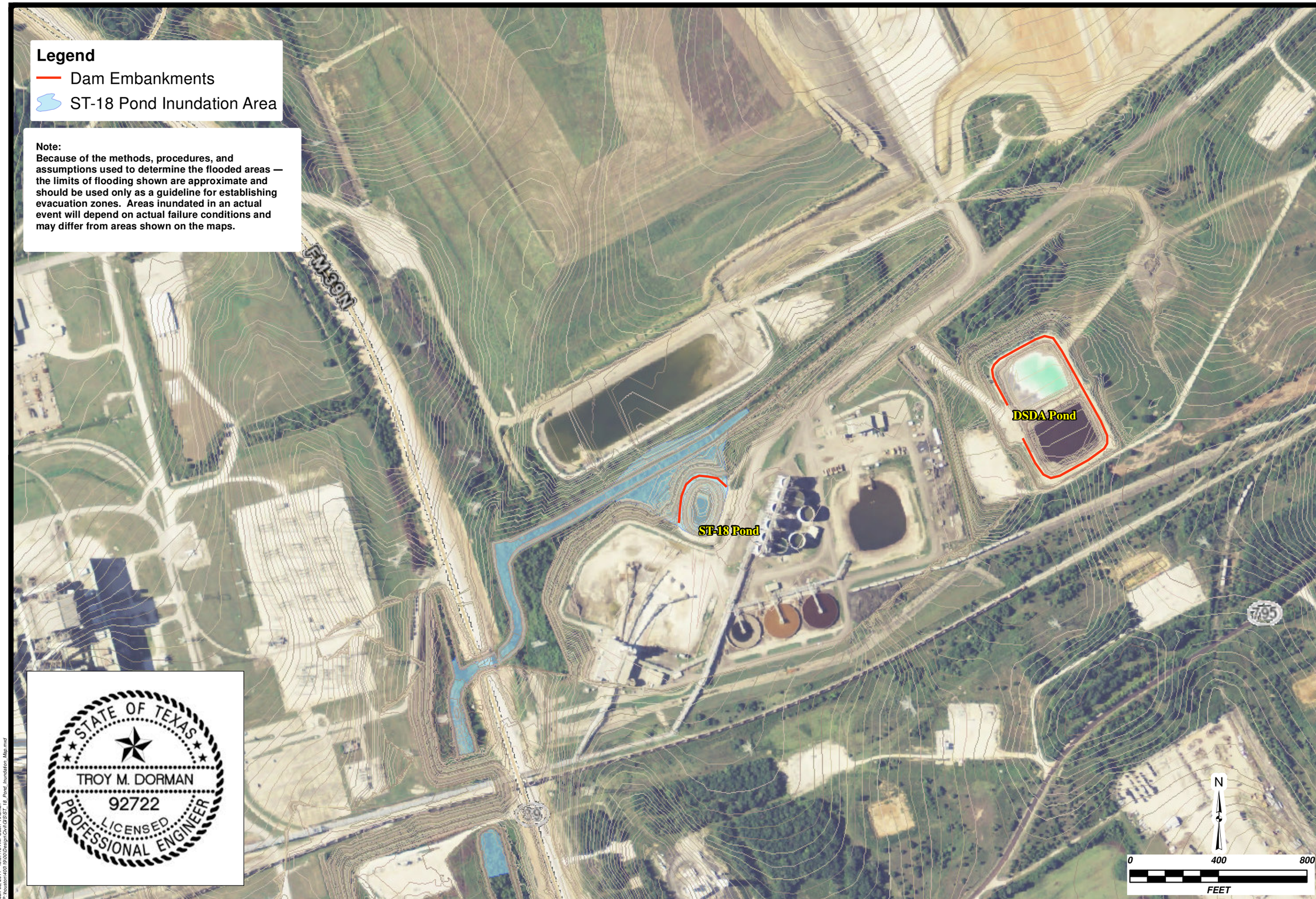
WORK THIS DWG. WITH DWGS M-113610S03, M-113620S05 & M-113620S06.

HOUSTON LIGHTING & POWER CO.
LIMESTONE ELECTRIC GENERATING STATION
UNIT 1, 750 MW 1985 INSTALLATION
UNIT 2, 750 MW 1986 EXTENSION

SOLID WASTE DISPOSAL AREA
SLUDGE STABILIZATION FACILITY
ROADS, PAVING & DRAINAGE - PLAN

EBASCO SERVICES INCORPORATED

SCALE 1" = 60'	APPROVED	DATE
DIV. CIVIL		HOU-3037
DR		M-113620 S03
CH P.S. HUANG	SKB	



REVISIONS:

PAPE-DAWSON ENGINEERS

555 EAST RAMSEY | SAN ANTONIO, TEXAS 78216 | PHONE: 210.375.9000 FAX: 210.375.9010

TEXAS BOARD OF PROFESSIONAL ENGINEERS, FIRM REGISTRATION # 470

ST-18 Pond
Dam Breach Inundation Map

JOB NO.	400-19-00
DATE	Jun 2011
DESIGNER	JML
CHECKED RH	DRAWN JML
SHEET	1

Date: Jun 03, 2011, 10:57:13 AM User: RHunter
File: P:\Revenue\400-19-00\Design\Civil\ST-18_Pond_Inundation_Map.mxd

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