Technical Package Cover Page

This file contains the following documents:

1. Summary of application (in plain language)
   - English
   - Alternative Language (Spanish)
2. First notice (NORI-Notice of Receipt of Application and Intent to Obtain a Permit)
   - English
   - Alternative Language (Spanish)
3. Second notice (NAPD-Notice of Preliminary Decision)
   - English
   - Alternative Language (Spanish)
4. Application materials
5. Draft permit
6. Technical summary or fact sheet

Portada de Paquete Técnico

Este archivo contiene los siguientes documentos:

1. Resumen de la solicitud (en lenguaje sencillo)
   - Inglés
   - Idioma alternativo (español)
2. Primer aviso (NORI, Aviso de Recepción de Solicitud e Intención de Obtener un Permiso)
   - Inglés
   - Idioma alternativo (español)
3. Segundo aviso (NAPD, Aviso de Decisión Preliminar)
   - Inglés
   - Idioma alternativo (español)
4. Materiales de la solicitud
5. Proyecto de permiso
6. Resumen técnico u hoja de datos

Graham Creek Steam Electric Station
WQ0000551000
PLAIN LANGUAGE SUMMARY

The following summary is provided for this pending water quality permit application being reviewed by the Texas Commission on Environmental Quality as required by 30 Texas Administrative Code Chapter 39. The information provided in this summary may change during the technical review of the application and are not federal enforceable representations of the permit application.

Luminant Generation Company LLC (CN603256413) operates the Graham Steam Electric Station (RN102563426), a two-unit natural gas-fired steam electric generating facility. The facility is located at 480 Power Plant Rd, Graham, Young County, Texas 76450.

This application is for the renewal of Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000551000 (EPA I.D. No. TX0001163) which authorizes the discharge of wastewaters at a daily average flow not to exceed 505.4 million gallons per day via Outfall 001. The permit also authorizes the discharge of low volume waste, storm water and previously monitored effluent (metal cleaning waste) via Outfall 002.

The discharge of once-through cooling water via Outfall 001, low volume waste via Outfall 002 and previously monitored effluent via Outfall 201 from this facility is subject to federal effluent limitation guidelines at 40 CFR Part 423. The pollutants expected from these discharges based on 40 CFR Part 423 are: total residual chlorine, free available chlorine, total suspended solids, oil and grease, total iron, total copper and pH. Temperature is also expected from discharges of 001. Additional potential pollutants are included in the Industrial Wastewater Application Technical Report, Worksheet 2.0.

The raw water supply for the facility's cooling water system is from Lake Grahm Reservoir, supplied by the City of Graham. Potable water is also supplied by the City of Graham. A chemical feed system supplies water conditioning chemicals to the once-through cooling water to minimize corrosion and control the formation of mineral scale and bio-fouling. Storm water is collected through various storm drains and is discharged under the TCEQ Industrial Multi-Sector General Permit TXR05W674. Domestic wastes are routed to the City of Grahm wastewater treatment plant disposal.

Estación eléctrica de vapor de Graham Creek
WQ0000551000
RESUMEN EN LENGUAJE SENCILLO

El siguiente resumen se proporciona para esta solicitud de permiso de calidad del agua pendiente que está siendo revisada por la Comisión de Calidad Ambiental de Texas según lo exige el Capítulo 39 del Código Administrativo de Texas 30. La información proporcionada en este resumen puede cambiar durante la revisión técnica de la solicitud y no es federal. representaciones ejecutables de la solicitud de permiso.

Luminant Generation Company LLC (CN603256413) opera la Graham Steam Electric Station (RN102563426), una instalación de generación eléctrica de vapor alimentada con gas natural de dos unidades. La instalación está ubicada en 480 Power Plant Rd, Graham, condado de Young, Texas 76450.

Esta solicitud es para la renovación del Permiso No. WQ0000551000 del Sistema de Eliminación de Descarga de Contaminantes de Texas (TPDES) (N.º de identificación de la EPA TX0001163), que autoriza la descarga de aguas residuales a un flujo promedio diario que no exceda los 505.4 millones de galones por día a través del Emisario 001. El permiso también autoriza la descarga de residuos de bajo volumen, aguas pluviales y efluentes previamente monitoreados (residuos de limpieza de metales) a través del Emisario 002.

La descarga de agua de enfriamiento de un solo paso a través del Emisario 001, desechos de bajo volumen a través del Emisario 002 y efluentes previamente monitoreados a través del Emisario 201 de esta instalación están sujetos a pautas federales de limitación de efluentes en 40 CFR Parte 423. Los contaminantes esperados de estas descargas se basan en 40 CFR Parte 423 son: cloro residual total, cloro libre disponible, sólidos suspendidos totales, aceite y grasa, hierro total, cobre total y pH. También se espera temperatura de las descargas de 001. Se incluyen contaminantes potenciales adicionales en el Informe técnico de aplicación de aguas residuales industriales, Hoja de trabajo 2.0.

El suministro de agua cruda para el sistema de agua de refrigeración de la instalación proviene del embalse del lago Grahm, suministrado por la ciudad de Graham. La ciudad de Graham también suministra agua potable. Un sistema de alimentación de químicos suministra químicos acondicionadores de agua al agua de enfriamiento de un solo paso para minimizar la corrosión y controlar la formación de incrustaciones minerales y bioincrustaciones. El agua pluvial se recolecta a través de varios drenajes pluviales y se descarga según el Permiso general industrial multisectorial TXR05W674 de la TCEQ. Los desechos domésticos se envían a la planta de tratamiento de aguas residuales de la ciudad de Grahm.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

**NOTICE OF RECEIPT OF APPLICATION AND
INTENT TO OBTAIN WATER QUALITY PERMIT
RENEWAL**

PERMIT NO. WQ0000551000

APPLICATION. Luminant Generation Company LLC, 6555 Sierra Drive, Irving, Texas 75039, which owns a steam electric station, has applied to the Texas Commission on Environmental Quality (TCEQ) to renew Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000551000 (EPA I.D. No. TX0001163) to authorize the discharge of treated wastewater at a volume not to exceed a daily average flow of 505,400,000 gallons per day via Outfall 001; and the discharg of treated wastewater at a flow variable rate via Outfall 002. The facility is located at 480 Power Plant Road, in the city of Graham, in Young County, Texas 76450. The discharge route is from the plant site via Outfall 001 directly to the Lake Eddleman portion of Graham Lake and via Outfall 002 to Salt Creek; thence to Brazos River Above Possum Kingdom Lake. TCEQ received this application on May 30, 2024. The permit application will be available for viewing and copying at Young Court House, 516 Fourth Street, Graham, in Young County, Texas prior to the date this notice is published in the newspaper. The application, including any updates, and associated notices are available electronically at the following webpage: https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications. This link to an electronic map of the site or facility's general location is provided as a public courtesy and not part of the application or notice. For the exact location, refer to the application.
https://gisweb.tceq.texas.gov/LocationMapper/?marker=-98.611666,33.135&level=18

ALTERNATIVE LANGUAGE NOTICE. Alternative language notice in Spanish is available at: https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications.El aviso de idioma alternativo en español está disponible en https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications.

ADDITIONAL NOTICE. TCEQ's Executive Director has determined the application is administratively complete and will conduct a technical review of the application. After technical review of the application is complete, the Executive Director may prepare a draft permit and will issue a preliminary decision on the application. **Notice of the Application and Preliminary Decision will be published and mailed to those who are on the county-wide mailing list and to those who are on the mailing list for this application. That notice will contain the deadline for submitting public comments.**

PUBLIC COMMENT / PUBLIC MEETING. You may submit public comments or request a public meeting on this application. The purpose of a public meeting is to provide the opportunity to submit comments or to ask questions about the application. TCEQ will hold a public meeting if the Executive Director determines that there is a significant degree of public interest in the application or if requested by a local legislator. A public meeting is not a contested case hearing.

OPPORTUNITY FOR A CONTESTED CASE HEARING. After the deadline for submitting public comments, the Executive Director will consider all timely comments and prepare a response to all relevant and material, or significant public comments. **Unless the application is directly referred for a contested case hearing, the response to comments, and the Executive Director's decision on the application, will be mailed to everyone who submitted public comments and to those persons who are on the mailing list for this application. If comments are received, the mailing will also provide instructions for requesting reconsideration of the Executive Director's decision and for requesting a contested case hearing.** A contested case hearing is a legal proceeding similar to a civil trial in state district court.

TO REQUEST A CONTESTED CASE HEARING, YOU MUST INCLUDE THE FOLLOWING ITEMS IN YOUR REQUEST: your name, address, phone number; applicant's name and proposed permit number; the location and distance of your property/activities relative to the proposed facility; a specific description of how you would be adversely affected by the facility in a way not common to the general public; a list of all disputed issues of fact that you submit during the comment period and, the statement "[I/we] request a contested case hearing." If the request for contested case hearing is filed on behalf of a group or association, the request must designate the group's representative for receiving future correspondence; identify by name and physical address an individual member of the group who would be adversely affected by the proposed facility or activity; provide the information discussed above regarding the affected member's location and distance from the facility or activity; explain how and why the member would be affected; and explain how the interests the group seeks to protect are relevant to the group's purpose.

Following the close of all applicable comment and request periods, the Executive Director will forward the application and any requests for reconsideration or for a contested case hearing to the TCEQ Commissioners for their consideration at a scheduled Commission meeting.

The Commission may only grant a request for a contested case hearing on issues the requestor submitted in their timely comments that were not subsequently withdrawn. **If a hearing is granted, the subject of a hearing will be limited to disputed issues of fact or mixed questions of fact and law relating to relevant and material water quality concerns submitted during the comment period.**

TCEQ may act on an application to renew a permit for discharge of wastewater without providing an opportunity for a contested case hearing if certain criteria are met.

MAILING LIST. If you submit public comments, a request for a contested case hearing or a reconsideration of the Executive Director's decision, you will be added to the mailing list for this specific application to receive future public notices mailed by the Office of the Chief Clerk. In addition, you may request to be placed on: (1) the permanent mailing list for a specific applicant name and permit number; and/or (2) the mailing list for a specific county. If you wish to be placed on the permanent and/or the county mailing list, clearly specify which list(s) and send your request to TCEQ Office of the Chief Clerk at the address below.

INFORMATION AVAILABLE ONLINE. For details about the status of the application, visit the Commissioners' Integrated Database at www.tceq.texas.gov/goto/cid. Search the database using the permit number for this application, which is provided at the top of this notice.

AGENCY CONTACTS AND INFORMATION. All public comments and requests must be submitted either electronically at **https://www14.tceq.texas.gov/epic/eComment/**, or in writing to the Texas Commission on Environmental Quality, Office of the Chief Clerk, MC-105, P.O. Box 13087, Austin, Texas 78711-3087. Please be aware that any contact information you provide, including your name, phone number, email address and physical address will become part of the agency's public record. For more information about this permit application or the permitting process, please call the TCEQ Public Education Program, Toll Free, at 1-800-687-4040 or visit their website at www.tceq.texas.gov/goto/pep. Si desea información en Español, puede llamar al 1-800-687-4040.

Further information may also be obtained from Luminant Generation Company LLC at the address stated above or by calling Mr. Ryan Bayle, P.G., at 214-875-8294.

Issuance Date: July 16, 2024

Comisión de Calidad Ambiental del Estado de Texas

**AVISO DE RECIBO DE LA SOLICITUD Y
EL INTENTO DE OBTENER PERMISO PARA LA CALIDAD DEL AGUA
RENOVACION**

PERMISO NO. WQ00055100

SOLICITUD. Luminant Generation Company LLC, 6555 Sierra Drive, Irving, Texas 75039, que posee una generación de electricidad, ha solicitado a la Comisión de Calidad Ambiental de Texas (TCEQ) renovar el permiso del Sistema de Eliminación de Descargas Contaminantes de Texas (TPDES) No. WQ0000551000 (EPA I.D. No. TX0001163) para autorizar la descarga de aguas residuales tratadas en un volumen que no exceda un flujo promedio diario de 505,400,000 galones por día a través del Emisario 001; y la descarga de aguas residuales tratadas a un caudal variable a través del Emisario 002. La instalación está ubicada en 480 Power Plant Road, en la ciudad de Graham, en el condado de Young, Texas 76540. La ruta de descarga es desde el sitio de la planta a través del Emisario 001 directamente. hasta la parte del lago Eddleman del lago Graham y por el emisario 002 hasta Salt Creek; de allí al río Brazos sobre el lago Possum Kingdom. La TCEQ recibió esta solicitud el 30 de mayo de 2024. La solicitud de permiso estará disponible para ver y copiar en el Tribunal del Condado de Young, Oficina del Secretario del Condado de Young, 516 Fourth Street, Graham, Texas, antes de la fecha de publicación de este aviso en el periódico. Este enlace a un mapa electrónico de la ubicación general del sitio o instalación se proporciona como cortesía pública y no forma parte de la solicitud o aviso. Para conocer la ubicación exacta, consulte la aplicación.
https://gisweb.tceq.texas.gov/LocationMapper/?marker=-98.611666,33.135&level=18

AVISO ADICIONAL. El Director Ejecutivo de la TCEQ ha determinado que la solicitud es administrativamente completa y conducirá una revisión técnica de la solicitud. Después de completar la revisión técnica, el Director Ejecutivo puede preparar un borrador del permiso y emitirá una Decisión Preliminar sobre la solicitud. **El aviso de la solicitud y la decisión preliminar serán publicados y enviado a los que están en la lista de correo de las personas a lo largo del condado que desean recibir los avisos y los que están en la lista de correo que desean recibir avisos de esta solicitud. El aviso dará la fecha límite para someter comentarios públicos.**

COMENTARIO PUBLICO / REUNION PUBLICA. Usted puede presentar

comentarios públicos o pedir una reunión pública sobre esta solicitud. El propósito de una reunión pública es dar la oportunidad de presentar comentarios o hacer preguntas acerca de la solicitud. La TCEQ realiza una reunión pública si el Director Ejecutivo determina que hay un grado de interés público suficiente en la solicitud o si un legislador local lo pide. Una reunión pública no es una audiencia administrativa de lo contencioso.

OPORTUNIDAD DE UNA AUDIENCIA ADMINISTRATIVA DE LO CONTENCIOSO. Después del plazo para presentar comentarios públicos, el Director Ejecutivo considerará todos los comentarios apropiados y preparará una respuesta a todo los comentarios públicos esenciales, pertinentes, o significativos. **A menos que la solicitud haya sido referida directamente a una audiencia administrativa de lo contencioso, la respuesta a los comentarios y la decisión del Director Ejecutivo sobre la solicitud serán enviados por correo a todos los que presentaron un comentario público y a las personas que están en la lista para recibir avisos sobre esta solicitud. Si se reciben comentarios, el aviso también proveerá instrucciones para pedir una reconsideración de la decisión del Director Ejecutivo y para pedir una audiencia administrativa de lo contencioso.** Una audiencia administrativa de lo contencioso es un procedimiento legal similar a un procedimiento legal civil en un tribunal de distrito del estado.

PARA SOLICITAR UNA AUDIENCIA DE CASO IMPUGNADO, USTED DEBE INCLUIR EN SU SOLICITUD LOS SIGUIENTES DATOS: su nombre, dirección, y número de teléfono; el nombre del solicitante y número del permiso; la ubicación y distancia de su propiedad/actividad con respecto a la instalación; una descripción específica de la forma cómo usted sería afectado adversamente por el sitio de una manera no común al público en general; una lista de todas las cuestiones de hecho en disputa que usted presente durante el período de comentarios; y la declaración "[Yo/nosotros] solicito/solicitamos una audiencia de caso impugnado". Si presenta la petición para una audiencia de caso impugnado de parte de un grupo o asociación, debe identificar una persona que representa al grupo para recibir correspondencia en el futuro; identificar el nombre y la dirección de un miembro del grupo que sería afectado adversamente por la planta o la actividad propuesta; proveer la información indicada anteriormente con respecto a la ubicación del miembro afectado y su distancia de la planta o actividad propuesta; explicar cómo y porqué el miembro sería afectado; y explicar cómo los intereses que el grupo desea proteger son pertinentes al propósito del grupo.

Después del cierre de todos los períodos de comentarios y de petición que aplican, el Director Ejecutivo enviará la solicitud y cualquier petición para reconsideración o para una audiencia de caso impugnado a los Comisionados de la TCEQ para su consideración durante una reunión programada de la Comisión. La Comisión sólo puede conceder una solicitud de una audiencia de caso impugnado sobre los temas que el solicitante haya

presentado en sus comentarios oportunos que no fueron retirados posteriormente. Si se concede una audiencia, el tema de la audiencia estará limitado a cuestiones de hecho en disputa o cuestiones mixtas de hecho y de derecho relacionadas a intereses pertinentes y materiales de calidad del agua que se hayan presentado durante el período de comentarios.

Si ciertos criterios se cumplen, la TCEQ puede actuar sobre una solicitud para renovar un permiso sin proveer una oportunidad de una audiencia administrativa de lo contencioso.

LISTA DE CORREO. Si somete comentarios públicos, un pedido para una audiencia administrativa de lo contencioso o una reconsideración de la decisión del Director Ejecutivo, la Oficina del Secretario Principal enviará por correo los avisos públicos en relación con la solicitud. Ademas, puede pedir que la TCEQ ponga su nombre en una or mas de las listas correos siguientes (1) la lista de correo permanente para recibir los avisos de el solicitante indicado por nombre y número del permiso específico y/o (2) la lista de correo de todas las solicitudes en un condado especifico. Si desea que se agrega su nombre en una de las listas designe cual lista(s) y envia por correo su pedido a la Oficina del Secretario Principal de la TCEQ.

CONTACTOS E INFORMACIÓN A LA AGENCIA. Todos los comentarios públicos y solicitudes deben ser presentadas electrónicamente vía http://www14.tceq.texas.gov/epic/eComment/ o por escrito dirigidos a la Comisión de Texas de Calidad Ambiental, Oficial de la Secretaría (Office of Chief Clerk), MC-105, P.O. Box 13087, Austin, Texas 78711-3087. Tenga en cuenta que cualquier información personal que usted proporcione, incluyendo su nombre, número de teléfono, dirección de correo electrónico y dirección física pasarán a formar parte del registro público de la Agencia. Para obtener más información acerca de esta solicitud de permiso o el proceso de permisos, llame al programa de educación pública de la TCEQ, gratis, al 1-800-687-4040. Si desea información en Español, puede llamar al 1-800-687-4040.

También se puede obtener más información de Luminant Generation Company LLC en la dirección indicada anteriormente o llamando al Sr. Ryan Bayle, P.G., al 214-875-8294.

Fecha de emission ____________ *[Date notice issued]*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

NOTICE OF APPLICATION AND PRELIMINARY DECISION
FOR TPDES PERMIT FOR INDUSTRIAL WASTEWATER

RENEWAL

PERMIT NO. WQ0000551000

APPLICATION AND PRELIMINARY DECISION. Luminant Generation Company LLC, 6555 Sierra Drive, Irving, Texas 75039, which operates Graham Steam Electric Station, has applied to the Texas Commission on Environmental Quality (TCEQ) for a renewal of Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000551000, which authorizes the discharge of once-through cooling water at a daily average flow not to exceed 505,400,000 gallons per day via Outfall 001; and low volume waste sources, stormwater runoff, and previously monitored effluent (metal cleaning waste via internal Outfall 102) on a flow-variable basis via Outfall 002. TCEQ received this application on May 30, 2024.
The facility is located at 480 Power Plant Road, on the shores of Lakes Eddleman and Graham adjacent to United States Highway 380, approximately 2.5 miles northwest of the City of Graham, Young County, Texas 76450. This link to an electronic map of the site or facility's general location is provided as a public courtesy and is not part of the application or notice. For the exact location, refer to the application.
https://gisweb.tceq.texas.gov/LocationMapper/?marker=-98.611666,33.135&level=18

The effluent is discharged via Outfall 001 directly to the Lake Eddleman portion of Lake Graham in Segment No. 1231 of the Brazos River Basin; and via Outfall 002 to Salt Creek, thence to the Brazos River Above Possum Kingdom Lake in Segment No.1208 of the Brazos River Basin. The unclassified receiving water uses are high aquatic life use for Salt Creek. The designated uses for Segment No. 1231 are primary contact recreation, public water supply, and high aquatic life use; and for Segment No. 1208 are primary contact recreation and high aquatic life use.

The TCEQ Executive Director has completed the technical review of the application and prepared a draft permit. The draft permit, if approved, would establish the conditions under which the facility must operate. The Executive Director has made a preliminary decision that this permit, if issued, meets all statutory and regulatory requirements. The permit application, Executive Director's preliminary decision, and draft permit are available for viewing and copying at Young County Court House, 516 Fourth Street, Graham, in Young County, Texas. The application, including any updates, and associated notices are available electronically at the following webpage: https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications

ALTERNATIVE LANGUAGE NOTICE. Alternative language notice in Spanish is available at https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications. El aviso de idioma alternativo en español está disponible en https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications.

PUBLIC COMMENT / PUBLIC MEETING. You may submit public comments or request a public meeting about this application. The purpose of a public meeting is to provide the opportunity to submit written or oral comment or to ask questions about the application. Generally, the TCEQ will hold a public meeting if the Executive Director determines that there is a significant degree of public interest in the application or if requested by a local legislator. A public meeting is not a contested case hearing.

OPPORTUNITY FOR A CONTESTED CASE HEARING. After the deadline for public comments, the Executive Director will consider the comments and prepare a response to all relevant and material, or significant public comments. **The response to comments, along with the Executive Director's decision on the application, will be mailed to everyone who submitted public comments or who requested to be on a mailing list for this application. If comments are received, the mailing will also provide instructions for requesting a contested case hearing or reconsideration of the Executive Director's decision.** A contested case hearing is a legal proceeding similar to a civil trial in a state district court.

TO REQUEST A CONTESTED CASE HEARING, YOU MUST INCLUDE THE FOLLOWING ITEMS IN YOUR REQUEST: your name, address, phone number; applicant's name and proposed permit number; the location and distance of your property/activities relative to the proposed facility; a specific description of how you would be adversely affected by the facility in a way not common to the general public; a list of all disputed issues of fact that you submit during the comment period; and the statement "[I/we] request a contested case hearing." If the request for contested case hearing is filed on behalf of a group or association, the request must designate the group's representative for receiving future correspondence; identify by name and physical address an individual member of the group who would be adversely affected by the proposed facility or activity; provide the information discussed above regarding the affected member's location and distance from the facility or activity; explain how and why the member would be affected; and explain how the interests the group seeks to protect are relevant to the group's purpose.

Following the close of all applicable comment and request periods, the Executive Director will forward the application and any requests for reconsideration or for a contested case hearing to the TCEQ Commissioners for their consideration at a scheduled Commission meeting.
The Commission may only grant a request for a contested case hearing on issues the requestor submitted in their timely comments that were not subsequently withdrawn. **If a hearing is granted, the subject of a hearing will be limited to disputed issues of fact or mixed questions of fact and law relating to relevant and material water quality concerns submitted during the comment period.**

EXECUTIVE DIRECTOR ACTION. The Executive Director may issue final approval of the application unless a timely contested case hearing request or a timely request for reconsideration is filed. If a timely hearing request or request for reconsideration is filed, the Executive Director will not issue final approval of the permit and will forward the application and requests to the TCEQ Commissioners for their consideration at a scheduled Commission meeting.
MAILING LIST. If you submit public comments, a request for a contested case hearing or a reconsideration of the Executive Director's decision, you will be added to the mailing list for this specific application to receive future public notices mailed by the Office of the Chief Clerk. In addition, you may request to be added to: (1) the permanent list for a specific applicant name and permit number; and (2) the mailing list for a specific county. If you wish to be placed on the permanent and the county mailing list, clearly specify which list(s) and send your request to TCEQ Office of the Chief Clerk at the address below.

All written public comments and public meeting requests must be submitted to the Office of the Chief Clerk, MC 105, TCEQ, P.O. Box 13087, Austin, TX 78711-3087 or electronically at https://www.tceq.texas.gov/goto/comment/ within 30 days from the date of newspaper publication of this notice.

INFORMATION AVAILABLE ONLINE. For details about the status of the application, visit the Commissioners' Integrated Database at https://www.tceq.texas.gov/goto/cid/. Search the database using the permit number for this application**,** which is provided at the top of this notice.

AGENCY CONTACTS AND INFORMATION. Public comments and requests must be submitted either electronically at https://www.tceq.texas.gov/goto/comment/ or in writing to the Texas Commission on Environmental Quality, Office of the Chief Clerk, MC-105, P.O. Box 13087, Austin, Texas 78711-3087. Please be aware that any contact information you provide, including your name, phone number, email address, and physical address will become part of the agency's public record. For more information about this permit application or the permitting process, please call the TCEQ Public Education Program, toll free, at 1-800-687-4040 or visit their website at https://www.tceq.texas.gov/agency/decisions/participation/permitting-participation. Si desea información en Español, puede llamar al 1-800-687-4040.
Further information may also be obtained from Luminant Generation Company LLC at the address stated above or by calling Mr. Ryan Bayle, P.G., at (214) 875-8294.

Issued: September 4, 2025

Comisión De Calidad Ambiental Del Estado De Texas

**AVISO DE SOLICITUD Y DECISIÓN PRELIMINAR
PARA LA RENOVACIÓN DEL PERMISO TPDES PARA AGUAS RESIDUALES INDUSTRIALES**

PERMISO NO. WQ0001481000

APPLICATION AND PRELIMINARY DECISION. Luminant Generation Company LLC, 6555 Sierra Drive, Irving, Texas 75039, operadora de la central eléctrica Graham Steam, ha solicitado a la Comisión de Calidad Ambiental de Texas (TCEQ) la renovación del Permiso n.° WQ0000551000 del Sistema de Eliminación de Descargas Contaminantes de Texas (TPDES). Este permiso autoriza la descarga de agua de refrigeración de paso único con un caudal promedio diario que no supere los 505,400,000 galones por día a través del emisario 001; así como la descarga de aguas residuales de bajo volumen, escorrentía pluvial y efluentes previamente monitoreados (residuos de limpieza de metales a través del emisario interno 102) con caudal variable a través del emisario 002. La TCEQ recibió esta solicitud el 30 de mayo de 2024.

La instalación se encuentra en 480 Power Plant Road, a orillas de los lagos Eddleman y Graham, junto a la carretera federal 380, aproximadamente a 4 kilómetros al noroeste de la ciudad de Graham, condado de Young, Texas 76450. Este enlace a un mapa electrónico de la ubicación general del sitio o la instalación se proporciona como cortesía pública y no forma parte de la solicitud ni del aviso. Para conocer la ubicación exacta, consulte la solicitud.
https://gisweb.tceq.texas.gov/LocationMapper/?marker=-98.611666,33.135&level=18

El efluente se descarga por el desagüe 001 directamente a la sección del lago Eddleman del lago Graham, en el segmento n.° 1231 de la cuenca del río Brazos; y por el desagüe 002 a Salt Creek, y de allí al río Brazos, sobre el lago Possum Kingdom, en el segmento n.° 1208 de la cuenca del río Brazos. Los usos no clasificados del agua receptora son el uso intensivo de vida acuática para Salt Creek. Los usos designados para el segmento n.° 1231 son recreación de contacto primario, suministro público de agua y uso intensivo de vida acuática; y para el segmento n.° 1208 son recreación de contacto primario y uso intensivo de vida acuática.

El Director Ejecutivo de la TCEQ ha completado la revisión técnica de la solicitud y ha preparado un borrador del permiso. De aprobarse, este borrador establecería las condiciones de funcionamiento de la instalación. El Director Ejecutivo ha determinado preliminarmente que este permiso, de ser emitido, cumple con todos los requisitos legales y reglamentarios. La solicitud de permiso, la decisión preliminar del Director Ejecutivo y el borrador del permiso están disponibles para su consulta y copia en el Tribunal del Condado de Young, 516 Fourth Street, Graham, Condado de Young, Texas. La solicitud, incluyendo sus actualizaciones y los avisos correspondientes, está disponible electrónicamente en la siguiente página web:
https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications

AVISO DE IDIOMA ALTERNATIVO. El aviso en idioma alternativo en español está disponible en https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications. El aviso de idioma alternativo en español está disponible en https://www.tceq.texas.gov/permitting/wastewater/pending-permits/tpdes-applications.

COMENTARIO PUBLICO / REUNION PUBLICA. Usted puede presentar comentarios públicos o pedir una reunión pública sobre esta solicitud. El propósito de una reunión pública es dar la oportunidad de presentar comentarios o hacer preguntas acerca de la solicitud. La TCEQ realiza una reunión pública si el Director Ejecutivo determina que hay un grado de interés público suficiente en la solicitud o si un legislador local lo pide. Una reunión pública no es una audiencia administrativa de lo contencioso.

OPORTUNIDAD PARA UNA AUDIENCIA DE CASO IMPUGNADO. Después de la fecha límite para los comentarios públicos, el director ejecutivo considerará los comentarios y preparará una respuesta a todos los comentarios públicos relevantes y materiales, o significativos. **La respuesta a los comentarios, junto con la decisión del director ejecutivo sobre la solicitud, se enviará por correo a todos los que enviaron comentarios públicos o que solicitaron estar en una lista de correo para esta solicitud. Si se reciben comentarios, el correo también proporcionará instrucciones para solicitar una audiencia de caso impugnado o reconsiderar la decisión del director ejecutivo.** Una audiencia de caso disputado es un procedimiento legal similar a un juicio civil en un tribunal de distrito estatal.

PARA SOLICITAR UNA AUDIENCIA DE CASO IMPUGNADO, USTED DEBE INCLUIR EN SU SOLICITUD LOS SIGUIENTES DATOS: su nombre, dirección, y número de teléfono; el nombre del solicitante y número del permiso; la ubicación y distancia de su propiedad/actividad con respecto a la instalación; una descripción específica de la forma cómo usted sería afectado adversamente por el sitio de una manera no común al público en general; una lista de todas las cuestiones de hecho en disputa que usted presente durante el período de comentarios; y la declaración "[Yo/nosotros] solicito/solicitamos una audiencia de caso impugnado". Si presenta la petición para una audiencia de caso impugnado de parte de un grupo o asociación, debe identificar una persona que representa al grupo para recibir correspondencia en el futuro; identificar el nombre y la dirección de un miembro del grupo que sería afectado adversamente por la planta o la actividad propuesta; proveer la información indicada anteriormente con respecto a la ubicación del miembro afectado y su distancia de la planta o actividad propuesta; explicar cómo y porqué el miembro sería afectado; y explicar cómo los intereses que el grupo desea proteger son pertinentes al propósito del grupo.

Después del cierre de todos los períodos de comentarios y de petición que aplican, el Director Ejecutivo enviará la solicitud y cualquier petición para reconsideración o para una audiencia de caso impugnado a los Comisionados de la TCEQ para su consideración durante una reunión programada de la Comisión. La Comisión sólo puede conceder una solicitud de una audiencia de caso impugnado sobre los temas que el solicitante haya presentado en sus comentarios oportunos que no fueron retirados posteriormente. Si se concede una audiencia, el tema de la audiencia estará limitado a cuestiones de hecho en disputa o cuestiones mixtas de hecho y de derecho relacionadas a intereses pertinentes y materiales de calidad del agua que se hayan presentado durante el período de comentarios.

La Comisión otorgará solamente una audiencia administrativa de lo contencioso sobre los hechos reales disputados del caso que son pertinentes y esenciales para la decisión de la Comisión sobre la solicitud. Además, la Comisión sólo otorgará una audiencia administrativa de lo contencioso sobre los asuntos que fueron presentados antes del plazo de vencimiento y que no fueron retirados posteriormente. **Si ciertos criterios se cumplen, la TCEQ puede actuar sobre una solicitud para renovar un permiso para descargar aguas residuales sin proveer una oportunidad de una audiencia administrativa de lo contencioso.**

ACCIÓN DEL DIRECTOR EJECUTIVO. El Director Ejecutivo puede emitir la aprobación final de la solicitud a menos que se presente una solicitud de audiencia de caso impugnado oportunamente o una solicitud de reconsideración. Si se presenta una solicitud de audiencia oportuna o una solicitud de reconsideración, el Director Ejecutivo no emitirá la aprobación final del permiso y enviará la solicitud y la petición a los Comisionados de la TCEQ para su consideración en una reunión programada de la Comisión.

LISTA DE CORREO. Si envía comentarios públicos, una solicitud de una audiencia de caso impugnado o una reconsideración de la decisión del Director Ejecutivo, se le agregará a la lista de correo para que esta solicitud reciba avisos públicos futuros enviadas por correo por la Oficina del Secretario Oficial. Además, puede solicitar ser colocado en: (1) la lista de correo permanente para un nombre de solicitante específico y número de permiso; y/o (2) la lista de correo para un condado específico. Para ser colocado en la lista de correo permanente y / o del condado, especifique claramente qué lista(s) y envíe su solicitud a la Oficina del Secretario Oficial de la TCEQ a la dirección a continuación.

Todos los comentarios públicos escritos y las solicitudes de reunión pública deben enviarse a la Office of the Chief Clerk, MC 105, TCEQ, P.O. Box 13087, Austin, TX 78711-3087 o electrónicamente a https://www14.tceq.texas.gov/epic/eComment/ dentro de los 30 días a partir de la fecha de publicación de este aviso en el periódico.

INFORMACIÓN DISPONIBLE EN LÍNEA. Para obtener detalles sobre el estado de la solicitud, visite la Base de Datos Integrada de los Comisionados en www.tceq.texas.gov/goto/cid. Busque en la base de datos utilizando el número de permiso para esta solicitud, que se proporciona en la parte superior de este aviso.

CONTACTOS E INFORMACIÓN DE LA AGENCIA. Los comentarios y solicitudes públicas deben enviarse electrónicamente a https://www14.tceq.texas.gov/epic/eComment/, o por escrito a Texas Commission on Environmental Quality, Office of the Chief Clerk, MC-105, P.O. Box 13087, Austin, Texas 78711-3087. Cualquier información personal que envíe a al TCEQ pasará a formar parte del registro de la agencia; esto incluye las direcciones de correo electrónico. Para obtener más información sobre esta solicitud de permiso o el proceso de permisos, llame al Programa de Educación Pública de la TCEQ, sin cargo, al 1-800-687-4040 o visite su sitio web en www.tceq.texas.gov/goto/pep. Si desea información en español, puede llamar al 1-800-687-4040.

También se puede obtener más información de Luminant Generation Company LLC en la dirección indicada anteriormente o llamando al Sr. Ryan Bayle, Gerente Ambiental, al 214-875-8294.

Emitido: 4 de septiembre de 2025

Luminant

Renee Collins
Sr. Director,
Environmental Services
renee.collins@luminant.com

Luminant
6555 Sierra Drive
Irving, TX 75039

T 214.875.8338
C 214.406.2452
F 214.875.8699

Delivered Via FedEx
FTP File Upload

May 30, 2024

Texas Commission on Environmental Quality
Water Quality Division
Applications Review and Processing Team (MC148)
12100 Park 35 Circle
Austin, Texas 78753

Re: Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Industrial Wastewater Permit Renewal Application
TPDES Permit No. WQ0000551000

Dear Sir/Madam:

Luminant Generation Company LLC hereby submits one original and two copies of the Industrial Wastewater Permit Application for renewal of the above referenced TPDES Permit. This application consists of the "Industrial Administrative Report" and the "Industrial Technical Report" and associated attachments. A copy of the complete application will also be uploaded to the TCEQ FTP server.

If you have any questions, please contact Ryan Bayle at 214-875-8294 or via e-mail at ryan.bayle@luminant.com.

Sincerely,

Renee Collins

RMB
Attachment

Luminant Generation Company LLC
Graham Steam Electric Station

TPDES Industrial Wastewater Permit Renewal Application

Permit No. WQ0000551000

May 2024

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

INDUSTRIAL WASTEWATER PERMIT APPLICATION CHECKLIST

Complete and submit this checklist with the industrial wastewater permit application.

APPLICANT NAME: Luminant Generation Company LLC

PERMIT NUMBER (If new, leave blank): WQ00 00551000

Indicate if each of the following items is included in your application.

	Y	N
Administrative Report 1.0	☒	☐
Administrative Report 1.1	☐	☒
SPIF	☒	☐
Core Data Form	☒	☐
Public Involvement Plan Form	☐	☒
Plain Language Summary	☒	☐
Technical Report 1.0	☒	☐
Worksheet 1.0	☒	☐
Worksheet 2.0	☒	☐
Worksheet 3.0	☐	☒
Worksheet 3.1	☐	☒
Worksheet 3.2	☐	☒
Worksheet 3.3	☐	☒
Worksheet 4.0	☒	☐
Worksheet 4.1	☐	☒
Worksheet 5.0	☐	☒
Worksheet 6.0	☐	☒
Worksheet 7.0	☐	☒
Worksheet 8.0	☐	☒
Worksheet 9.0	☐	☒
Worksheet 10.0	☐	☒
Worksheet 11.0	☒	☐
Worksheet 11.1	☒	☐
Worksheet 11.2	☒	☐
Worksheet 11.3	☒	☐
Original USGS Map	☒	☐
Affected Landowners Map	☐	☒
Landowner Disk or Labels	☐	☒
Flow Diagram	☒	☐
Site Drawing	☒	☐
Original Photographs	☐	☒
Design Calculations	☒	☐
Solids Management Plan	☐	☒
Water Balance	☒	☐

For TCEQ Use Only

Segment Number ______________________ County ______________________
Expiration Date ______________________ Region ______________________
Permit Number ____

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

INDUSTRIAL WASTEWATER PERMIT APPLICATION ADMINISTRATIVE REPORT 1.0

This report is required for all applications for TPDES permits and TLAPs, except applications for oil and gas extraction operations subject to 40 CFR Part 435. Contact the Applications Review and Processing Team at 512-239-4671 with any questions about completing this report.

Applications for oil and gas extraction operations subject to 40 CFR Part 435 must use the Oil and Gas Exploration and Production Administrative Report (TCEQ Form-20893 and 20893-inst[1]).

Item 1. Application Information and Fees (Instructions, Page 26)

a. Complete each field with the requested information, if applicable.

Applicant Name: Luminant Generation Company LLC

Permit No.: WQ0000551000

EPA ID No.: TX0001163

Expiration Date: Click to enter text.

b. Check the box next to the appropriate authorization type.

☒ Industrial Wastewater (wastewater and stormwater)

☐ Industrial Stormwater (stormwater only)

c. Check the box next to the appropriate facility status.

☒ Active ☐ Inactive

d. Check the box next to the appropriate permit type.

☒ TPDES Permit ☐ TLAP ☐ TPDES with TLAP component

e. Check the box next to the appropriate application type.

☐ New

☐ Renewal with changes ☒ Renewal without changes

☐ Major amendment with renewal ☐ Major amendment without renewal

☐ Minor amendment without renewal

☐ Minor modification without renewal

f. If applying for an amendment or modification, describe the request: N/A

For TCEQ Use Only

Segment Number ______________________ County ______________________

Expiration Date ______________________ Region ______________________

Permit Number ____

[1] https://www.tceq.texas.gov/publications/search_forms.html

g. Application Fee

EPA Classification	New	Major Amend. (with or without renewal)	Renewal (with or without changes)	Minor Amend. / Minor Mod. (without renewal)
Minor facility not subject to EPA categorical effluent guidelines (40 CFR Parts 400-471)	☐ $350	☐ $350	☐ $315	☐ $150
Minor facility subject to EPA categorical effluent guidelines (40 CFR Parts 400-471)	☐ $1,250	☐ $1,250	☐ $1,215	☐ $150
Major facility	N/A [2]	☐ $2,050	☒ $2,015	☐ $450

h. Payment Information

Mailed

Check or money order No.: Click to enter text.

Check or money order amt.: Click to enter text.

Named printed on check or money order: Click to enter text.

Epay

Voucher number: 707022/707023

Copy of voucher attachment: A

Item 2. Applicant Information (Instructions, Pages 26)

a. Customer Number, if applicant is an existing customer: CN603256413

Note: Locate the customer number using the TCEQ's Central Registry Customer Search[3].

b. Legal name of the entity (applicant) applying for this permit: Luminant Generation Company LLC

Note: The owner of the facility must apply for the permit. The legal name must be spelled exactly as filed with the TX SOS, Texas Comptroller of Public Accounts, County, or in the legal documents forming the entity.

c. Name and title of the person signing the application. (**Note:** The person must be an executive official that meets signatory requirements in 30 TAC § 305.44.)

Prefix: Click to enter text. Full Name (Last/First Name): Collins, Renee

Title: Sr. Director Environmental Services Credential: Click to enter text.

d. Will the applicant have overall financial responsibility for the facility?

[2] All facilities are designated as minors until formally classified as a major by EPA.

[3] https://www15.tceq.texas.gov/crpub/index.cfm?fuseaction=cust.CustSearch

☒ Yes ☐ No

Note: The entity with overall financial responsibility for the facility must apply as a co-applicant, if not the facility owner.

Item 3. Co-applicant Information (Instructions, Page 27)

☒ Check this box if there is no co-applicant.; otherwise, complete the below questions.

a. Legal name of the entity (co-applicant) applying for this permit: Click to enter text.

Note: The legal name must be spelled exactly as filed with the TX SOS, Texas Comptroller of Public Accounts, County, or in the legal documents forming the entity.

b. Customer Number (if applicant is an existing customer): CNClick to enter text.

Note: Locate the customer number using the TCEQ's Central Registry Customer Search.

c. Name and title of the person signing the application. (**Note:** The person must be an executive official that meets signatory requirements in 30 TAC § 305.44.)

Prefix: Click to enter text. Full Name (Last/First Name): Click to enter text.

Title: Click to enter text. Credential: Click to enter text.

d. Will the co-applicant have overall financial responsibility for the facility?

☐ Yes ☐ No

Note: The entity with overall financial responsibility for the facility must apply as a co-applicant, if not the facility owner.

Item 4. Core Data Form (Instructions, Pages 27)

a. Complete one Core Data Form (TCEQ Form 10400) for each customer (applicant and co-applicant(s)) and include as an attachment. If the customer type selected on the Core Data Form is Individual, complete Attachment 1 of the Administrative Report. Attachment: B

Item 5. Application Contact Information (Instructions, Page 27)

Provide names of two individuals who can be contact for additional information about this application. Indicate if the individual can be contact about administrative or technical information, or both.

a. ☒ Administrative Contact . ☒ Technical Contact

Prefix: Click to enter text. Full Name (Last/First Name): Bayle, Ryan

Title: Environmental Manager Credential: P.G.

Organization Name: Luminant Generation Company LLC

Mailing Address: 6555 Sierra Drive City/State/Zip: Irving, TX 75039

Phone No: 214-875-8294 Email: ryan.bayle@vistracorp.com

b. ☐ Administrative Contact ☒ Technical Contact

Prefix: Click to enter text. Full Name (Last/First Name): Manthei, Dustin

Title: Environmental Coordinator Credential: Click to enter text.

Organization Name: Luminant Generation Company LLC

Mailing Address: 6555 Sierra Drive City/State/Zip: Irving, TX 75039

Phone No: 214-295-7334 Email: dustin.manthei@vistracorp.com

Attachment: Click to enter text.

Item 6. Permit Contact Information (Instructions, Page 28)

Provide two names of individuals that can be contacted throughout the permit term.

a. Prefix: Click to enter text. Full Name (Last/First Name): Bayle, Ryan

Title: Environmental Manager Credential: P.G.

Organization Name: Luminant Generation Company LLC

Mailing Address: 6555 Sierra Drive City/State/Zip: Irving, TX 75039

Phone No: 214-875-8294 Email: ryan.bayle@vistracorp.com

b. Prefix: Click to enter text. Full Name (Last/First Name): Manthei, Dustin

Title: Environmental Coordinator Credential: Click to enter text.

Organization Name: Luminant Generation Company LLC

Mailing Address: 6555 Sierra Drive City/State/Zip: Irving, TX 75039

Phone No: 214-295-7334 Email: dustin.manthei@vistracorp.com

Attachment: Click to enter text.

Item 7. Billing Contact Information (Instructions, Page 28)

The permittee is responsible for paying the annual fee. The annual fee will be assessed for permits **in effect on September 1 of each year**. The TCEQ will send a bill to the address provided in this section. The permittee is responsible for terminating the permit when it is no longer needed (form TCEQ-20029).

Provide the complete mailing address where the annual fee invoice should be mailed and the name and phone number of the permittee's representative responsible for payment of the invoice.

Prefix: Click to enter text. Full Name (Last/First Name): Bayle, Ryan

Title: Environmental Manger Credential: P.G.

Organization Name: Luminant Generation Company LLC

Mailing Address: 6555 Sierra Drive City/State/Zip: Irving, TX 75039

Phone No: 214-875-8294 Email: ryan.bayle@vistracorp.com

Item 8. DMR/MER Contact Information (Instructions, Page 28)

Provide the name and mailing address of the person delegated to receive and submit DMRs or MERs. **Note:** DMR data must be submitted through the NetDMR system. An electronic reporting account can be established once the facility has obtained the permit number.

Prefix: Click to enter text. Full Name (Last/First Name): Whitaker, Josh

Title: Director Environmental Services Credential: Click to enter text.

Organization Name: Luminant Generation Company LLC

Mailing Address: 6555 Sierra Drive City/State/Zip: Irving, TX 75039

Phone No: 214-875-8378 Email: josh.whitaker@vistracorp.com

Item 9. Notice Information (Instructions, Pages 28)

a. Individual Publishing the Notices

Prefix: Click to enter text. Full Name (Last/First Name): Bayle, Ryan

Title: Environmental Manager Credential: P.G.

Organization Name: Luminant Generation Company LLC

Mailing Address: 6555 Sierra Drive City/State/Zip: Irving, TX 75039

Phone No: 214-875-8294 Email: ryan.bayle@vistracorp.com

b. Method for Receiving Notice of Receipt and Intent to Obtain a Water Quality Permit Package (only for NORI, NAPD will be sent via regular mail)

☒ E-mail: ryan.bayle@vistracorp.com

☐ Fax: Click to enter text.

☒ Regular Mail (USPS)

Mailing Address: 6555 Sierra Drive

City/State/Zip Code: Irving, TX 75039

c. Contact in the Notice

Prefix: Click to enter text. Full Name (Last/First Name): Bayle, Ryan

Title: Environmental Manager Credential: P.G.

Organization Name: Luminant Generation Company LLC

Phone No: 214-875-8294 Email: ryan.bayle@vistracorp.com

d. Public Viewing Location Information

Note: If the facility or outfall is located in more than one county, provide a public viewing place for each county.

Public building name: Young County Courthouse Location within the building: Young County Clerk's Office

Physical Address of Building: 516 Fourth Street

City: Graham County: Young

e. Bilingual Notice Requirements

This information is required for new, major amendment, minor amendment or minor modification, and renewal applications.

This section of the application is only used to determine if alternative language notices will be needed. Complete instructions on publishing the alternative language notices will be in your public notice package.

Call the bilingual/ESL coordinator at the nearest elementary and middle schools and obtain the following information to determine if an alternative language notice(s) is required.

1. Is a bilingual education program required by the Texas Education Code at the elementary or middle school nearest to the facility or proposed facility?

☒ Yes ☐ No

If no, publication of an alternative language notice is not required; skip to Item 8 (Regulated Entity and Permitted Site Information.)

2. Are the students who attend either the elementary school or the middle school enrolled in a bilingual education program at that school?

   ☒ Yes ☐ No

3. Do the students at these schools attend a bilingual education program at another location?

   ☐ Yes ☒ No

4. Would the school be required to provide a bilingual education program, but the school has waived out of this requirement under 19 TAC §89.1205(g)?

   ☐ Yes ☒ No ☐ N/A

5. If the answer is yes to question 1, 2, 3, or 4, public notices in an alternative language are required. Which language is required by the bilingual program? Spanish

f. Plain Language Summary Template – Complete the Plain Language Summary (TCEQ Form 20972) and include as an attachment. Attachment: C

g. Complete one Public Involvement Plan (PIP) Form (TCEQ Form 20960) for each application for a new permit or major amendment and include as an attachment. Attachment: N/A

Item 10. Regulated Entity and Permitted Site Information (Instructions Page 29)

a. TCEQ issued Regulated Entity Number (RN), if available: RN102563426

   Note: If your business site is part of a larger business site, a Regulated Entity Number (RN) may already be assigned for the larger site. Use the RN assigned for the larger site. Search the TCEQ's Central Registry to determine the RN or to see if the larger site may already be registered as a Regulated Entity. If the site is found, provide the assigned RN.

b. Name of project or site (the name known by the community where located): Graham Steam Electric Station

c. Is the location address of the facility in the existing permit the same?

   ☒ Yes ☐ No ☐ N/A (new permit)

   Note: If the facility is located in Bexar, Comal, Hays, Kinney, Medina, Travis, Uvalde, or Williamson County, additional information concerning protection of the Edwards Aquifer may be required.

d. Owner of treatment facility:

   Prefix: Click to enter text. Full Name (Last/First Name): Click to enter text.

   or Organization Name: Luminant Generation Company LLC

   Mailing Address: 6555 Sierra Drive City/State/Zip: Irving, TX 75039

   Phone No: 214-872-8294 Email: ryan.bayle@vistracorp.com

e. Ownership of facility: ☐ Public ☒ Private ☐ Both ☐ Federal

f. Owner of land where treatment facility is or will be: Click to enter text.

Prefix: Click to enter text. Full Name (Last/First Name): Click to enter text.

or Organization Name: Luminant Generation Company LLC

Mailing Address: 6555 Sierra Drive City/State/Zip: Irving, TX 75039

Phone No: 214-875-8294 Email: ryan.bayle@vistracorp.com

Note: If not the same as the facility owner, attach a long-term lease agreement in effect for at least six years (In some cases, a lease may not suffice - see instructions). Attachment: N/A

g. Owner of effluent TLAP disposal site (if applicable): N/A

Prefix: Click to enter text. Full Name (Last/First Name): Click to enter text.

or Organization Name: Click to enter text.

Mailing Address: Click to enter text. City/State/Zip: Click to enter text.

Phone No: Click to enter text. Email: Click to enter text.

Note: If not the same as the facility owner, attach a long-term lease agreement in effect for at least six years. Attachment: Click to enter text.

h. Owner of sewage sludge disposal site (if applicable):

Prefix: Click to enter text. Full Name (Last/First Name): N/A

or Organization Name: Click to enter text.

Mailing Address: Click to enter text. City/State/Zip: Click to enter text.

Phone No: Click to enter text. Email: Click to enter text.

Note: If not the same as the facility owner, attach a long-term lease agreement in effect for at least six years. Attachment: Click to enter text.

Item 11. TDPES Discharge/TLAP Disposal Information (Instructions, Page 31)

a. Is the facility located on or does the treated effluent cross Native American Land?

☐ Yes ☒ No

b. Attach an original full size USGS Topographic Map (or an 8.5"×11" reproduced portion for renewal or amendment applications) with all required information. Check the box next to each item below to confirm it has been included on the map.

☒ One-mile radius
☒ Three-miles downstream information
☒ Applicant's property boundaries
☐ Treatment facility boundaries
☒ Labeled point(s) of discharge
☒ Highlighted discharge route(s)
☐ Effluent disposal site boundaries
☒ All wastewater ponds
☐ Sewage sludge disposal site
☐ New and future construction

Attachment: D

c. Is the location of the sewage sludge disposal site in the existing permit accurate?

☐ Yes ☐ No or New Permit

If no, or a new application, provide an accurate location description: N/A

d. Are the point(s) of discharge in the existing permit correct?

☒ Yes ☐ No or New Permit

If no, or a new application, provide an accurate location description: Click to enter text.

e. Are the discharge route(s) in the existing permit correct?

☒ Yes ☐ No or New Permit

If no, or a new permit, provide an accurate description of the discharge route: Click to enter text.

f. City nearest the outfall(s): Graham, TX

g. County in which the outfalls(s) is/are located: Young

h. Is or will the treated wastewater discharge to a city, county, or state highway right-of-way, or a flood control district drainage ditch?

☐ Yes ☒ No

If yes, indicate by a check mark if: ☐ Authorization granted ☐ Authorization pending

For new and amendment applications, attach copies of letters that show proof of contact and provide the approval letter upon receipt. Attachment: Click to enter text.

For all applications involving an average daily discharge of 5 MGD or more, provide the names of all counties located within 100 statute miles downstream of the point(s) of discharge: Young, Palo Pinto, Parker, Hood, Johnson, Somervell, Bosque and Hill

i. For TLAPs, is the location of the effluent disposal site in the existing permit accurate?

☐ Yes No or New Permit ☒ N/A

If no, or a new application, provide an accurate location description: Click to enter text.

j. City nearest the disposal site: N/A

k. County in which the disposal site is located: N/A

l. For TLAPs, describe how effluent is/will be routed from the treatment facility to the disposal site: N/A

m. For TLAPs, identify the nearest watercourse to the disposal site to which rainfall runoff might flow if not contained: N/A

Item 12. Miscellaneous Information (Instructions, Page 33)

a. Did any person formerly employed by the TCEQ represent your company and get paid for service regarding this application?

☐ Yes ☒ No

If yes, list each person: Click to enter text.

b. Do you owe any fees to the TCEQ?

☐ Yes ☒ No

If yes, provide the following information:

Account no.: Click to enter text.

Total amount due: Click to enter text.

c. Do you owe any penalties to the TCEQ?

☐ Yes ☒ No

If yes, provide the following information:

Enforcement order no.: Click to enter text.

Amount due: Click to enter text.

Item 13. Signature Page (Instructions, Page 33)

Permit No: WQ0000551000

Applicant Name: Luminant Generation Company LLC

Certification: I, Renee Collins, certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

I further certify that I am authorized under 30 Texas Administrative Code §305.44 to sign and submit this document and can provide documentation in proof of such authorization upon request.

Signatory name (typed or printed): Renee Collins

Signatory title: Sr. Director Environmental Services

Signature: Ren Col Date: 5/30/2024
(Use blue ink)

Subscribed and Sworn to before me by the said Renee Collins
on this 30th day of May, 2024.
My commission expires on the 29th day of August, 2025.

Tish Goodspeed
Notary Public

TISH GOODSPEED
My Notary ID # 129536082
Expires August 29, 2025

[SEAL]

Dallas
County, Texas

Note: *If co-applicants are necessary, each entity must submit an original, separate signature page.*

VISTRA

Vistra Corp.
6555 Sierra Drive
Irving, TX 75039

O 214-875-8996

Texas Commission on Environmental Quality
12100 Park 35 Circle
Austin, Texas 78753

Re: Delegation of Administrative Authority for Vistra Corp.

This letter confirms the signatory authority for environmental matters related to the subsidiary entities of Vistra Operations Company LLC, which is a subsidiary of Vistra Corp.

Vistra Operations Company LLC hereby authorizes Renee Collins, Senior Director – Environmental Services, to act in the following capacities as it relates to administrative issues related to the below listed subsidiaries: Authorized Responsible Official and Alternate Designated Representative; as well, Ms. Collins has signatory authority for all air, water and waste permitting activities, and for water rights and water quality regulatory submissions. Those subsidiaries for which Ms. Collins has signatory authority are: Luminant Mining Company LLC, Luminant Generation Company LLC, La Frontera Holdings, LLC, Sandow Power Company LLC, Oak Grove Management Company LLC, Coleto Creek Power, LLC, Brightside Solar, LLC, Emerald Grove, LLC, and Core Solar SPV I, LLC.

Vistra Operations Company LLC hereby authorizes Renee Collins, Senior Director – Environmental Services, to act in the following capacities as it relates to administrative issues related to the below listed Vistra Corp. subsidiaries: Duly Authorized Representative and Alternate Designated Representative; as well, Ms. Collins has signatory authority for all air, water and waste permitting activities, and for water rights and water quality regulatory submissions. Those subsidiaries for which Ms. Collins has signatory authority are: Midlothian Energy, LLC and Wharton County Generation LLC.

This delegation of authority is effective as of August 23, 2021, supersedes all previous delegations for this responsibility, and is valid until revoked or revised by Vistra Operations Company LLC.

I, Barry Boswell, being Executive Vice President—Generation Operations and Services of Vistra Operations Company LLC, the parent company to each of the above listed entities, and designee in charge of business functions, policy or decision-making functions for solar, battery, and fossil operations, hereby delegate authority, as detailed herein, to Renee Collins, Senior Director – Environmental Services.

Barry Boswell 9/8/21

Signature Date

cc: David Mitchell – Senior Counsel

INDUSTRIAL WASTEWATER PERMIT APPLICATION

SUPPLEMENTAL PERMIT INFORMATION FORM (SPIF)

This form applies to TPDES permit applications only. Complete and attach the Supplemental Permit information Form (SPIF) (TCEQ Form 20971).

Attachment: E

INDUSTRIAL WASTEWATER PERMIT APPLICATION CHECKLIST OF COMMON DEFICIENCIES

Below is a list of common deficiencies found during the administrative review of industrial wastewater permit applications. To ensure the timely processing of this application, please review the items below and indicate each item is complete and in accordance applicable rules at 30 TAC Chapters 21, 281, and 305 by checking the box next to the item. If an item is not required this application, indicate by checking N/A where appropriate. Please do not submit the application until all items below are addressed.

☒ Core Data Form (TCEQ Form No. 10400)
(Required for all applications types. Must be completed in its entirety and signed. Note: Form may be signed by applicant representative.)

☒ Correct and Current Industrial Wastewater Permit Application Forms
(TCEQ Form Nos. 10055 and 10411. Version dated 5/10/2019 or later.)

☐ Water Quality Permit Payment Submittal Form (Page 14)
(Original payment sent to TCEQ Revenue Section. See instructions for mailing address.)

☒ 7.5 Minute USGS Quadrangle Topographic Map Attached
*(Full-size map if seeking "New" permit.
8 ½ x 11 acceptable for Renewals and Amendments.)*

☒ N/A ☐ Current/Non-Expired, Executed Lease Agreement or Easement Attached

☒ N/A ☐ Landowners Map
(See instructions for landowner requirements.)

Things to Know:

- All the items shown on the map must be labeled.
- The applicant's complete property boundaries must be delineated which includes boundaries of contiguous property owned by the applicant.
- The applicant cannot be its own adjacent landowner. You must identify the landowners immediately adjacent to their property, regardless of how far they are from the actual facility.
- If the applicant's property is adjacent to a road, creek, or stream, the landowners on the opposite side must be identified. Although the properties are not adjacent to applicant's property boundary, they are considered potentially affected landowners. If the adjacent road is a divided highway as identified on the USGS topographic map, the applicant does not have to identify the landowners on the opposite side of the highway.

☒ N/A ☐ Landowners Cross Reference List
(See instructions for landowner requirements.)

☒ N/A ☐ Landowners Labels or CD-RW attached
(See instructions for landowner requirements.)

☒ Original signature per 30 TAC § 305.44 – Blue Ink Preferred
(If signature page is not signed by an elected official or principle executive officer, a copy of signature authority/delegation letter must be attached.)

☒ Plain Language Summary

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

INDUSTRIAL WASTEWATER PERMIT APPLICATION TECHNICAL REPORT 1.0

The following information **is required** for all applications for a TLAP or an individual TPDES discharge permit.

For **additional information** or clarification on the requested information, please refer to the Instructions for Completing the Industrial Wastewater Permit Application[1] available on the TCEQ website. Please contact the Industrial Permits Team at 512-239-4671 with any questions about this form.

If more than one outfall is included in the application, provide applicable information for each individual outfall. **If an item does not apply to the facility, enter N/A** to indicate that the item has been considered. Include separate reports or additional sheets as **clearly cross-referenced attachments** and provide the attachment number in the space provided for the item the attachment addresses.

NOTE: This application is for an industrial wastewater permit only. Additional authorizations from the TCEQ Waste Permits Division or the TCEQ Air Permits Division may be needed.

Item 1. Facility/Site Information (Instructions, Page 39)

a. Describe the general nature of the business and type(s) of industrial and commercial activities. Include all applicable SIC codes (up to 4).

Generation of Electricity

b. Describe all wastewater-generating processes at the facility.

See attachment F: General Description

1 https://www.tceq.texas.gov/permitting/wastewater/industrial/TPDES_industrial_wastewater_steps.html

c. Provide a list of raw materials, major intermediates, and final products handled at the facility.

Materials List

Raw Materials	Intermediate Products	Final Products
Water	Steam	Electricity
Natural Gas		
Fuel Oil		

Attachment: Click to enter text.

d. Attach a facility map (drawn to scale) with the following information:

- Production areas, maintenance areas, materials-handling areas, waste-disposal areas, and water intake structures.
- The location of each unit of the WWTP including the location of wastewater collection sumps, impoundments, outfalls, and sampling points, if significantly different from outfall locations.

Attachment: G: Facility Map

e. Is this a new permit application for an existing facility?

☐ Yes ☒ No

If **yes**, provide background discussion: N/A

f. Is/will the treatment facility/disposal site be located above the 100-year frequency flood level.

☒ Yes ☐ No

List source(s) used to determine 100-year frequency flood plain: FEMA Flood Insurance Rate Map, Young County Texas Panel 350 if 625, Map #4850C.350E, July 18, 2011

If **no**, provide the elevation of the 100-year frequency flood plain and describe what protective measures are used/proposed to prevent flooding (including tail water and rainfall run-on controls) of the treatment facility and disposal area: Click to enter text.

Attachment: Click to enter text.

g. For **new** or **major amendment** permit applications, will any construction operations result in a discharge of fill material into a water in the state?

☐ Yes ☐ No ☒ N/A (renewal only)

h. If **yes** to Item 1.g, has the applicant applied for a USACE CWA Chapter 404 Dredge and Fill permit?

☐ Yes ☐ No

If **yes**, provide the permit number: Click to enter text.

If **no**, provide an approximate date of application submittal to the USACE: Click to enter text.

Item 2. Treatment System (Instructions, Page 40)

a. List any physical, chemical, or biological treatment process(es) used/proposed to treat wastewater at this facility. Include a description of each treatment process, starting with initial treatment and finishing with the outfall/point of disposal.

TREATMENT PROCESS	TREATMENT UNIT	CAPACITY or DIMENSIONS	OUTFALL
1. Oil/Water Separation Oil Skimmer	Oil/Water Separators (2)	76.3 gallons each	002
2. Evaporation	Evaporation Pond	170,000 Gallons	102
3. Solids Settling	Settling Pond	1,795,200 Gallons	002
4. pH Control	Neutralization Tank	54,200 Gallons	002

Additional information is available in Attachment E: General Description.

b. Attach a flow schematic **with a water balance** showing all sources of water and wastewater flow into the facility, wastewater flow into and from each treatment unit, and wastewater flow to each outfall/point of disposal.

Attachment: H: Water Balance Diagram

Item 3. Impoundments (Instructions, Page 40)

Does the facility use or plan to use any wastewater impoundments (e.g., lagoons or ponds?)

☒ Yes ☐ No

If **no**, proceed to Item 4. If **yes**, complete **Item 3.a** for **existing** impoundments and **Items 3.a - 3.e** for **new or proposed** impoundments. **NOTE:** See instructions, Pages 40-42, for additional information on the attachments required by Items 3.a - 3.e.

a. Complete the table with the following information for each existing, new, or proposed impoundment. Attach additional copies of the Impoundment Information table, if needed.

Use Designation: Indicate the use designation for each impoundment as Treatment (**T**), Disposal (**D**), Containment (**C**), or Evaporation (**E**).

Associated Outfall Number: Provide an outfall number if a discharge occurs or will occur.

Liner Type: Indicate the liner type as Compacted clay liner (**C**), In-situ clay liner (**I**), Synthetic/plastic/rubber liner (**S**), or Alternate liner (**A**). **NOTE:** See instructions for further detail on liner specifications. If an alternate liner (A) is selected, include an attachment that provides a description of the alternate liner and any additional technical information necessary for an evaluation.

Leak Detection System: If any leak detection systems are in place/planned, enter **Y** for yes. Otherwise, enter **N** for no.

Groundwater Monitoring Wells and Data: If groundwater monitoring wells are in place/planned, enter **Y** for yes. Otherwise, enter **N** for no. Attach any existing groundwater monitoring data.

Dimensions: Provide the dimensions, freeboard, surface area, storage capacity of the impoundments, and the maximum depth (not including freeboard). For impoundments with irregular shapes, submit surface area instead of length and width.

Compliance with 40 CFR Part 257, Subpart D: If the impoundment is required to be in compliance with 40 CFR Part 257, Subpart D, enter **Y** for yes. Otherwise, enter **N** for no.

Date of Construction: Enter the date construction of the impoundment commenced (mm/dd/yy).

Impoundment Information

Parameter	**Pond #**	**Pond #**	**Pond #**	**Pond #**
Use Designation: (T) (D) (C) or (E)	T, D	T, D, C, E		
Associated Outfall Number	002	102		
Liner Type (C) (I) (S) or (A)	None	C, S		
Alt. Liner Attachment Reference	N/A	N/A		
Leak Detection System, Y/N	N	N		
Groundwater Monitoring Wells, Y/N	N	N		
Groundwater Monitoring Data Attachment	N/A	N/A		
Pond Bottom Located Above The Seasonal High-Water Table, Y/N	Y	Y		
Length (ft)	N/A	125		
Width (ft)	N/A	60		
Max Depth From Water Surface (ft), Not Including Freeboard	4'	5'		
Freeboard (ft)	2'	2'		
Surface Area (acres)	1.38	0.27		
Storage Capacity (gallons)	1,795,200	170,000		
40 CFR Part 257, Subpart D, Y/N	N	N		
Date of Construction	~1960	~1960		

Attachment: Click to enter text.

The following information (**Items 3.b – 3.e**) is required only for **new or proposed** impoundments.

b. For new or proposed impoundments, attach any available information on the following items. If attached, check **yes** in the appropriate box. Otherwise, check **no** or **not yet designed.**

1. Liner data

☐ Yes ☐ No ☐ Not yet designed

2. Leak detection system or groundwater monitoring data

☐ Yes ☐ No ☐ Not yet designed

3. Groundwater impacts

☐ Yes ☐ No ☐ Not yet designed

NOTE: Item b.3 is required if the bottom of the pond is not above the seasonal high-water table in the shallowest water-bearing zone.

Attachment: N/A

For TLAP applications: Items 3.c – 3.e are **not required**, continue to Item 4.

c. Attach a USGS map or a color copy of original quality and scale which accurately locates and identifies all known water supply wells and monitor wells within ½-mile of the impoundments.

Attachment: N/A

d. Attach copies of State Water Well Reports (e.g., driller's logs, completion data, etc.), and data on depths to groundwater for all known water supply wells including a description of how the depths to groundwater were obtained.

Attachment: N/A

e. Attach information pertaining to the groundwater, soils, geology, pond liner, etc. used to assess the potential for migration of wastes from the impoundments or the potential for contamination of groundwater or surface water.

Attachment: N/A

Item 4. Outfall/Disposal Method Information (Instructions, Page 42)

Complete the following tables to describe the location and wastewater discharge or disposal operations for each outfall for discharge, and for each point of disposal for TLAP operations.

If there are more outfalls/points of disposal at the facility than the spaces provided, copies of pages 6 and/0r numbered accordingly (i.e., page 6a, 6b, etc.) may be used to provide information on the additional outfalls.

For TLAP applications: Indicate the disposal method and each individual irrigation area **I**, evaporation pond **E**, or subsurface drainage system **S** by providing the appropriate letter designation for the disposal method followed by a numerical designation for each disposal area in the space provided for **Outfall** number (e.g. **E1** for evaporation pond 1, **I2** for irrigation area No. 2, etc.).

Outfall Longitude and Latitude

Outfall No.	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
001	33.133353	-98.609709
002	33.130283	-98.615402
102	33.136396	-98.613110

Outfall Location Description

Outfall No.	Location Description
001	From the Once-Through Cooling Discharge Canal to Lake Eddleman.
002	From the treatment pond through an inverted weir through the discharge pipe to Salt Creek.
102	From the lined evaporation pond to the treatment pond.

Description of Sampling Point(s) (if different from Outfall location)

Outfall No.	Description of sampling point

Outfall Flow Information – Permitted and Proposed

Outfall No.	Permitted Daily Avg Flow (MGD)	Permitted Daily Max Flow (MGD)	Proposed Daily Avg Flow (MGD)	Proposed Daily Max Flow (MGD)	Anticipated Discharge Date (mm/dd/yy)
001	505.4	505.4	505.4	505.4	
002	Report	Report	Report	Report	
102	Report	Report	Report	Report	

Outfall Discharge – Method and Measurement

Outfall No.	Pumped Discharge? Y/N	Gravity Discharge? Y/N	Type of Flow Measurement Device Used
001	Y	N	Record
002	N	Y	Estimate
102	Y	N	Estimate

Outfall Discharge – Flow Characteristics

Outfall No.	Intermittent Discharge? Y/N	Continuous Discharge? Y/N	Seasonal Discharge? Y/N	Discharge Duration (hrs/day)	Discharge Duration (days/mo)	Discharge Duration (mo/yr)
001	N	Y	N	12	31	12

Outfall No.	Intermittent Discharge? Y/N	Continuous Discharge? Y/N	Seasonal Discharge? Y/N	Discharge Duration (hrs/day)	Discharge Duration (days/mo)	Discharge Duration (mo/yr)
002	N	Y	N	12	31	12
102	Y	N	N	N/A	N/A	N/A

Outfall Wastestream Contributions

Outfall No. **001**

Contributing Wastestream	Volume (MGD)	Percent (%) of Total Flow
Once-through cooling & Auxiliary Cooling Water	505.4	505.4
See Attachment F: General Description for additional information		

Outfall No. **002**

Contributing Wastestream	Volume (MGD)	Percent (%) of Total Flow
Boiler Blowdown	0.062	Variable
Floor/equipment drains	Variable	Variable
Storm water runoff	Variable	Variable
Storm water runoff from construction	Variable	Variable
Previously Monitored Effluent from Outfall 102	Variable	Variable
Water Treatment Wastes	Variable	Variable
Non-Chemical Metal Cleaning Wastes	Variable	Variable
See Attachment F: General Description for additional information		

Outfall No. **102**

Contributing Wastestream	Volume (MGD)	Percent (%) of Total Flow
Metal cleaning wastewater	Variable	100
See Attachment F: General Description for additional information		

Attachment: Click to enter text.

Item 5. Blowdown and Once-Through Cooling Water Discharges (Instructions, Page 43)

a. Indicate if the facility currently or proposes to:

☐ Yes ☒ No Use cooling towers that discharge blowdown or other wastestreams

☒ Yes ☐ No Use boilers that discharge blowdown or other wastestreams

☒ Yes ☐ No Discharge once-through cooling water

NOTE: If the facility uses or plans to use cooling towers or once-through cooling water, Item 12 **is required.**

b. If **yes** to any of the above, attach an SDS with the following information for each chemical additive.

- Manufacturers Product Identification Number
- Product use (e.g., biocide, fungicide, corrosion inhibitor, etc.)
- Chemical composition including CASRN for each ingredient
- Classify product as non-persistent, persistent, or bioaccumulative
- Product or active ingredient half-life
- Frequency of product use (e.g., 2 hours/day once every two weeks)
- Product toxicity data specific to fish and aquatic invertebrate organisms
- Concentration of whole product or active ingredient, as appropriate, in wastestream.

In addition to each SDS, attach a summary of the above information for each specific wastestream and the associated chemical additives. Specify which outfalls are affected.

Attachment: I: Boiler Chemical Additives and J: Once-through Cooling Chemical Additives

c. Cooling Towers and Boilers

If the facility currently or proposes to use cooling towers or boilers that discharge blowdown or other wastestreams to the outfall(s), complete the following table.

Cooling Towers and Boilers

Type of Unit	Number of Units	Daily Avg Blowdown (gallons/day)	Daily Max Blowdown (gallons/day)
Cooling Towers			
Boilers	2	27,000	460,000

Item 6. Stormwater Management (Instructions, Page 44)

Will any existing/proposed outfalls discharge stormwater associated with industrial activities, as defined at *40 CFR § 122.26(b)(14)*, commingled with any other wastestream?

☒ Yes ☐ No

If **yes**, briefly describe the industrial processes and activities that occur outdoors or in a manner which may result in exposure of the activities or materials to stormwater: F

Item 7. Domestic Sewage, Sewage Sludge, and Septage Management and Disposal (Instructions, Page 44)

Domestic Sewage - Waste and wastewater from humans or household operations that is discharged to a wastewater collection system or otherwise enters a treatment works.

a. Check the box next to the appropriate method of domestic sewage and domestic sewage sludge treatment or disposal. Complete Worksheet 5.0 or Item 7.b if directed to do so.

☒ Domestic sewage is routed (i.e., connected to or transported to) to a WWTP permitted to receive domestic sewage for treatment, disposal, or both. Complete Item 7.b.

☐ Domestic sewage disposed of by an on-site septic tank and drainfield system. Complete Item 7.b.

☐ Domestic and industrial treatment sludge ARE commingled prior to use or disposal.

☐ Industrial wastewater and domestic sewage are treated separately, and the respective sludge IS NOT commingled prior to sludge use or disposal. Complete Worksheet 5.0.

☐ Facility is a POTW. Complete Worksheet 5.0.

☐ Domestic sewage is not generated on-site.

☐ Other (e.g., portable toilets), specify and Complete Item 7.b: Click to enter text.

b. Provide the name and TCEQ, NPDES, or TPDES Permit No. of the waste-disposal facility which receives the domestic sewage/septage. If hauled by motorized vehicle, provide the name and TCEQ Registration No. of the hauler.

Domestic Sewage Plant/Hauler Name

Plant/Hauler Name	Permit/Registration No.
City of Graham Wastewater Treatment Plant	WQ0010487002

Item 8. Improvements or Compliance/Enforcement Requirements (Instructions, Page 45)

a. Is the permittee currently required to meet any implementation schedule for compliance or enforcement?

☐ Yes ☒ No

b. Has the permittee completed or planned for any improvements or construction projects?

☐ Yes ☒ No

c. If **yes** to either 8.a **or** 8.b, provide a brief summary of the requirements and a status update: N/A

Item 9. Toxicity Testing (Instructions, Page 45)

Have any biological tests for acute or chronic toxicity been made on any of the discharges or on a receiving water in relation to the discharge within the last three years?

☒ Yes ☐ No

If **yes**, identify the tests and describe their purposes: Chronic and 24-hour Acute Biomonitoring of Outfall 001 and Outfall 002 is done once per six months as required by the current permit. All test results have been previously submitted to the TCEQ.

Additionally, attach a copy of all tests performed which **have not** been submitted to the TCEQ or EPA. **Attachment:** Click to enter text.

Item 10. Off-Site/Third Party Wastes (Instructions, Page 45)

a. Does or will the facility receive wastes from off-site sources for treatment at the facility, disposal on-site via land application, or discharge via a permitted outfall?

☐ Yes ☒ No

If **yes**, provide responses to Items 10.b through 10.d below.

If **no**, proceed to Item 11.

b. Attach the following information to the application:

- List of wastes received (including volumes, characterization, and capability with on-site wastes).
- Identify the sources of wastes received (including the legal name and addresses of the generators).
- Description of the relationship of waste source(s) with the facility's activities.

Attachment: Click to enter text.

c. Is or will wastewater from another TCEQ, NPDES, or TPDES permitted facility commingled with this facility's wastewater after final treatment and prior to discharge via the final outfall/point of disposal?

☐ Yes ☐ No

If **yes**, provide the name, address, and TCEQ, NPDES, or TPDES permit number of the contributing facility and a copy of any agreements or contracts relating to this activity.

Attachment: Click to enter text.

d. Is this facility a POTW that accepts/will accept process wastewater from any SIU and has/is required to have an approved pretreatment program under the NPDES/TPDES program?

☐ Yes ☐ No

If **yes, Worksheet 6.0** of this application **is required.**

Item 11. Radioactive Materials (Instructions, Page 46)

a. Are/will radioactive materials be mined, used, stored, or processed at this facility?

☐ Yes ☒ No

If **yes**, use the following table to provide the results of one analysis of the effluent for all radioactive materials that may be present. Provide results in pCi/L.

Radioactive Materials Mined, Used, Stored, or Processed

Radioactive Material Name	Concentration (pCi/L)

b. Does the applicant or anyone at the facility have any knowledge or reason to believe that radioactive materials may be present in the discharge, including naturally occurring radioactive materials in the source waters or on the facility property?

☐ Yes ☒ No

If **yes**, use the following table to provide the results of one analysis of the effluent for all radioactive materials that may be present. Provide results in pCi/L. Do not include information provided in response to Item 11.a.

Radioactive Materials Present in the Discharge

Radioactive Material Name	Concentration (pCi/L)

Item 12. Cooling Water (Instructions, Page 46)

a. Does the facility use or propose to use water for cooling purposes?

☒ Yes ☐ No

If **no**, stop here. If **yes**, complete Items 12.b thru 12.f.

b. Cooling water is/will be obtained from a groundwater source (e.g., on-site well).

☐ Yes ☒ No

If **yes**, stop here. If **no**, continue.

c. Cooling Water Supplier

1. Provide the name of the owner(s) and operator(s) for the CWIS that supplies or will supply water for cooling purposes to the facility.

Cooling Water Intake Structure(s) Owner(s) and Operator(s)

CWIS ID	GR CWIS #1			
Owner	Luminant Generation Company LLC			
Operator	Luminant Generation Company LLC			

2. Cooling water is/will be obtained from a Public Water Supplier (PWS)

   ☐ Yes ☒ No

   If **no**, continue. If **yes**, provide the PWS Registration No. and stop here: PWS No. Click to enter text.

3. Cooling water is/will be obtained from a reclaimed water source?

   ☐ Yes ☒ No

   If **no**, continue. If **yes**, provide the Reuse Authorization No. and stop here: Click to enter text.

4. Cooling water is/will be obtained from an Independent Supplier

   ☐ Yes ☒ No

   If **no**, proceed to Item 12.d. If **yes**, provide the actual intake flow of the Independent Supplier's CWIS that is/will be used to provide water for cooling purposes and proceed: Click to enter text.

d. 316(b) General Criteria

1. The CWIS(s) used to provide water for cooling purposes to the facility has or will have a cumulative design intake flow of 2 MGD or greater.

   ☒ Yes ☐ No

2. At least 25% of the total water withdrawn by the CWIS is/will be used at the facility exclusively for cooling purposes on an annual average basis.

   ☒ Yes ☐ No

3. The CWIS(s) withdraw(s)/propose(s) to withdraw water for cooling purposes from surface waters that meet the definition of Waters of the United States in *40 CFR § 122.2.*

   ☒ Yes ☐ No

   If **no**, provide an explanation of how the waterbody does not meet the definition of Waters of the United States in *40 CFR § 122.2*: Click to enter text.

If **yes** to all three questions in Item 12.d, the facility **meets** the minimum criteria to be subject to the full requirements of Section 316(b) of the CWA. Proceed to **Item 12.f.**

If **no** to any of the questions in Item 12.d, the facility **does not meet** the minimum criteria to be subject to the full requirements of Section 316(b) of the CWA; however, a determination is required based upon BPJ. Proceed to **Item 12.e.**

e. The facility does not meet the minimum requirements to be subject to the fill requirements of Section 316(b) **and uses**/proposes **to use cooling towers**.

☐ Yes ☐ No

If **yes**, stop here. If **no**, complete Worksheet 11.0, Items 1.a, 1.b.1-3 and 6, 2.b.1, and 3.a to allow for a determination based upon BPJ.

f. Oil and Gas Exploration and Production

1. The facility is subject to requirements at 40 CFR Part 435, Subparts A or D.

   ☐ Yes ☒ No

   If **yes**, continue. If **no**, skip to Item 12.g.

2. The facility is an existing facility as defined at 40 CFR § 125.92(k) or a new unit at an existing facility as defined at 40 CFR § 125.92(u).

   ☐ Yes ☐ No

   If **yes**, complete Worksheet 11.0, Items 1.a, 1.b.1-3 and 6, 2.b.1, and 3.a to allow for a determination based upon BPJ. If **no**, skip to Item 12.g.3.

g. Compliance Phase and Track Selection

1. Phase I – New facility subject to 40 CFR Part 125, Subpart I

   ☐ Yes ☒ No

   If **yes**, check the box next to the compliance track selection, attach the requested information, and complete Worksheet 11.0, Items 2 and 3, and Worksheet 11.2.

   ☐ Track I – AIF greater than 2 MGD, but less than 10 MGD

   - Attach information required by *40 CFR §§ 125.86(b)(2)-(4).*

   ☐ Track I – AIF greater than 10 MGD

   - Attach information required by *40 CFR § 125.86(b).*

   ☐ Track II

   - Attach information required by *40 CFR § 125.86(c).*

   Attachment: Click to enter text.

2. Phase II – Existing facility subject to 40 CFR Part 125, Subpart J

   ☒ Yes ☐ No

   If **yes**, complete Worksheets 11.0 through 11.3, as applicable.

3. Phase III – New facility subject to 40 CFR Part 125, Subpart N

   ☐ Yes ☒ No

   If **yes**, check the box next to the compliance track selection and provide the requested information.

   ☐ Track I – Fixed facility

   - Attach information required by 40 CFR § 125.136(b) and complete Worksheet 11.0, Items 2 and 3, and Worksheet 11.2.

☐ Track I – Not a fixed facility

- Attach information required by 40 CFR § 125.136(b) and complete Worksheet 11.0, Item 2 (except CWIS latitude/longitude under Item 2.a).

☐ Track II – Fixed facility

- Attach information required by 40 CFR § 125.136(c) and complete Worksheet 11.0, Items 2 and 3.

Attachment: Click to enter text.

Item 13. Permit Change Requests (Instructions, Page 48)

This item is only applicable to existing permitted facilities.

a. Is the facility requesting a **major amendment** of an existing permit?

☐ Yes ☒ No

If **yes**, list each request individually and provide the following information: 1) detailed information regarding the scope of each request and 2) a justification for each request. Attach any supplemental information or additional data to support each request.

Click to enter text.

b. Is the facility requesting any **minor amendments** to the permit?

☐ Yes ☒ No

If **yes**, list and describe each change individually.

Click to enter text.

c. Is the facility requesting any **minor modifications** to the permit?

☐ Yes ☒ No

If **yes**, list and describe each change individually.

INDUSTRIAL WASTEWATER PERMIT APPLICATION WORKSHEET 1.0: EPA CATEGORICAL EFFLUENT GUIDELINES

This worksheet **is required** for all applications for TPDES permits for discharges of wastewaters subject to EPA categorical effluent limitation guidelines (ELGs).

Item 1. Categorical Industries (Instructions, Page 53)

Is this facility subject to any 40 CFR categorical ELGs outlined on page 53 of the instructions?

☒ Yes ☐ No

If **no**, this worksheet is not required. If **yes**, provide the appropriate information below.

40 CFR Effluent Guideline

Industry	40 CFR Part
Steam Electric Power Generation	423

Item 2. Production/Process Data (Instructions, Page 54)

NOTE: For all TPDES permit applications requesting individual permit coverage for discharges of oil and gas exploration and production wastewater (discharges into or adjacent to water in the state, falling under the Oil and Gas Extraction Effluent Guidelines – 40 CFR Part 435), see Worksheet 12.0, Item 2 instead.

a. Production Data

Provide appropriate data for effluent guidelines with production-based effluent limitations.

Production Data

Subcategory	Actual Quantity/Day	Design Quantity/Day	Units
N/A			

b. Organic Chemicals, Plastics, and Synthetic Fibers Manufacturing Data (40 CFR Part 414)

Provide each applicable subpart and the percent of total production. Provide data for metal-bearing and cyanide-bearing wastestreams, as required by *40 CFR Part 414, Appendices A and B.*

Percentage of Total Production

Subcategory	Percent of Total Production	Appendix A and B - Metals	Appendix A - Cyanide
N/A			

c. Refineries (40 CFR Part 419)

Provide the applicable subcategory and a brief justification.

N/A

Item 3. Process/Non-Process Wastewater Flows (Instructions, Page 54)

Provide a breakdown of wastewater flow(s) generated by the facility, including both process and non-process wastewater flow(s). Specify which wastewater flows are to be authorized for discharge under this permit and the disposal practices for wastewater flows, excluding domestic, which are not to be authorized for discharge under this permit.

PROCESS WASTEWATER

low volume waste sources

chemical metal cleaning wastes

non-chemical metal cleaning wastes

NON-PROCESS WASTEWATER

once-through cooling water

Item 4. New Source Determination (Instructions, Page 54)

Provide a list of all wastewater-generating processes subject to EPA categorical ELGs, identify the appropriate guideline Part and Subpart, and provide the date the process/construction commenced.

Wastewater Generating Processes Subject to Effluent Guidelines

Process	EPA Guideline Part	EPA Guideline Subpart	Date Process/ Construction Commenced
low volume waste sources	423	N/A	1960
chemical metal cleaning wastes	423	N/A	1960
non-chemical metal cleaning wastes	423	N/A	1960
once-through cooling water	423	N/A	1960

Luminant Generation Company LLC
Graham Steam Electric Station
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Worksheet 2.0 – Pollutant Analysis Requirements

Outfall 001 is an external, continuous discharge of non-process wastewater.

Outfall 002 is an external, continuous discharge of process wastewater.

Outfall 102 is an intermittent, internal discharge to Outfall 002; therefore, characterization sampling is not required.

As required by the permit application, Outfalls 001 and 002 were sampled for four consecutive weeks from 04/30/2024-05/21/2024 and submitted for the laboratory analysis of the parameters listed in Tables 1, 2, 3 (partial list), 6, 8 and 9. As of the submittal of this permit renewal application, we have not yet received the final laboratory reports from the contract lab. Once the final reports are received, Worksheet 2.0 will be completed and submitted as an addendum to the application.

INDUSTRIAL WASTEWATER PERMIT APPLICATION WORKSHEET 4.0: RECEIVING WATERS

This worksheet **is required** for all TPDES permit applications.

Item 1. Domestic Drinking Water Supply (Instructions, Page 80)

a. There is a surface water intake for domestic drinking water supply located within 5 (five) miles downstream from the point/proposed point of discharge.

☒ Yes ☐ No

If **no**, stop here and proceed to Item 2. If **yes**, provide the following information:

1. The legal name of the owner of the drinking water supply intake: Click to enter text.
2. The distance and direction from the outfall to the drinking water supply intake: Click to enter text.

b. Locate and identify the intake on the USGS 7.5-minute topographic map provided for Administrative Report 1.0.

☒ Check this box to confirm the above requested information is provided.

Item 2. Discharge Into Tidally Influenced Waters (Instructions, Page 80)

If the discharge is to tidally influenced waters, complete this section. Otherwise, proceed to Item 3.

a. Width of the receiving water at the outfall: N/A feet

b. Are there oyster reefs in the vicinity of the discharge?

☐ Yes ☐ No

If **yes**, provide the distance and direction from the outfall(s) to the oyster reefs: N/A

c. Are there sea grasses within the vicinity of the point of discharge?

☐ Yes ☐ No

If **yes**, provide the distance and direction from the outfall(s) to the grasses: N/A

Item 3. Classified Segment (Instructions, Page 80)

The discharge is/will be directly into (or within 300 feet of) a classified segment.

☒ Yes ☐ No

If **yes**, stop here and do not complete Items 4 and 5 of this worksheet or Worksheet 4.1.

If **no**, complete Items 4 and 5 and Worksheet 4.1 may be required.

Item 4. Description of Immediate Receiving Waters (Instructions, Page 80)

a. Name of the immediate receiving waters: Click to enter text.

b. Check the appropriate description of the immediate receiving waters:

☐ Lake or Pond

- Surface area (acres): Click to enter text.
- Average depth of the entire water body (feet): Click to enter text.
- Average depth of water body within a 500-foot radius of the discharge point (feet): Click to enter text.

☐ Man-Made Channel or Ditch

☐ Stream or Creek

☐ Freshwater Swamp or Marsh

☐ Tidal Stream, Bayou, or Marsh

☐ Open Bay

☐ Other, specify:

If **Man-Made Channel or Ditch** or **Stream or Creek** were selected above, provide responses to Items 4.c – 4.g below:

c. For **existing discharges**, check the description below that best characterizes the area **upstream** of the discharge.

For **new discharges**, check the description below that best characterizes the area **downstream** of the discharge.

☐ Intermittent (dry for at least one week during most years)

☐ Intermittent with Perennial Pools (enduring pools containing habitat to maintain aquatic life uses)

☐ Perennial (normally flowing)

Check the source(s) of the information used to characterize the area upstream (existing discharge) or downstream (new discharge):

☐ USGS flow records

☐ personal observation

☐ historical observation by adjacent landowner(s)

☐ other, specify: Click to enter text.

d. List the names of all perennial streams that join the receiving water within three miles downstream of the discharge point: Click to enter text.

e. The receiving water characteristics change within three miles downstream of the discharge (e.g., natural or man-made dams, ponds, reservoirs, etc.).

☐ Yes ☐ No

If **yes**, describe how: Click to enter text.

f. General observations of the water body during normal dry weather conditions: Click to enter text.

Date and time of observation: Click to enter text.

g. The water body was influenced by stormwater runoff during observations.

☐ Yes ☐ No

If **yes**, describe how: Click to enter text.

Item 5. General Characteristics of Water Body (Instructions, Page 81)

a. Is the receiving water upstream of the existing discharge or proposed discharge site influenced by any of the following (check all that apply):

☐ oil field activities
☐ agricultural runoff
☐ upstream discharges
☐ urban runoff
☐ septic tanks
☐ other, specify: Click to enter text.

b. Uses of water body observed or evidence of such uses (check all that apply):

☐ livestock watering
☐ non-contact recreation
☐ domestic water supply
☐ contact recreation
☐ fishing
☐ industrial water supply
☐ irrigation withdrawal
☐ navigation
☐ picnic/park activities
☐ other, specify: Click to enter text.

c. Description which best describes the aesthetics of the receiving water and the surrounding area (check only one):

☐ **Wilderness:** outstanding natural beauty; usually wooded or un-pastured area: water clarity exceptional

☐ **Natural Area:** trees or native vegetation common; some development evident (from fields, pastures, dwellings); water clarity discolored

☐ **Common Setting:** not offensive, developed but uncluttered; water may be colored or turbid

☐ **Offensive:** stream does not enhance aesthetics; cluttered; highly developed; dumping areas; water discolored

INDUSTRIAL WASTEWATER PERMIT APPLICATION WORKSHEET 11.0: COOLING WATER SYSTEM INFORMATION

This worksheet **is required** for all TPDES permit applications **that meet the conditions outlined in Technical Report 1.0, Item 12.**

Item 1. Cooling Water System Data (Instructions, Page 104)

a. Complete the following table with information regarding the cooling water system.

Cooling Water System Data

Parameter	Volume (include units)
Total DIF	505.4 MGD
Total AIF	250 MGD (2019-2023)
Intake Flow Use(s) (%)	
Contact cooling	0
Non-contact cooling	>99
Process Wastewater	<1
Other	<1

b. Attach the following information:

1. A narrative description of the design and annual operation of the facility's cooling water system and its relationship to the CWIS(s).
2. A scaled map depicting the location of each CWIS, impoundment, intake pipe, and canals, pipes, or waterways used to convey cooling water to, or within, the cooling water system. Provide the latitude and longitude for each CWIS and any intake pipe(s) on the map. Indicate the position of the intake pipe within the water column.
3. A description of water reuse activities, if applicable, reductions in total water withdrawals, if applicable, and the proportion of the source waterbody withdrawn (on a monthly basis).
4. Design and engineering calculations prepared by a qualified professional and data to support the information provided in above item a.
5. Previous year (a minimum of 12 months) of AIF data.
6. A narrative description of existing or proposed impingement and entrainment technologies or operation measures and a summary of their performance, including, but not limited to, reductions in impingement mortality and entrainment due to intake location and reductions in total water withdrawals and usage.

Attachment: L: Graham Steam Electric Station & 316(b) and M: Design and Engineering Calculations of CWIS

Item 2. Cooling Water Intake Structure(s) Data (Instructions, Page 105)

a. Complete the following table with information regarding each cooling water intake structure (this includes primary and make-up CWIS(s)).

Cooling Water Intake Structure(s) Data

CWIS ID	GR CWIS #1			
DIF (include units)	505.4 MGD			
AIF (include units)	250 MGD (2019-2023)			
Intake Flow Use(s) (%)				
Contact cooling	0			
Non-contact cooling	>99			
Process Wastewater	<1			
Other	<1			
Latitude (decimal degrees)	33.135797			
Longitude (decimal degrees)	98.613839			

b. Attach the following information regarding the CWIS(s):

1. A narrative description of the configuration of each CWIS, annual and daily operation, including any seasonal changes, and where it is located in the water body and in the water column.

2. Engineering calculations for each CWIS.

Attachment: L: Graham Steam Electric & 316(b) Information and M: Design and Engineering Calculations of CWIS

Item 3. Source Water Physical Data (Instructions, Page 105)

a. Complete the following table with information regarding the CWIS(s) source waterbody (this includes primary and make-up CWIS(s)).

Source Waterbody Data

CWIS ID	GR CWIS #1			
Source Waterbody	Lake Graham/Lake Eddleman			
Mean Annual Flow	N/A			
Source	Salt Creek/Flint Creek			

b. Attach the following information regarding the source waterbody.

1. A narrative description of the source water for each CWIS, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports this determination of the water body type where each cooling water intake structure is located.

2. A narrative description of the source waterbody's hydrological and geomorphological features.

3. Scaled drawings showing the physical configuration of all source water bodies used by the facility, including the source waterbody's hydrological and geomorphological features. **NOTE:** The source waterbody's hydrological and geomorphological features may be included on the map submitted for item 1.b.ii of this worksheet.

4. A description of the methods used to conduct any physical studies to determine the intake's area of influence within the waterbody and the results of such studies.

Attachment: L: Graham Steam Electric Station & 316(b) Information and M: Design and Engineering Calculations of CWIS

Item 4. Operational Status (Instructions, Page 106)

a. Is this application for a power production or steam generation facility?

☒ Yes ☐ No

If **no**, proceed to Item 4.b. If **yes**, provide the following information as an attachment:

1. Describe the operating status of each individual unit, including age, capacity utilization rate (or equivalent) for the previous five years (a minimum of 60 months), and any seasonal changes in operation.

2. Describe any extended or unusual outages or other factors which significantly affect current data for flow, impingement, entrainment.

3. Identify any operating unit with a capacity utilization rate of less than 8 percent averaged over a contiguous period of two years (a minimum of 24 months).

4. Describe any major upgrades completed within the last 15 years, including but not limited to boiler replacement, condenser replacement, turbine replacement, or changes of fuel type.

Attachment: L: Graham Steam Electric Station & 316(b) Information and M: Design and Engineering Calculations of CWIS

b. Process Units

1. Is this application for a facility which has process units that use cooling water (other than for power production or steam generation)?

☐ Yes ☒ No

If **no**, proceed to Item 4.c. If **yes**, continue.

2. Does the facility use or intend to use reductions in flow or changes in operations to meet the requirements of *40 CFR § 125.94(c)*?

☐ Yes ☐ No

If **no**, proceed to Item 4.c. If **yes**, attach descriptions of the following information:

- Individual production processes and product lines
- The operating status, including age of each line and seasonal operation
- Any extended or unusual outages that significantly affect current data for flow, impingement, entrainment, or other factors
- Any major upgrades completed within the last 15 years and plans or schedules for decommissioning or replacement of process units or production processes and product lines.

Attachment: Click to enter text.

c. Is this an application for a nuclear power production facility?

☐ Yes ☒ No

If **no**, proceed to Item 4.d. If **yes**, attach a description of completed, approved, or scheduled upgrades and the Nuclear Regulatory Commission relicensing status for each unit at the facility.

Attachment: Click to enter text.

d. Is this an application for a manufacturing facility?

☐ Yes ☒ No

If **no**, proceed to Worksheet 11.1. If **yes**, attach descriptions of current and future production schedules and any plans or schedules for any new units planned within the next five years (a minimum of 60 mos)

Attachment: Click to enter text.

INDUSTRIAL WASTEWATER PERMIT APPLICATION WORKSHEET 11.1: IMPINGEMENT MORTALITY

This worksheet **is required** for all TPDES permit applications **that meet the conditions outlined in Technical Report 1.0, Item 12.** Complete one copy of this worksheet for **each** individual CWIS the facility uses or proposes to use.

CWIS ID: GR CWIS #1

Item 1. Impingement Compliance Technology Selection (Instructions, Page 107)

Check the box next to the method of compliance for the Impingement Mortality Standard selected by the facility.

☒ Closed-cycle recirculating system(CCRS) [*40 CFR § 125.94(c)(1)*]

☐ 0.5 ft/s Through-Screen Design Velocity [*40 CFR § 125.94(c)(2)*] - Proceed to Worksheet 11.2

☐ 0.5 ft/s Through Screen Actual Velocity [*40 CFR § 125.94(c)(3)*]

☐ Existing offshore velocity cap [*40 CFR § 125.94(c)(4)*] - Proceed to Worksheet 11.2

☐ Modified traveling screens [*40 CFR § 125.94(c)(5)*]

☐ System of technologies [*40 CFR § 125.94(c)(6)*]

☐ Impingement mortality performance standard [*40 CFR § 125.94(c)(7)*]

☐ De minimis rate of impingement [*40 CFR § 125.94(c)(11)*]

☐ Low capacity utilization power-generation facilities [*40 CFR § 125.94(c)(12)*]

If 0.5 ft/s Through-Screen Design Velocity [*40 CFR § 125.94(c)(2)*] or existing offshore velocity cap [*40 CFR § 125.94(c)(4)*] was selected, proceed to Worksheet 11.2. Otherwise, continue to Item 2.

Item 2. Impingement Compliance Technology Information (Instructions, Page 107)

Complete the following sections based on the selection made for item 1 above.

a. CCRS [*40 CFR § 125.94(c)(1)*]

☒ Check this box to confirm the CWS meets the definition of CCRS located at *40 CFR § 125.91(c)* and provide a response to the following questions.

1. Does the facility use or propose to use a CWIS to replenish water losses to the CWS?

   ☐ Yes ☒ No

   If **no**, proceed to item a.2. If **yes**, provide the following information as an attachment and continue.

   - CWIS ID
   - 12 months of intake flow data for any CWIS used for make-up intake flows to replenish cooling water losses, excluding intakes for losses due to blowdown, drift, or evaporation.
   - A narrative description of any physical or operational measures taken to minimize make-up withdraws.

Attachment: Click to enter text.

NOTE: Do not complete a separate Worksheet 11.1 for a make-up CWIS.

2. Does the facility use or propose to use cooling towers?

   ☐ Yes ☒ No

   If **no**, proceed to Worksheet 11.2. If **yes**, provide the following information and proceed to Worksheet 11.2.

   - Average number of cycles of concentration (COCs) prior to blowdown:

   Average COCs Prior to Blowdown

Cooling Tower ID				
COCs				

   - Attach COC monitoring data for each cooling tower from the previous year (a minimum of 12 months): Click to enter text.
   - Maximum number of COCs each cooling tower can accomplish based on design of the system.

   Calculated COCs Prior to Blowdown

Cooling Tower ID				
COCs				

   - Describe conditions that may limit the number of COCs prior to blowdown, if any, including but not limited to permit conditions: Click to enter text.

b. 0.5 ft/s Through Screen Actual Velocity [*40 CFR § 125.94(c)(3)*]

Provide daily intake flow measurement monitoring data from the previous year (a minimum of 12 months) as an attachment and proceed to Worksheet 11.2.

Attachment: Click to enter text.

c. Modified traveling screens [*40 CFR § 125.94(c)(5)*]

Provide the following information as an attachment and proceed to Worksheet 11.2.

1. A description of the modified traveling screens and associated equipment.
2. A site-specific impingement technology performance optimization study that includes a narrative description of the biological data collection methods
3. Biological sampling data from the previous two years (a minimum of 24 months).

Attachment: Click to enter text.

d. System of technologies [*40 CFR § 125.94(c)(6)*] or impingement mortality performance standard [*40 CFR § 125.94(c)(7)*]

Provide the following information as an attachment and proceed to Worksheet 11.2.

1. A description of the system of technologies used or proposed for use by the facility to achieve compliance with the impingement mortality standard.

2. A site-specific impingement technology performance optimization study that includes a narrative description of the biological data collection methods.

3. Biological sampling data from the previous two years (a minimum of 24 months).

Attachment: Click to enter text.

e. De minimis rate of impingement [*40 CFR § 125.94(c)(11)*]

Provide the following information and proceed to Worksheet 11.2.

1. Attach monitoring data from the previous year (a minimum of 12 months) of intake flow measured at a frequency of 1/day on days of operation.

   Attachment: Click to enter text.

2. If the rate of impingement caused by the CWIS is extremely low (at an organism or age-one equivalent count), attach supplemental information to Worksheet 11.0, item 1.b.6. to support this determination.

   Attachment: Click to enter text.

f. Low capacity utilization power-generation facilities [*40 CFR § 125.94(c)(12)*]

Attach monthly utilization data from the previous 2 years (a minimum of 24 months) for each operating unit and proceed to Worksheet 11.2.

Attachment: Click to enter text.

INDUSTRIAL WASTEWATER PERMIT APPLICATION
WORKSHEET 11.2: SOURCE WATER BIOLOGICAL DATA

This worksheet **is required** for all TPDES permit applications that **meet the conditions outlined in Technical Report 1.0, Item 12.** Complete one copy of this worksheet for **each** source waterbody of a CWIS for which a facility has selected an Impingement Mortality Technology Option described at *40 CFR §§ 125.94(c)(1)-(7).*

Name of source waterbody: Lake Graham

Item 1. Species Management (Instructions, Page 109)

a. The facility has obtained an incidental take permit for its cooling water intake structure(s) from the USFWS or the NMFS.

☐ Yes ☒ No

If yes, attach any information submitted in order to obtain that permit, which may be used to supplement the permit application information requirements of paragraph *40 CFR § 125.95(f).*

Attachment: Click to enter text.

b. Is the facility requesting a waiver from application requirements at *40 CFR § 122.21(r)(4)* in accordance with *40 CFR § 125.95* for any CWIS(s) that withdraw from a man-made reservoir that is stocked and managed by a state or federal natural resources agency or the equivalent?

☒ Yes ☐ No

If **yes**, attach a copy of the most recent managed fisheries report to TPWD, or equivalent.

Attachment: L: Graham Steam Electric Station & 316(b) Information

c. There are no federally listed threatened or endangered species or critical habitat designations within the source water body.

☒ True ☐ False

Item 2. Source Water Biological Data (Instructions, Page 109)

New Facilities (Phase I, Track I and II)

- Provide responses to all items in this section and stop.

Existing Facilities (Phase II)

- If the answer to **1.b.** above was **no**, provide responses to all items in this section and proceed to Worksheet 11.3.
- If the answer to **1.b.** was **yes** and **1.c.** was **true**, do not complete any items in this section and proceed to Worksheet 11.3.
- If the answer to **1.b.** was **yes** and **1.c.** was **false**, attach a response for any item in this section that is not contained within the most recent TPWD, or equivalent and proceed to Worksheet 11.3.

Attachment: Click to enter text.

a. A list of the data requested at *40 CFR § 122.21(r)(4)(ii)* through *(vi)* that are not available, and efforts made to identify sources of the data.

b. Provide a list of species (or relevant taxa) in the vicinity of the CWIS and identify the following information regarding each species listed.
   - all life stages and their relative abundance,
   - identification of all species and life stages that would be most susceptible to impingement and entrainment,
   - forage base,
   - significance to commercial fisheries,
   - significance to recreational fisheries,
   - primary period of reproduction,
   - larval recruitment, and
   - period of peak abundance for relevant taxa.

c. Data representative of the seasonal and daily activities (e.g., feeding and water column migration) of biological organisms in the vicinity of the CWIS(s).

d. Identify all threatened, endangered, and other protected species that might be susceptible to impingement and entrainment at the CWIS(s).

e. Documentation of any public participation or consultation with federal or state agencies undertaken.

The following is required for existing facilities only. Include the following information with the above listed attachment.

f. Identify any protective measures and stabilization activities that have been implemented and provide a description of how these measures and activities affected the baseline water condition in the vicinity of the intake.

g. A list of fragile species, as defined at *40 CFR § 125.92(m)*, at the facility. The applicant need only identify those species not already identified as fragile at *40 CFR § 125.92(m)*.

NOTE: New units at an existing facility are not required to resubmit this information if the cooling water withdrawals for the operation of the new unit are from an existing intake.

INDUSTRIAL WASTEWATER PERMIT APPLICATION WORKSHEET 11.3: ENTRAINMENT

This worksheet **is required** for all TPDES permit applications that **meet the conditions outlined in Technical Report 1.0, Item 12**. Complete one copy of this worksheet for **each** individual CWIS the facility uses or proposes to use.

CWIS ID: GR CWIS #1

Item 1. Applicability (Instructions, Page 111)

Is the AIF of the CWIS identified above greater than, or equal to, 125 MGD?

☐ Yes ☒ No

- If **no** or the facility has selected **CCRS** [*40 CFR § 125.94(c)(1)*] for the impingement mortality compliance method, complete Item 2 and stop here.
- If **yes** and the facility is **seeking a waiver** from application requirements in accordance with *40 CFR § 125.95* for any CWIS(s) that withdraw from a man-made reservoir that is stocked and managed by a state or federal natural resources agency or the equivalent, complete item 2 and stop.
- If **yes** and the facility is **not seeking a waiver** from application requirements in accordance *with 40 CFR § 125.95*, complete item 2 and provide any required and completed studies listed in item 3. For any required studies in item 3 that are not complete, provide a detailed explanation for the delay and an anticipated schedule for completion and submittal.

Item 2. Existing Entrainment Performance Studies (Instructions, Page 111)

Attach any previously conducted studies or studies obtained from other facilities addressing technology efficacy, through-facility entrainment survival, and other entrainment studies.

Attachment: N: Supplemental Fisheries Data Analysis for Proposal for Information Collection, Clean Water Act, Section 316(b) Phase II Requirements

Item 3. Facility Entrainment Performance Studies (Instructions, Page 111)

a. Attach an entrainment characterization study, as described at *40 CFR § 122.21(r)(9)*: Click to enter text.

b. Attach a comprehensive feasibility study, as described as *40 CFR § 122.21(r)(10)*: Click to enter text.

c. Attach a benefits valuation study, as described as *40 CFR § 122.21(r)(11)*: Click to enter text.

d. Attach a non-water quality environmental and other impacts study, as described as *40 CFR § 122.21(r)(12)*: Click to enter text.

e. Attach a peer review analysis, as described as *40 CFR § 122.21(r)(13)*: Click to enter text.

Attachment A

Copy of Renewal Application Fee Payment

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Questions or Comments >>

Shopping Cart | Select Fee | Search Transactions | Sign Out

Your transaction is complete. Thank you for using TCEQ ePay.

Note: It may take up to 3 working days for this electronic payment to be processed and be reflected in the TCEQ ePay system. Print this receipt and the vouchers for your records. An email receipt has also been sent.

Transaction Information

Trace Number: 582EA000611788
Date: 05/28/2024 10:06 AM
Payment Method: CC - Authorization 0000065030
ePay Actor: RYAN BAYLE
Actor Email: ryan.bayle@luminant.com
IP: 136.226.100.103
TCEQ Amount: $2,015.00
Texas.gov Price: $2,060.59*

* This service is provided by Texas.gov, the official website of Texas. The price of this service includes funds that support the ongoing operations and enhancements of Texas.gov, which is provided by a third party in partnership with the State.

Payment Contact Information

Name: RYAN BAYLE
Company: LUMINANT GENERATION COMPANY LLC
Address: 6555 SIERRA DRIVE, IRVING, TX 75039
Phone: 214-875-8294

Cart Items

Click on the voucher number to see the voucher details.

Voucher	Fee Description	AR Number	Amount
707022	WW PERMIT - MAJOR INDUSTRIAL FACILITY - RENEWAL		$2,000.00
707023	30 TAC 305.53B WQ RENEWAL NOTIFICATION FEE		$15.00
		TCEQ Amount:	$2,015.00

ePay Again | Exit ePay

Note: It may take up to 3 working days for this electronic payment to be processed and be reflected in the TCEQ ePay system. Print this receipt for your records.

Attachment B

Core Data Form

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

TCEQ Use Only

TCEQ Core Data Form

For detailed instructions on completing this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided.)* ☐ New Permit, Registration or Authorization *(Core Data Form should be submitted with the program application.)*		
☒ Renewal *(Core Data Form should be submitted with the renewal form)*		☐ Other
2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	**3. Regulated Entity Reference Number** *(if issued)*
CN 603256413		RN 102563426

SECTION II: Customer Information

4. General Customer Information	**5. Effective Date for Customer Information Updates** (mm/dd/yyyy)		
☐ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership ☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)			
The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).			
6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)*		*If new Customer, enter previous Customer below:*	
Luminant Generation Company LLC			
7. TX SOS/CPA Filing Number 0800881216	**8. TX State Tax ID** (11 digits) 17529678207	**9. Federal Tax ID** (9 digits) 752967820	**10. DUNS Number** *(if applicable)* 102247793
11. Type of Customer: ☒ Corporation		☐ Individual	Partnership: ☐ General ☐ Limited
Government: ☐ City ☐ County ☐ Federal ☐ Local ☐ State ☐ Other		☐ Sole Proprietorship	☐ Other:
12. Number of Employees ☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☒ 501 and higher		**13. Independently Owned and Operated?** ☒ Yes ☐ No	
14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following*			
☐ Owner ☐ Operator ☒ Owner & Operator ☐ Occupational Licensee ☐ Responsible Party ☐ VCP/BSA Applicant		☐ Other:	

15. Mailing Address:	6555 Sierra Drive							
	City	Irving	**State**	TX	**ZIP**	75039	**ZIP + 4**	2479

16. Country Mailing Information *(if outside USA)*	**17. E-Mail Address** *(if applicable)*
	Renee.Collins@lvistracorp.com

18. Telephone Number	**19. Extension or Code**	**20. Fax Number** *(if applicable)*

(214) 875-8338		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected, a new permit application is also required.)* ☐ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information							
The Regulated Entity Name submitted may be updated, in order to meet TCEQ Core Data Standards (removal of organizational endings such as Inc, LP, or LLC).							
22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*							
Graham Steam Electric Station							
23. Street Address of the Regulated Entity: ***(No PO Boxes)***	480 Power Plant Rd.						
	City	Graham	**State**	TX	**ZIP**	76450	**ZIP + 4**
24. County	Young						

If no Street Address is provided, fields 25-28 are required.

25. Description to Physical Location:					
26. Nearest City			**State**		**Nearest ZIP Code**
Latitude/Longitude are required and may be added/updated to meet TCEQ Core Data Standards. (Geocoding of the Physical Address may be used to supply coordinates where none have been provided or to gain accuracy).					
27. Latitude (N) In Decimal:	33.135142		**28. Longitude (W) In Decimal:**	-98.611905	
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

29. Primary SIC Code (4 digits)	**30. Secondary SIC Code** (4 digits)	**31. Primary NAICS Code** (5 or 6 digits)	**32. Secondary NAICS Code** (5 or 6 digits)
4911		221112	
33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*			
Generation of Electricity			

34. Mailing Address:	c/o Environmental Services							
	6555 Sierra Drive							
	City	Irving	**State**	TX	**ZIP**	75039	**ZIP + 4**	2479
35. E-Mail Address:	renee.collins@vistracorp.com							
36. Telephone Number		**37. Extension or Code**		**38. Fax Number** *(if applicable)*				
(214) 875-8338				( ) -				

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☐ Municipal Solid Waste	☐ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☐ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☒ Wastewater	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:
	WQ0000551000			

SECTION IV: Preparer Information

40. Name:	Ryan Bayle	41. Title:	Environmental Manager
42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(214) 875-8294		( ) -	ryan.bayle@vistracorp.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	Luminant Generation Company LLC	**Job Title:**	Sr. Director Evironmental Services
Name *(In Print)*:	Renee Collins	**Phone:**	(214) 875- 8338
Signature:	Rene Collins	**Date:**	5/30/2024

Attachment C

Plain Language Summary

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Graham Creek Steam Electric Station
WQ0000551000
PLAIN LANGUAGE SUMMARY

The following summary is provided for this pending water quality permit application being reviewed by the Texas Commission on Environmental Quality as required by 30 Texas Administrative Code Chapter 39. The information provided in this summary may change during the technical review of the application and are not federal enforceable representations of the permit application.

Luminant Generation Company LLC (CN603256413) operates the Graham Steam Electric Station (RN102563426), a two-unit natural gas-fired steam electric generating facility. The facility is located at 480 Power Plant Rd, Graham, Young County, Texas 76450.

This application is for the renewal of Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000551000 (EPA I.D. No. TX0001163) which authorizes the discharge of wastewaters at a daily average flow not to exceed 505.4 million gallons per day via Outfall 001. The permit also authorizes the discharge of low volume waste, storm water and previously monitored effluent (metal cleaning waste) via Outfall 002.

The discharge of once-through cooling water via Outfall 001, low volume waste via Outfall 002 and previously monitored effluent via Outfall 201 from this facility is subject to federal effluent limitation guidelines at 40 CFR Part 423. The pollutants expected from these discharges based on 40 CFR Part 423 are: total residual chlorine, free available chlorine, total suspended solids, oil and grease, total iron, total copper and pH. Temperature is also expected from discharges of 001. Additional potential pollutants are included in the Industrial Wastewater Application Technical Report, Worksheet 2.0.

The raw water supply for the facility's cooling water system is from Lake Grahm Reservoir, supplied by the City of Graham. Potable water is also supplied by the City of Graham. A chemical feed system supplies water conditioning chemicals to the once-through cooling water to minimize corrosion and control the formation of mineral scale and bio-fouling. Storm water is collected through various storm drains and is discharged under the TCEQ Industrial Multi-Sector General Permit TXR05W674. Domestic wastes are routed to the City of Grahm wastewater treatment plant disposal.

Estación eléctrica de vapor de Graham Creek
WQ0000551000
RESUMEN EN LENGUAJE SENCILLO

El siguiente resumen se proporciona para esta solicitud de permiso de calidad del agua pendiente que está siendo revisada por la Comisión de Calidad Ambiental de Texas según lo exige el Capítulo 39 del Código Administrativo de Texas 30. La información proporcionada en este resumen puede cambiar durante la revisión técnica de la solicitud y no es federal. representaciones ejecutables de la solicitud de permiso.

Luminant Generation Company LLC (CN603256413) opera la Graham Steam Electric Station (RN102563426), una instalación de generación eléctrica de vapor alimentada con gas natural de dos unidades. La instalación está ubicada en 480 Power Plant Rd, Graham, condado de Young, Texas 76450.

Esta solicitud es para la renovación del Permiso No. WQ0000551000 del Sistema de Eliminación de Descarga de Contaminantes de Texas (TPDES) (N.º de identificación de la EPA TX0001163), que autoriza la descarga de aguas residuales a un flujo promedio diario que no exceda los 505.4 millones de galones por día a través del Emisario 001. El permiso también autoriza la descarga de residuos de bajo volumen, aguas pluviales y efluentes previamente monitoreados (residuos de limpieza de metales) a través del Emisario 002.

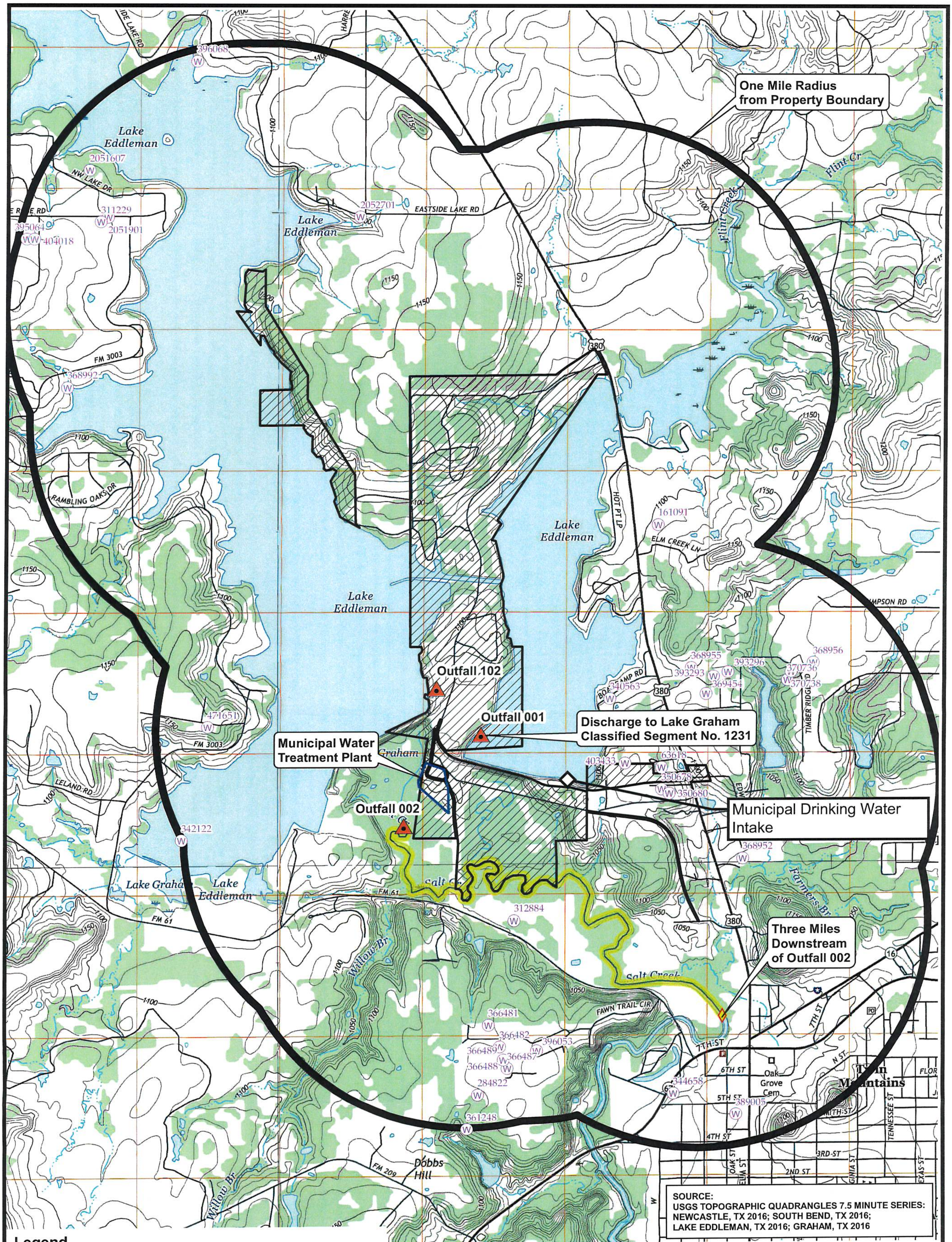
La descarga de agua de enfriamiento de un solo paso a través del Emisario 001, desechos de bajo volumen a través del Emisario 002 y efluentes previamente monitoreados a través del Emisario 201 de esta instalación están sujetos a pautas federales de limitación de efluentes en 40 CFR Parte 423. Los contaminantes esperados de estas descargas se basan en 40 CFR Parte 423 son: cloro residual total, cloro libre disponible, sólidos suspendidos totales, aceite y grasa, hierro total, cobre total y pH. También se espera temperatura de las descargas de 001. Se incluyen contaminantes potenciales adicionales en el Informe técnico de aplicación de aguas residuales industriales, Hoja de trabajo 2.0.

El suministro de agua cruda para el sistema de agua de refrigeración de la instalación proviene del embalse del lago Grahm, suministrado por la ciudad de Graham. La ciudad de Graham también suministra agua potable. Un sistema de alimentación de químicos suministra químicos acondicionadores de agua al agua de enfriamiento de un solo paso para minimizar la corrosión y controlar la formación de incrustaciones minerales y bioincrustaciones. El agua pluvial se recolecta a través de varios drenajes pluviales y se descarga según el Permiso general industrial multisectorial TXR05W674 de la TCEQ. Los desechos domésticos se envían a la planta de tratamiento de aguas residuales de la ciudad de Grahm.

Attachment D

USGS TOPO MAPS

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000



Legend

- Luminant Generation Company LLC Property Boundary
- Outfall Location
- Discharge Route
- Downstream Marker
- Water Wells
- Municipal Water Treatment Plant
- One Mile Radius From Property Boundary

LUMINANT GENERATION COMPANY LLC

USGS MAP

DRAWN BY: L WILSON	SCALE:	PROJ. NO.	TPDES 2018
CHECKED BY: D KOCUREK	AS NOTED	FILE NO.	USGS Map.mxd
APPROVED BY: D KOCUREK	DATE PRINTED:		
DATE: June 2018	6/14/2018		

Attachment E

Supplemental Permit Information Form

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

SUPPLEMENTAL PERMIT INFORMATION FORM (SPIF)

FOR AGENCIES REVIEWING DOMESTIC OR INDUSTRIAL TPDES WASTEWATER PERMIT APPLICATIONS

TCEQ USE ONLY:

Application type: ____Renewal ____Major Amendment ____Minor Amendment ____New

County: ______________________ Segment Number: ______________

Admin Complete Date: ______________

Agency Receiving SPIF:

_____ Texas Historical Commission _____ U.S. Fish and Wildlife

_____ Texas Parks and Wildlife Department _____ U.S. Army Corps of Engineers

This form applies to TPDES permit applications only. (Instructions, Page 53)

Complete this form as a separate document. TCEQ will mail a copy to each agency as required by our agreement with EPA. If any of the items are not completely addressed or further information is needed, we will contact you to provide the information before issuing the permit. Address each item completely.

Do not refer to your response to any item in the permit application form. Provide each attachment for this form separately from the Administrative Report of the application. The application will not be declared administratively complete without this SPIF form being completed in its entirety including all attachments. Questions or comments concerning this form may be directed to the Water Quality Division's Application Review and Processing Team by email at WQ-ARPTeam@tceq.texas.gov or by phone at (512) 239-4671.

The following applies to all applications:

1. Permittee: Luminant Generation Company LLC

   Permit No. WQ00 00551000 EPA ID No. TX 0001163

   Address of the project (or a location description that includes street/highway, city/vicinity, and county):

   480 Power Plant Road, Graham, Texas 76450

Provide the name, address, phone and fax number of an individual that can be contacted to answer specific questions about the property.

Prefix (Mr., Ms., Miss):

First and Last Name: Ryan Bayle

Credential (P.E, P.G., Ph.D., etc.): P.G.

Title: Environmental Manager

Mailing Address: 6555 Sierra Drive

City, State, Zip Code: Irving, TX 75039

Phone No.: 214-875-8294 Ext.: Fax No.:

E-mail Address: ryan.bayle@vistracorp.com

2. List the county in which the facility is located: Young

3. If the property is publicly owned and the owner is different than the permittee/applicant, please list the owner of the property.

N/A

4. Provide a description of the effluent discharge route. The discharge route must follow the flow of effluent from the point of discharge to the nearest major watercourse (from the point of discharge to a classified segment as defined in 30 TAC Chapter 307). If known, please identify the classified segment number.

Via Outfall 001 to Lake Eddleman which is part of Lake Graham in Segment No. 1231; via Outfall 002 to Salt Creek; thence to the Brazos River above Possum Kingdom Lake in Segment No. 1208 of the Brazos River Basin.

5. Please provide a separate 7.5-minute USGS quadrangle map with the project boundaries plotted and a general location map showing the project area. Please highlight the discharge route from the point of discharge for a distance of one mile downstream. (This map is required in addition to the map in the administrative report).

Provide original photographs of any structures 50 years or older on the property.

Does your project involve any of the following? Check all that apply.

- ☐ Proposed access roads, utility lines, construction easements
- ☐ Visual effects that could damage or detract from a historic property's integrity
- ☐ Vibration effects during construction or as a result of project design
- ☐ Additional phases of development that are planned for the future
- ☐ Sealing caves, fractures, sinkholes, other karst features

☐ Disturbance of vegetation or wetlands

1. List proposed construction impact (surface acres to be impacted, depth of excavation, sealing of caves, or other karst features):

   None - this is an established facility that has been in operation since 1960.

2. Describe existing disturbances, vegetation, and land use:

   Power plant associated structures, facilities and roads.

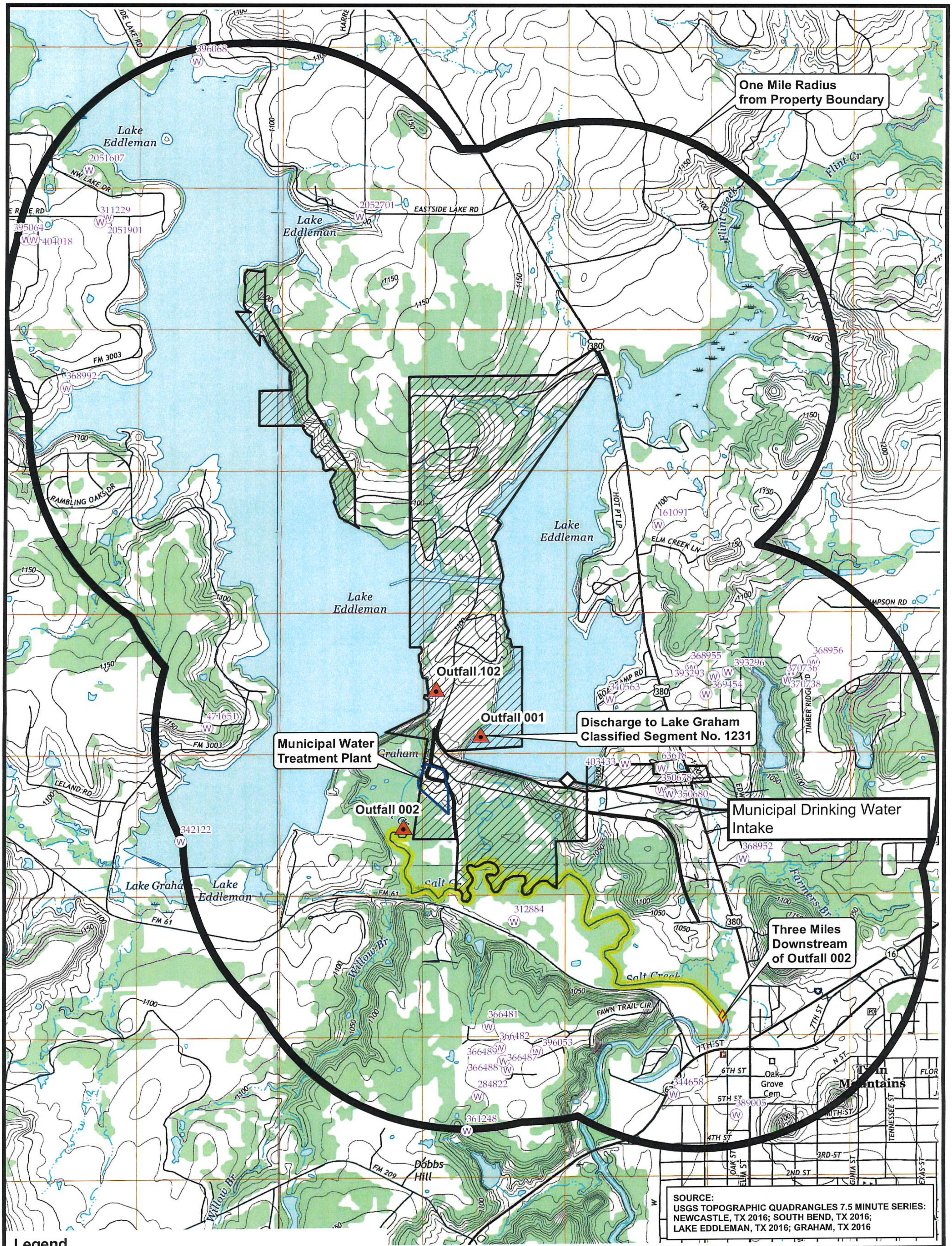
THE FOLLOWING ITEMS APPLY ONLY TO APPLICATIONS FOR NEW TPDES PERMITS AND MAJOR AMENDMENTS TO TPDES PERMITS

3. List construction dates of all buildings and structures on the property:

   [illegible]

4. Provide a brief history of the property, and name of the architect/builder, if known.

   [illegible]



Legend

- Luminant Generation Company LLC Property Boundary
- Outfall Location
- Discharge Route
- Downstream Marker
- Water Wells
- Municipal Water Treatment Plant
- One Mile Radius From Property Boundary

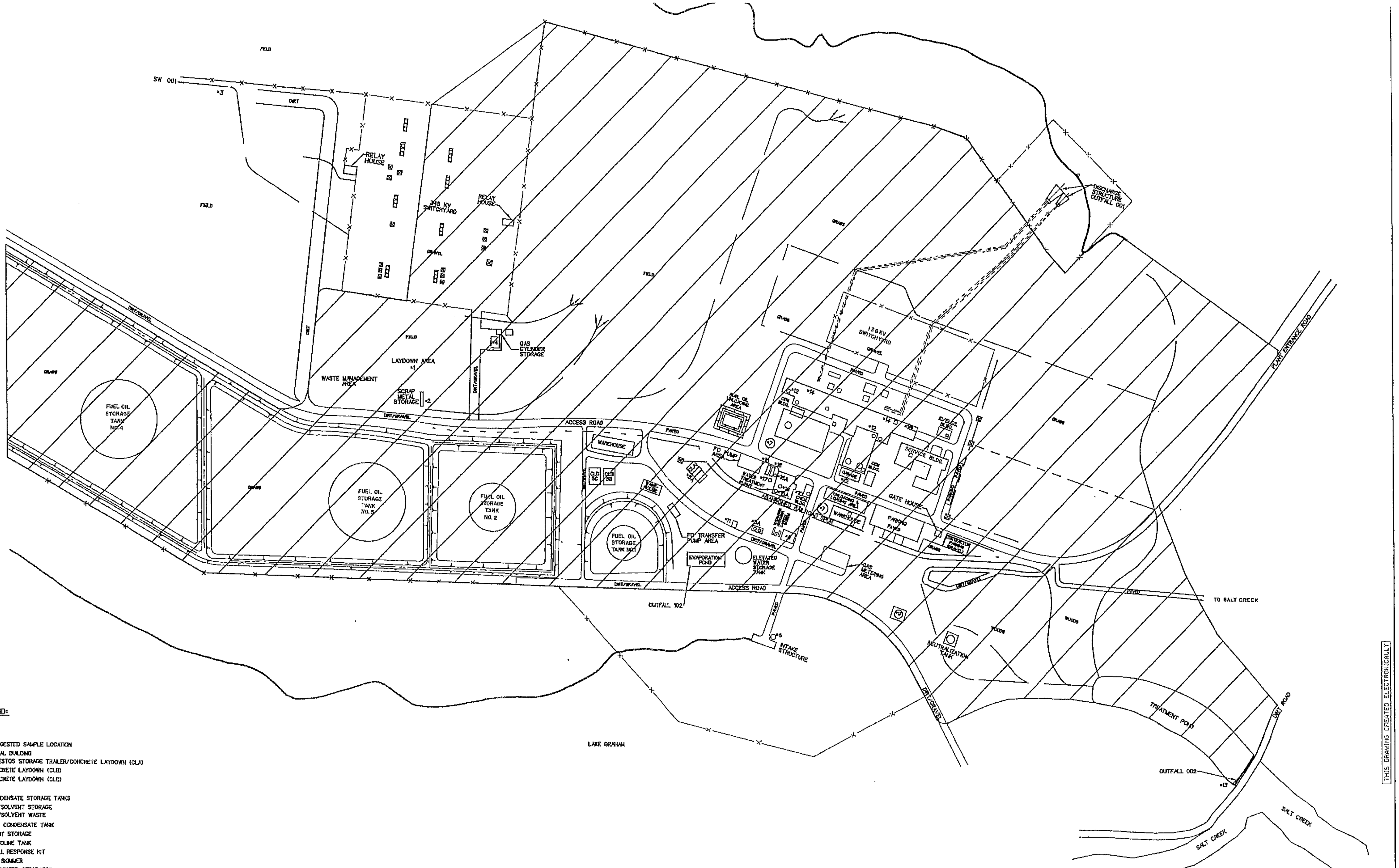
0 1,000 2,000 FEET

LUMINANT GENERATION COMPANY LLC

USGS MAP

DRAWN BY: L WILSON	SCALE:	PROJ. NO.	TPDES 2018
CHECKED BY: D KOCUREK	AS NOTED	FILE NO.	USGS Map.mxd
APPROVED BY: D KOCUREK	DATE PRINTED:		
DATE: June 2018	6/14/2018		

Printed By: lauri on 6/14/2018, 14:53 PM



LEGEND:

*1
*2
*3 SUGGESTED SAMPLE LOCATION
*4 METAL BUILDING
*5A ASBESTOS STORAGE TRAILER/CONCRETE LAYDOWN (CLA)
*5B CONCRETE LAYDOWN (CLB)
*5C CONCRETE LAYDOWN (CLC)
*6
*7 CONDENSATE STORAGE TANKS
*8 OIL/SOLVENT STORAGE
*8A OIL/SOLVENT WASTE
*9 GAS CONDENSATE TANK
*10 PAINT STORAGE
*11 GASOLINE TANK
*12 SPILL RESPONSE KIT
*13 OIL SKIMMER
*14 OIL/WATER SEPARATOR
*15 CAUSTIC STORAGE TANK
*15A CAUSTIC DAY TANK
*16 SULFURIC ACID STORAGE TANK
*16A SULFURIC ACID DAY TANK
*17 FERRICLEAR STORAGE TANK

UNDERGROUND PIPING
SURFACE DRAINAGE CONVEYANCE

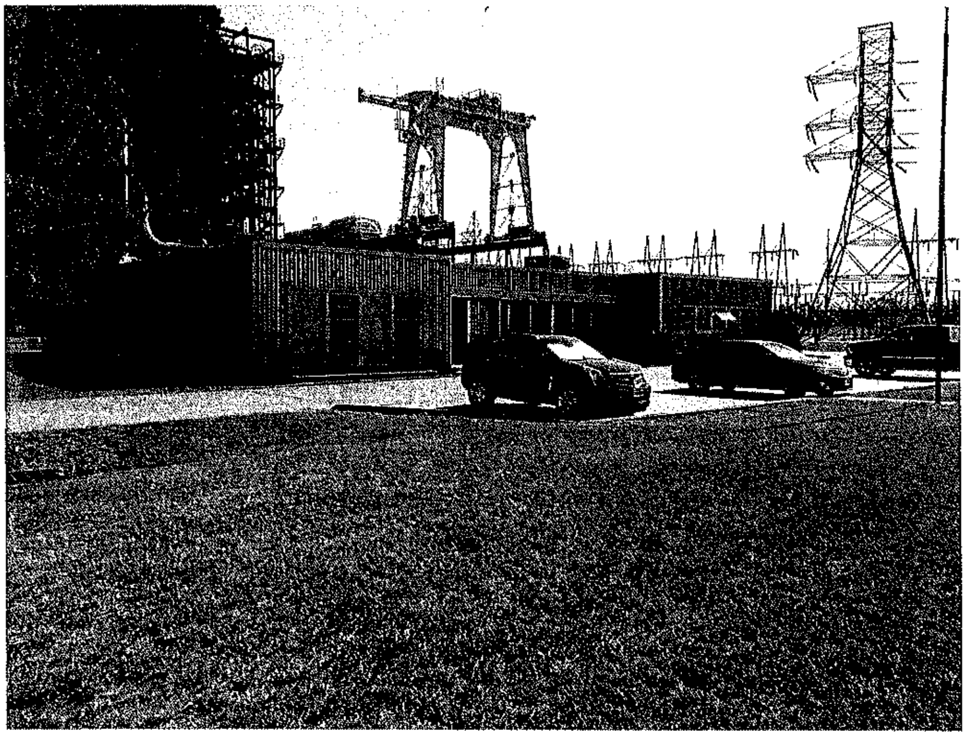
OUTFALL 002 DRAINAGE AREA

REV.	DATE	DWN.	CHKD.	APVD.	REMARKS

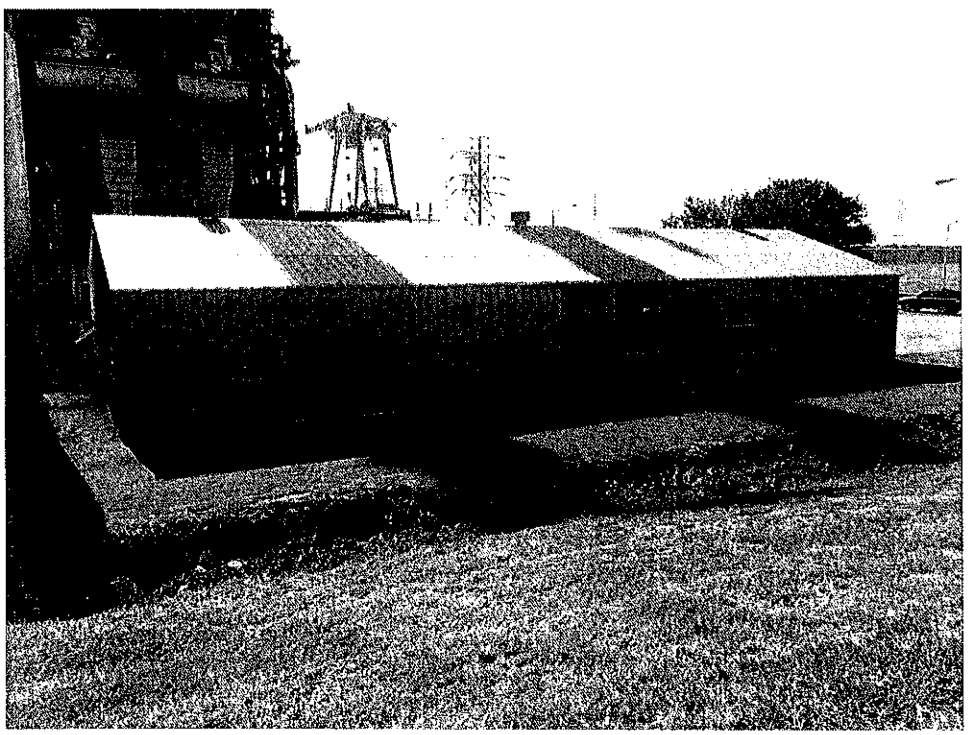
LUMINANT GENERATION COMPANY LLC
Production Engineering Services
GRAHAM SES-UNITS 1&2

FACILITY MAP

Luminant Generation Company LLC
Graham Steam Electric Station
Photographs of Structures More than 50 Years Old



Photograph No. 1: Administration Building construction completed 1960.

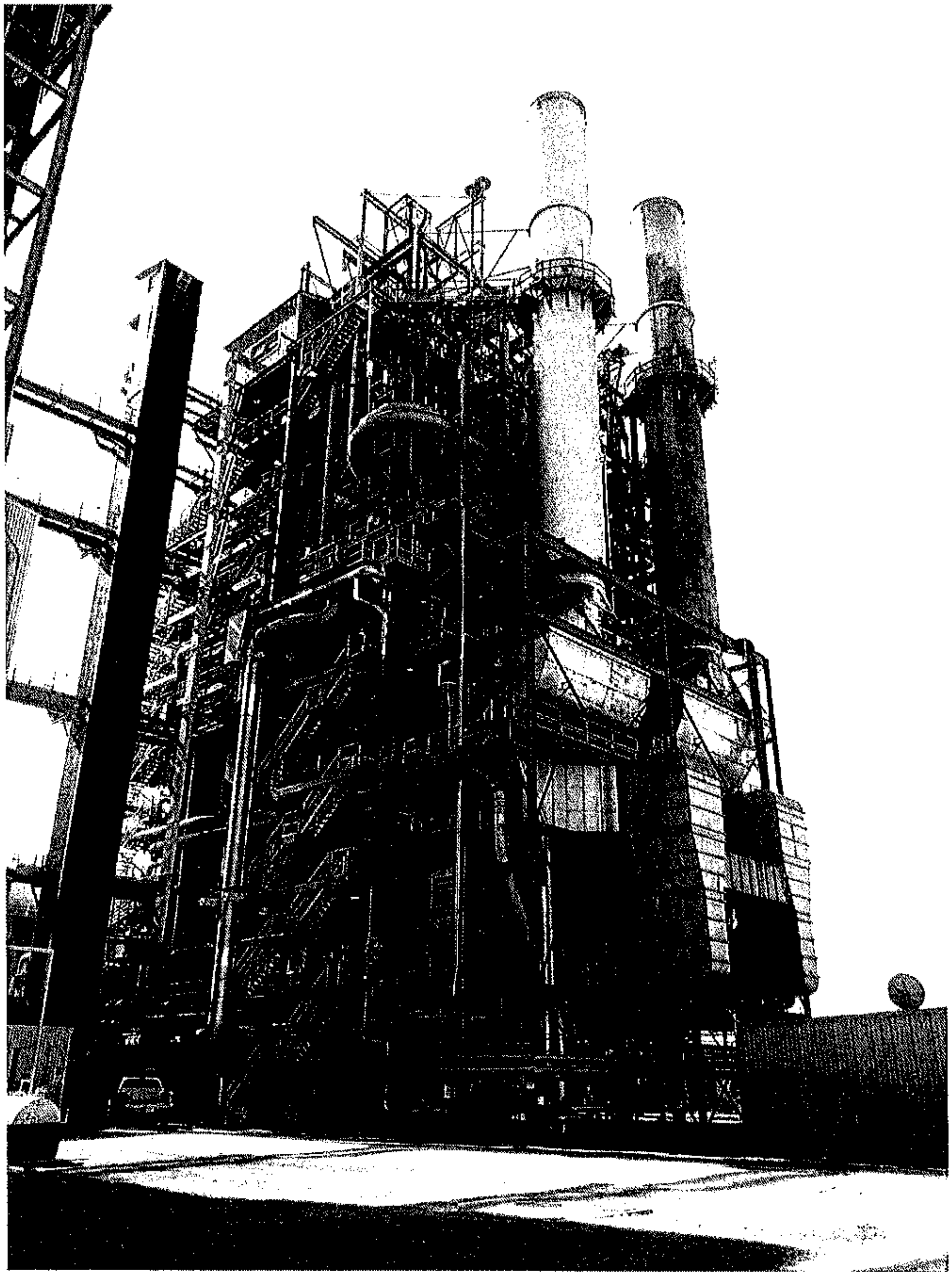


Photograph No. 2: Warehouse construction completed 1960.

Luminant Generation Company LLC
Graham Steam Electric Station
Photographs of Structures More than 50 Years Old

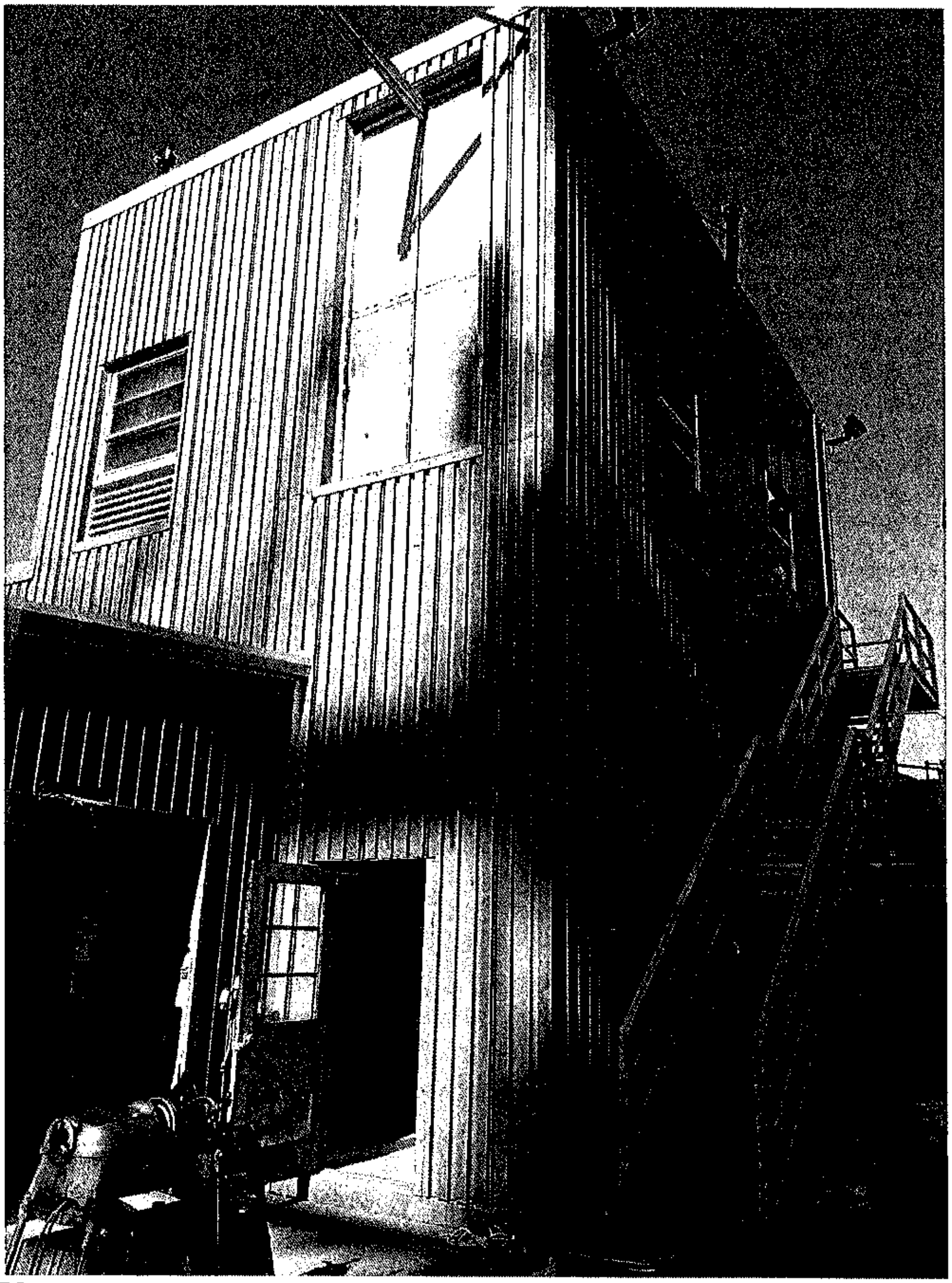
Photograph No. 3: Intake Structure construction completed 1960.

Luminant Generation Company LLC
Graham Steam Electric Station
Photographs of Structures More than 50 Years Old



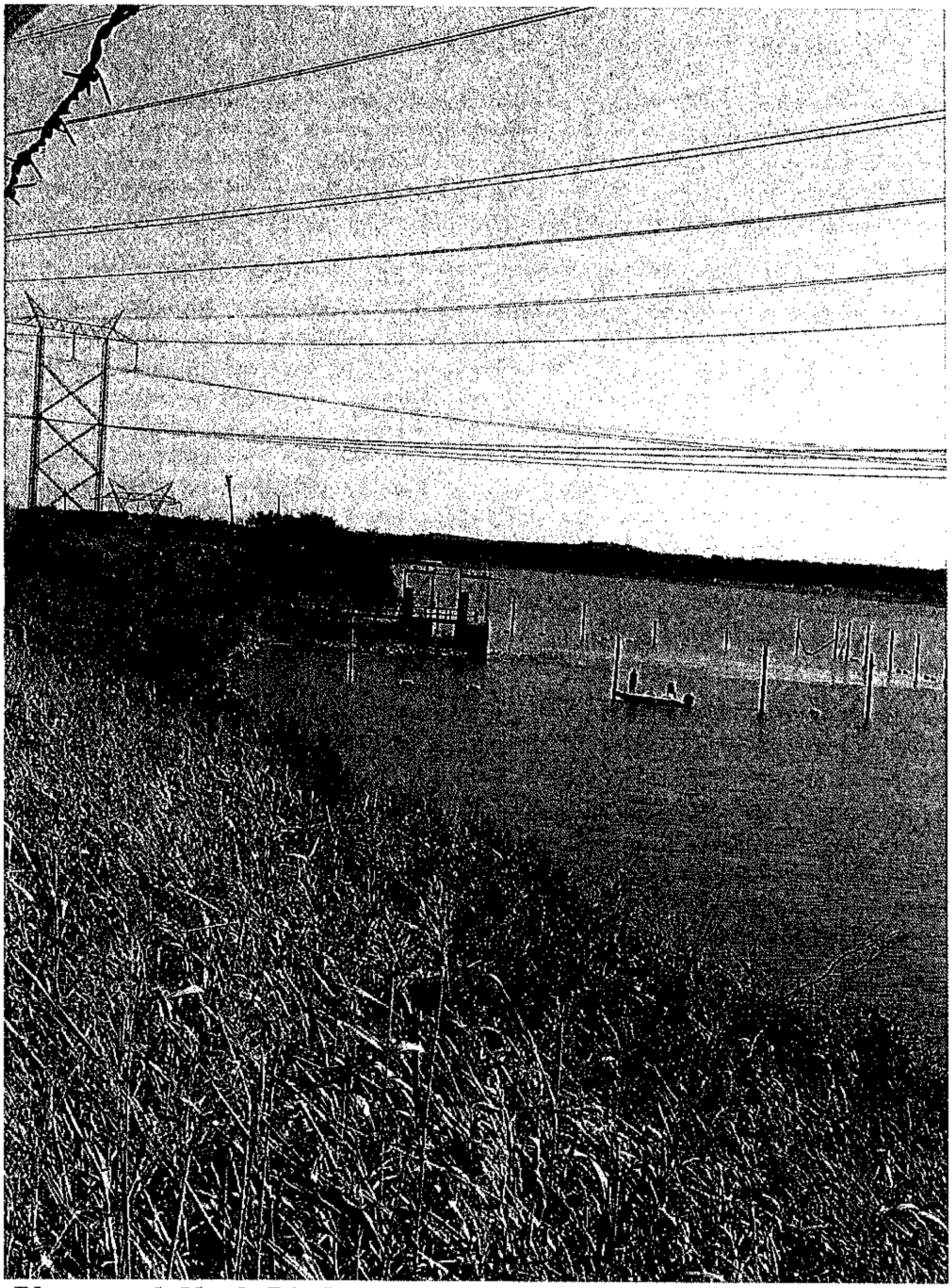
Photograph No. 4: Unit #1 construction completed 1960.

Luminant Generation Company LLC
Graham Steam Electric Station
Photographs of Structures More than 50 Years Old



Photograph No. 5: Water Treatment Plant construction complete 1960.

Luminant Generation Company LLC
Graham Steam Electric Station
Photographs of Structures More than 50 Years Old



Photograph No. 2: Discharge Structure construction completed 1960.

Attachment F

General Description

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

LUMINANT GENERATION COMPANY LLC
GRAHAM STEAM ELECTRIC STATION
GENERAL DESCRIPTION

The Graham Steam Electric Station is a two-unit natural gas-fired steam electric generating facility owned and operated by Luminant Generation Company LLC. The facility is located on the shores of Eddleman and Graham reservoirs off U.S. Highway 380 approximately 2.5 miles northwest of the City of Graham, Young County, Texas. Wastewater discharges are authorized by TPDES Permit No. WQ0000551000. Wastewaters are discharged via Outfall 001 to Eddleman Reservoir which is part of Graham Reservoir in Segment No. 1231 of the Brazos River Basin or via Outfall 002 to Salt Creek, thence to the Brazos River above Possum Kingdom Reservoir in Segment No. 1208 of the Brazos River Basin. Cooling water and plant make-up water are supplied by Lake Graham. The City of Graham municipal water system supplies the facility's potable water.

The generating capacity and date of initial commercial operation for the facility's two units are as follows:

Unit	Capacity (Mw)	Date
1	218	1960
2	392	1969

Wastewaters produced at the plant site consist of once-through and auxiliary cooling, low volume wastes (floor/equipment drains, boiler blowdown and water treatment wastes), metal cleaning wastes and storm water runoff. Wastewaters generated by the facility are collected, treated and discharged via three (3) permitted outfalls. Domestic wastes are discharged to the City of Graham sanitary sewer system. Luminant Generation Company's operating procedures and wastewater handling practices are designed both to comply with all applicable environmental regulations and to provide operational flexibility wherever practical.

The Company is aware of an increased potential for macroinvertebrate invasion of any plant water system, particularly the cooling water systems. In the event of such occurrence, the Company is prepared to treat its water on a static or flow-through basis by supplementing chlorination with ammonia to create chloramines.

The three permitted outfalls are listed below and a description of the wastewater system pertinent to each outfall follows:

Outfall	Type of Wastewater
001	Once-through cooling water
002	Low volume wastes, storm water runoff and previously monitored effluents
102	Metal cleaning waste

Outfall 001 (Once-through Cooling)

Water from Lake Graham is withdrawn at the intake structure, treated chemically and then passed through condensers and auxiliary equipment on a once-through basis to cool equipment and condense exhaust steam. This water is treated with sodium hypochlorite to prevent biofouling; application of this substance is intermittent and does not exceed the regulatory maximum frequency of two (2) hours/unit/day. Sodium Bromide may also be used to enhance the effectiveness of the Sodium hypochlorite in occasional circumstances. The once-through and auxiliary cooling wastewater streams are commingled and discharged to Eddleman Reservoir via Outfall 001.

Outfall 002 (Low Volume Wastes. Storm Water Runoff and Previously Monitored Effluents)

Low volume wastes consisting of boiler blowdown, floor/equipment drains and water treatment wastes (demineralizer regenerant, filter backwash, reverse osmosis wastes, coagulator blowdown, and non-chemical metal cleaning waste) along with storm water runoff (diked oil storage areas, yard drains, drainage ditches, and small on-site construction projects) are routed to a treatment pond for sedimentation and oil removal treatment. Demineralizer regenerant is treated in an elementary neutralization unit prior to discharge to the treatment pond. Floor/equipment drains, as well as some storm water runoff, is passed through oil/water separators prior to discharge to the treatment pond. The treatment pond discharges through an oil skimmer via Outfall 002 to Salt Creek. Outfall 002 also discharges "previously monitored effluents" from Outfall 102 (metal cleaning wastes) through the treatment pond.

Outfall 102 (Metal Cleaning Waste)

Metal cleaning wastes generated by the chemical cleaning of large pieces of equipment are either disposed off-site or evaporated in an on-site hypalon-lined evaporation pond. Occasionally, the wastes within this pond are treated and discharged via Outfall 102. These metal cleaning wastes, which constitute a "previously monitored effluent," are commingled with low volume wastes before discharge via Outfall 002.

<u>Storm Water Management</u>

Outdoor Industrial Processes that will be exposed to precipitation and/or runoff:

1. Storm water runoff from the immediate plant area and immediately around the generating units is routed to yard drains and drainage ditches and, after intermingling with process wastewaters in the treatment pond and the oil skimmer, is discharged through Outfall 002 to Salt Creek.
2. Storm water as a result of direct rainfall into the evaporation pond would be commingled with metal cleaning waste and could potentially discharge via Outfall 102. However, there is no anticipated discharge of Outfall 102.

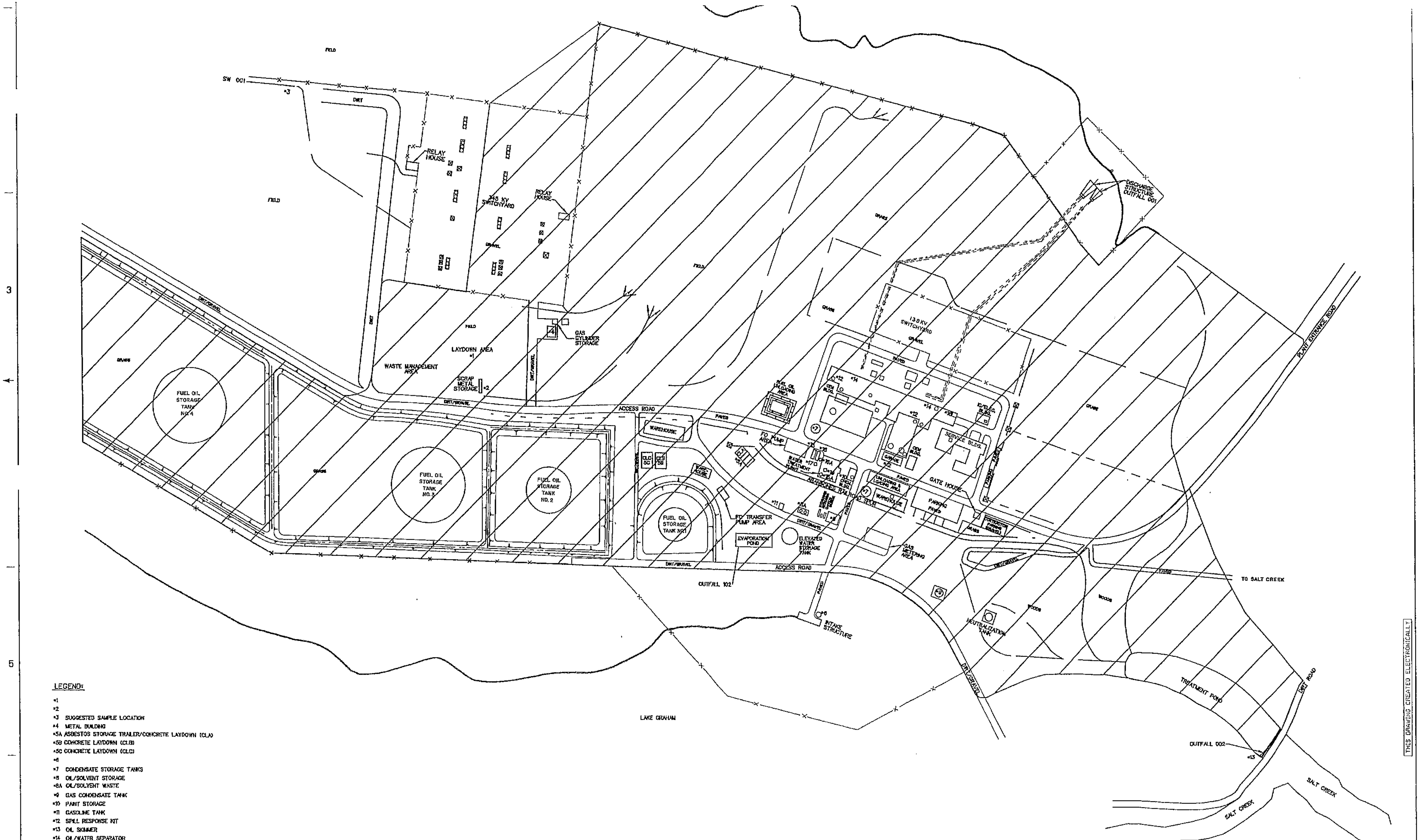
3. Storm water runoff from infrequent construction projects utilizing Best Management Practices may at times be commingled with Outfall 002.

Other areas where storm water runoff may be exposed to industrial processes are permitted under the TCEQ's Multi-Sector General Permit (Permit No. TXR05W674).

Attachment G

Facility Map

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000



LEGEND:

- *1
- *2
- *3 SUGGESTED SAMPLE LOCATION
- *4 METAL BUILDING
- *5A ASBESTOS STORAGE TRAILER/CONCRETE LAYDOWN (CLA)
- *5B CONCRETE LAYDOWN (CLB)
- *5C CONCRETE LAYDOWN (CLC)
- *6
- *7 CONDENSATE STORAGE TANKS
- *8 OIL/SOLVENT STORAGE
- *8A OIL/SOLVENT WASTE
- *9 GAS CONDENSATE TANK
- *10 PAINT STORAGE
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- *16A SULFURIC ACID DAY TANK
- *17 FERRICLEAR STORAGE TANK

UNDERGROUND PIPING
SURFACE DRAINAGE CONVEYANCE

OUTFALL 002 DRAINAGE AREA

REV.	DATE	DWN.	CHKD.	APVD.	REMARKS

LUMINANT GENERATION COMPANY LLC
Production Engineering Services
GRAHAM SES-UNITS 1&2

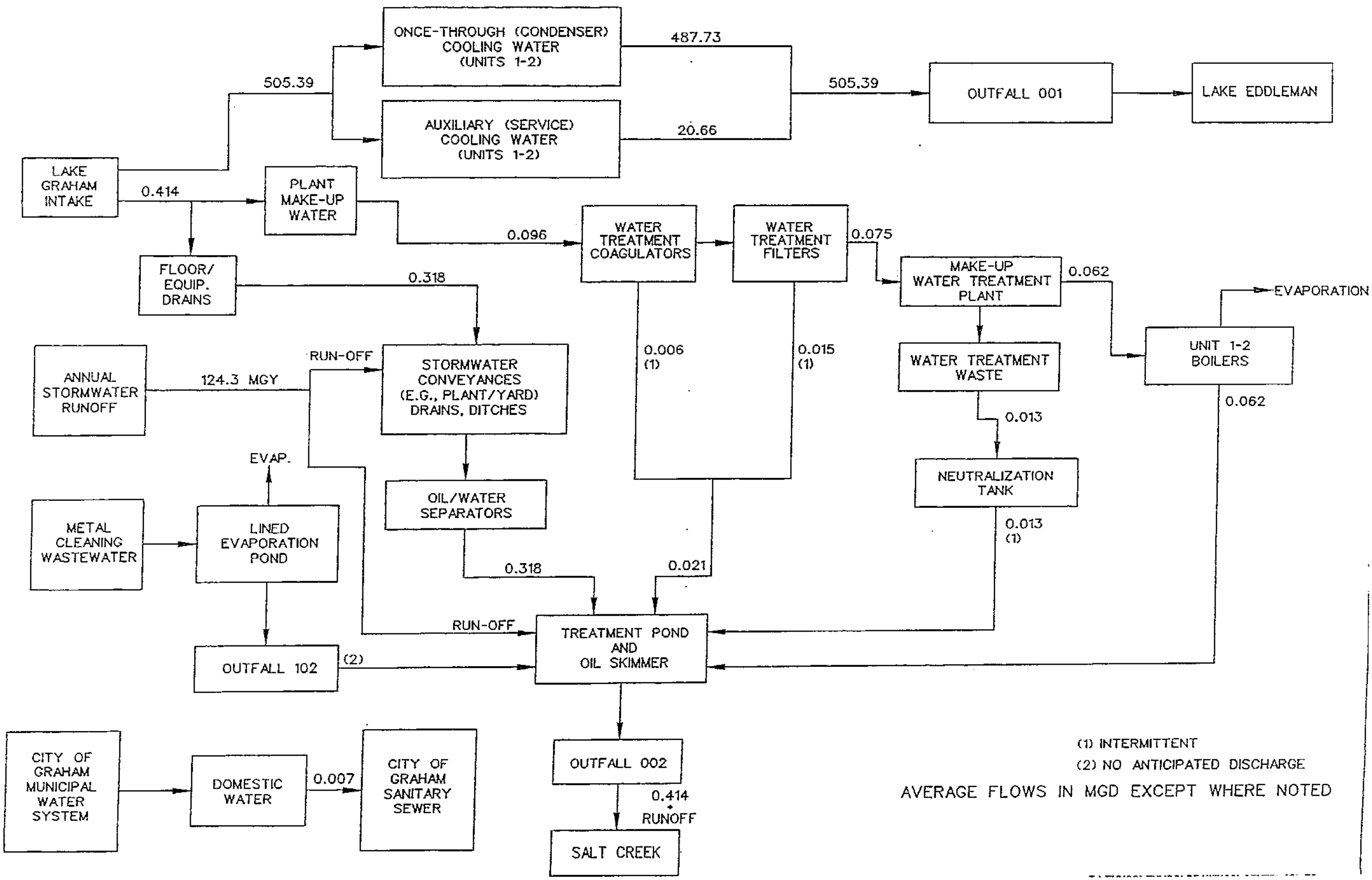
FACILITY MAP

Attachment H

Water balance Diagram

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

LUMINANT GENE_ATION COMPANY LLC
GRAHAM STEAM ELECTRIC STATION
WATER BALANCE DIAGRAM
OCTOBER 2008



(1) INTERMITTENT
(2) NO ANTICIPATED DISCHARGE

AVERAGE FLOWS IN MGD EXCEPT WHERE NOTED

Attachment I

Boiler Chemical Additivies

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Boiler Chemical Additives

a. Manufacturers Product Identification Number: **Ammonium hydroxide**

b. Product Use: **pH adjustment**

c. Chemical Composition: **NH_4OH**

d. Classification (non-persistent, persistent or bioaccumulative): **Believed Non-Persistent**

e. Product or active ingredient half-life: **Not Available**

f. Frequency of product use: **Continuous low concentration feed during operation**

g. Product toxicity data: **See attached MSDS**

h. Concentration of whole product or active ingredient: **Not Available**

i. Outfall: **002**

Material Safety Data Sheet

Ammonium hydroxide water solution, >14N NH4OH (25-30% as ammonia, NH3)

\CC# 00211

Section 1 - Chemical Product and Company Identification

MSDS Name: Ammonium hydroxide water solution, >14N NH4OH (25-30% as ammonia, NH3)
Catalog Numbers: AC205840000, AC205840010, AC205840025, AC205840050, AC255210000, AC255210025, AC255210051, AC390030000, AC390030010, AC390030025, AC423300000, AC423300250, S70665, S70665MF, S75029, S93119, S93120, S93120A, 42330-0025, 42330-5000, A667-212, A667-212LC, A669-212, A669-212LC, A669-385LB, A669-500, A669-500LC, A669-612GAL, A669C-212, A669C-212LC, A669J-500, A669S-212, A669S-212LC, A669S-500, A669S212EA, SCH1143
Synonyms: Ammonium hydrate; Ammonia solution; Ammonia water; Aqueous ammonia; Aqua ammonia.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7664-41-7	Ammonia	25-30	231-635-3
7732-18-5	Water	Balance	231-791-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid.
Danger! Causes eye and skin burns. Causes digestive and respiratory tract burns. Harmful if inhaled or swallowed.
Target Organs: Eyes, skin, mucous membranes.

Potential Health Effects
Eye: Contact with liquid or vapor causes severe burns and possible irreversible eye damage. Lachrymator (substance which increases the flow of tears).
Skin: Causes severe skin irritation. Causes skin burns. May cause deep, penetrating ulcers of the skin. Contact with the skin may cause staining, inflammation, and thickening of the skin.
Ingestion: Harmful if swallowed. May cause severe and permanent damage to the digestive tract. Causes gastrointestinal tract burns. Causes throat constriction, vomiting, convulsions, and shock.
Inhalation: Effects may be delayed. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma.
Chronic: Prolonged inhalation may cause respiratory tract inflammation and lung damage. Prolonged or repeated exposure may cause corneal damage and the development of cataracts and glaucoma.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid

immediately.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: After inhalation exposure, observe for 24 to 72 hours as pulmonary edema may be delayed.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Ammonium hydroxide itself is non-combustible. However concentrated ammonia solutions may give off ammonia vapours. Ammonia gas is generally not considered a serious fire or explosion hazard because ammonia/air mixtures are difficult to ignite. A relatively high concentration of ammonia gas must be present in order for ignition to occur. However, a large and intense energy source may cause ignition and/or explosion in a confined space.
Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.
Flash Point: Not available.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Neutralize spill with a weak acid such as vinegar or acetic acid. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation. Approach spill from upwind.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Keep container tightly closed. Discard contaminated shoes. Do not breathe vapor. Use only with adequate ventilation.
Storage: Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Isolate from oxidizing materials and acids. Walls, floors, shelving, fittings, lighting and ventilation systems in storage area should be made from carbon steel or stainless steel which do not react with ammonium hydroxide.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ammonia	25 ppm TWA; 35 ppm STEL	25 ppm TWA; 18 mg/m3 TWA 300 ppm IDLH	50 ppm TWA; 35 mg/m3 TWA
Ammonium hydroxide	none listed	none listed	none listed
Water	none listed	none listed	none listed

OSHA Vacated PELs: Ammonia: No OSHA Vacated PELs are listed for this chemical. Ammonium hydroxide: No OSHA Vacated PELs are listed for this chemical. Water: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear chemical splash goggles and face shield.

Skin: Wear appropriate gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colorless
Odor: strong odor - ammonia-like
pH: 13.6
Vapor Pressure: 557 mm Hg @ 21 deg C
Vapor Density: 0.59 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 27 deg C
Freezing/Melting Point:-69 deg C
Decomposition Temperature: Not available.
Solubility: Soluble.
Specific Gravity/Density:0.89
Molecular Formula:NH4OH
Molecular Weight:35.04

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures. Ammonium hydroxide is actually a solution of ammonia in water. Therefore the flammable properties of ammonia apply.

Conditions to Avoid: High temperatures, confined spaces, Ammonia solutions are corrosive to copper, zinc, aluminum and their alloys..

Incompatibilities with Other Materials: Strong oxidizing agents, acids, acrolein, halogens, mercury, hypochlorite, silver nitrate, acrylic acid, dimethyl sulfate, silver oxide.

Hazardous Decomposition Products: Nitrogen oxides (NOx) and ammonia (NH3).

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7664-41-7: BO0875000
CAS# 1336-21-6: BQ9625000
CAS# 7732-18-5: ZC0110000
LD50/LC50:
CAS# 7664-41-7:
Inhalation, mouse: LC50 = 4230 ppm/1H;

Inhalation, mouse: LC50 = 4600 mg/m3/2H;
Inhalation, rabbit: LC50 = 7 gm/m3/1H;
Inhalation, rat: LC50 = 2000 ppm/4H;
Inhalation, rat: LC50 = 18600 mg/m3/5M;
Inhalation, rat: LC50 = 7040 mg/m3/30M;
Skin, rat: LD50 = 112000 mg/m3/15M;
Skin, rat: LD50 = 71900 mg/m3/30M;
Skin, rat: LD50 = 4840 mg/m3/60M;

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CAS# 1336-21-6:
Draize test, rabbit, eye: 250 ug Severe;
Draize test, rabbit, eye: 44 ug Severe;
Oral, rat: LD50 = 350 mg/kg;

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CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;

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Carcinogenicity:
CAS# 7664-41-7: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 1336-21-6: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 0.008 mg/L; 24 Hr.; Unspecified
Fish: Fathead Minnow: LC50 = 8.2 mg/L; 96 Hr.; Unspecified
Fish: Bluegill/Sunfish: LC50 = 0.024-0.093 mg/L; 48 Hr.; Unspecified
Water flea Daphnia: EC50 =0.66 mg/L; 48 Hr.; 22 degrees C

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	AMMONIA SOLUTIONS	AMMONIA SOLUTION
Hazard Class:	8	8
UN Number:	UN2672	UN2672
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

ıSCA
CAS# 7664-41-7 is listed on the TSCA inventory.
CAS# 1336-21-6 is listed on the TSCA inventory.
CAS# 7732-18-5 is listed on the TSCA inventory.

Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs
CAS# 7664-41-7: 100 lb final RQ; 45.4 kg final RQ CAS# 1336-21-6: 1000 lb final RQ; 454 kg final RQ

SARA Section 302 Extremely Hazardous Substances
CAS# 7664-41-7: 500 lb TPQ

SARA Codes
CAS # 1336-21-6: immediate, delayed.

Section 313
This material contains Ammonia (CAS# 7664-41-7, 25-30%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

'ean Water Act:
ᴗAS# 7664-41-7 is listed as a Hazardous Substance under the CWA. CAS# 1336-21-6 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:
CAS# 7664-41-7 is considered highly hazardous by OSHA.

STATE
CAS# 7664-41-7 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
CAS# 1336-21-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.
CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:
C N

Risk Phrases:
R 34 Causes burns.
R 50 Very toxic to aquatic organisms.

.fety Phrases:
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39 Wear suitable protective clothing, gloves and eye/face pr otection.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

/GK (Water Danger/Protection)
CAS# 7664-41-7: 2
CAS# 1336-21-6: 2
CAS# 7732-18-5: No information available.

Canada - DSL/NDSL
CAS# 7664-41-7 is listed on Canada's DSL List.
CAS# 1336-21-6 is listed on Canada's DSL List.
CAS# 7732-18-5 is listed on Canada's DSL List.

Canada - WHMIS
This product has a WHMIS classification of D1B, E.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List
CAS# 7664-41-7 is listed on the Canadian Ingredient Disclosure List.
CAS# 1336-21-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/22/1999
Revision #15 Date: 11/12/2007

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Boiler Chemical Additives

a. Manufacturers Product Identification Number: **Hydrazine**

b. Product Use: **Oxygen Scavenger**

c. Chemical Composition: **N2H4.H2O**

d. Classification (non-persistent, persistent or bioaccumulative): **Believed Non-Persistent**

e. Product or active ingredient half-life: **Not Available**

f. Frequency of product use: **Continuous low concentration feed during operation**

g. Product toxicity data: **See attached MSDS**

h. Concentration of whole product or active ingredient: **Not Available**

i. Outfall: **002**

MATERIAL SAFETY DATA SHEET

LANXESS

Energizing Chemistry

LANXESS Corporation
Product Safety & Regulatory Affairs
111 RIDC Park West Drive
Pittsburgh, PA 15275-1112
USA

TRANSPORTATION EMERGENCY

CALL CHEMTREC:	(800) 424-9300
INTERNATIONAL:	(703) 527-3887

NON-TRANSPORTATION

LANXESS Emergency Phone:	(800) 410-3063
LANXESS Information Phone:	(800) LANXESS

1. Product and Company Identification

Product Name:	K-35 CERTIFIED HYDRAZINE 35%
Material Number:	6285880
Chemical Family:	Diamines
Chemical Name:	Hydrazine
Synonyms:	54.7 % Hydrazine Hydrate, Aqueous Hydrazine Solution, Diamide Hydrate
Formula:	N2H4.H2O

2. Hazards Identification

Emergency Overview

WARNING! **Color:** Colorless to light yellow **Form:** liquid **Odor:** ammoniacal, Fishy.
Toxic. Sudden reaction and fire may result when mixed with oxidizing agents. Harmful by inhalation and if swallowed. Toxic gases/fumes may given off during burning or thermal decomposition. Use cold water spray to cool fire-exposed containers to minimize the risk of rupture. May cause respiratory tract irritation. Harmful if absorbed through skin. Causes skin irritation. May cause allergic skin reaction. Causes eye irritation. May cause kidney damage. May cause liver damage. May cause blood disorders. May affect nervous system. May cause lung damage. May cause cancer based on animal data.

Potential Health Effects

Primary Routes of Entry:	Skin Absorption, Skin Contact, Eye Contact, Inhalation, Ingestion
Medical Conditions Aggravated by Exposure:	Eye disorders, Skin disorders, Respiratory disorders, Kidney disorders, Liver disorders, Blood disorders

HUMAN EFFECTS AND SYMPTOMS OF OVEREXPOSURE

Inhalation

Acute Inhalation

For Product: K-35 CERTIFIED HYDRAZINE 35%

May cause respiratory tract irritation with symptoms of coughing, sore throat and runny nose.

For Component: Hydrazine

Causes respiratory tract irritation with symptoms of coughing, sore throat and runny nose. May cause pulmonary edema with symptoms of breathing difficulty and tightness of chest. Expected to be toxic by inhalation. May cause methemoglobin formation resulting in a reduced ability of the blood to carry oxygen; a symptom of this may be cyanosis (purplish-blue coloring of the skin, fingernails, and lips). May cause nervous system effects which can include symptoms of dizziness, incoordination, headache, numbness, and/or confusion.

Chronic Inhalation

For Component: Hydrazine

Repeated or prolonged exposure may cause effects as described in chronic ingestion.

Skin

Acute Skin

For Product: K-35 CERTIFIED HYDRAZINE 35%

Causes irritation with symptoms of reddening, itching, and swelling.

For Component: Hydrazine

Corrosive with symptoms of reddening, itching, swelling, burning and possible permanent damage. May cause allergic skin reaction with symptoms of reddening, itching, swelling, and rash. Highly toxic by skin absorption. If sufficient amounts are absorbed, systemic toxicity may occur with symptoms similar to those described in acute inhalation.

Chronic Skin

For Component: Hydrazine

Prolonged or repeated skin contact may cause dermatitis with symptoms of red, itchy, dry skin. Chronic exposure may cause symptoms similar to those described in chronic inhalation.

Eye

Acute Eye

For Product: K-35 CERTIFIED HYDRAZINE 35%

Causes irritation with symptoms of reddening, tearing, stinging, and swelling.

For Component: Hydrazine

Corrosive with symptoms of reddening, tearing, swelling, burning and possible permanent damage.

Chronic Eye

For Component: Hydrazine

Prolonged vapor contact may cause conjuntivitis.

Ingestion

Acute Ingestion

For Product: K-35 CERTIFIED HYDRAZINE 35%

May cause irritation with symptoms of reddening.

For Component: Hydrazine

Harmful if swallowed. Symptoms of ingestion may include abdominal pain, nausea, vomiting, and diarrhea. Ingestion and/or vomiting may cause aspiration into the lungs resulting in chemical pneumonitis (inflammation of the lungs). May cause digestive tract burns. May cause nervous system effects which can include symptoms of dizziness, incoordination, headache, numbness, and/or confusion. May cause methemoglobin formation resulting in a reduced ability of the blood to carry oxygen; a symptom of this may be cyanosis (purplish-blue coloring of the skin, fingernails, and lips).

Chronic Ingestion
For Component: Hydrazine
May cause kidney damage. May cause liver damage. May cause brain damage. May cause blood disorders.

Carcinogenicity:

Hydrazine	NTP	- Hazard Designation: Anticipated carcinogen.
	IARC	- Overall evaluation: 2B Possible carcinogen.

3. Composition/Information on Ingredients

Hazardous Components

Weight %	Components	CAS-No.
30 - 40%	Hydrazine	302-01-2

4. First Aid Measures

Eye Contact
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Use fingers to ensure that eyelids are separated and that the eye is being irrigated. Call a physician immediately.

Skin Contact
In case of skin contact, wash affected areas with soap and water. Immediately remove contaminated clothing and shoes. Get medical attention. Wash clothing and shoes before reuse.

Inhalation
If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

Ingestion
If ingested, do not induce vomiting unless directed to do so by medical personnel. Give two glasses of water for dilution. Do not give anything by mouth to an unconscious person. Get medical attention.

Notes to physician
There are no definitive antidotes for hydrazine exposure. Physicians should treat exposed persons symptomatically. Overexposed persons should be closely observed for symptoms of central nervous system involvement, respiratory irritation, bronchitis or edema, and treat accordingly. Parenteral pyridoxine administration has been used by some physicians to treat patients suffering acute central nervous system effects. (In one reported case, following pyridoxine administration parenterally, there was a rapid reversal of coma in 4 hours in a patient who had been comatose for over 60 hours.)

5. Fire-Fighting Measures

Suitable Extinguishing Media: dry chemical, carbon dioxide (CO2), foam, water spray for large fires.

Special Fire Fighting Procedures
Firefighters should be equipped with self-contained breathing apparatus to protect against potentially toxic and irritating fumes. Use cold water spray to cool fire-exposed containers to minimize risk of rupture.

Unusual Fire/Explosion Hazards
Toxic and irritating gases/fumes may be given off during burning or thermal decomposition. Closed container may forcibly rupture when exposed to heat.

6. Accidental release measures

Spill and Leak Procedures
Cleanup personnel must use appropriate personal protective equipment. Contain small spills by diking and digging a containment pit sufficiently large to hold at least 10 times the spill volume. Dilute to approximately 10 times the volume with water. Add sufficient dry commercial calcium hypochlorite (dry chlorine, HTHR, dry bleach) to completely oxidize the hydrazine. Use 7-10 lbs per pound of hydrazine. Calcium hypochlorite or other oxidizing agents should never be allowed to mix with undiluted hydrazine solutions. The resulting reaction is very vigorous, releasing large amounts of heat and gas. Contaminated surfaces should be treated with household bleach or calcium hypochlorite solution to oxidize the residual hydrazine. Major Spill or Leak (10 gallons or more): Call LANXESS Corporation for assistance and advice. If transportation spill, call CHEMTREC.

7. Handling and Storage

Storage Temperature:
maximum: 50 °C (122 °F)

Storage Period
Unlimited in tightly closed containers.

Handling/Storage Precautions
Do not get in eyes. Do not get on skin or clothing. Do not taste or swallow. Do not breathe vapours/dust. Wear personal protective equipment. Wash thoroughly after handling. Keep container closed when not in use.

Further Info on Storage Conditions
Store in a place away from heat and ignition sources and oxidants, preferably outdoors. Shelter drums stored outdoors from direct sunlight. For indoor storage areas, continuous ventilation should be provided.

8. Exposure Controls / Personal Protection

Hydrazine (302-01-2)
- US. ACGIH Threshold Limit Values
  - Time Weighted Average (TWA): 0.01 ppm
- US. ACGIH Threshold Limit Values
  - Skin designation: Can be absorbed through the skin.
- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
  - PEL: 1 ppm, 1.3 mg/m3
- US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)
  - Skin designation: Can be absorbed through the skin.
- US. ACGIH Threshold Limit Values
  - Hazard Designation: Group A3 Confirmed animal carcinogen with unknown relevance to humans.

Industrial Hygiene/Ventilation Measures
General dilution and local exhaust as necessary to control airborne vapors, mists, dusts and thermal decomposition products below appropriate airborne concentration standards/guidelines.

Respiratory Protection
The following respirator is recommended if airborne concentrations exceed the appropriate standard/guideline., NIOSH approved positive pressure air-supplied respirator.

Hand Protection
Polyvinyl chloride (PVC/vinyl) gloves., Nitrile rubber gloves., Neoprene gloves

Eye Protection
Chemical resistant goggles must be worn., Chemical safety goggles in combination with a full face shield if a splash hazard exists.

Skin and body protection
Permeation resistant footwear, Permeation resistant clothing

Additional Protective Measures
Do not store or transfer hydrazine solutions in open container, because hydrazine can be absorbed into the body by all common routes of exposure. Protective equipment must be used. Educate and train employees in the safe use and handling of this product. Emergency showers and eye wash stations should be available. Employees should wash their hands and face before eating, drinking, or using tobacco products.

9. Physical and chemical properties

Form:	liquid
Color:	Colorless to light yellow
Odor:	ammoniacal, Fishy
pH:	> 12 @ 350 g/l 20 °C (68 °F) original solution
Freezing Point:	Approximately -65 °C (-85 °F)
Boiling Point/Range:	Approximately 109.39 °C (228.9 °F)
Flash Point:	> 100 °C (> 212 °F) (DIN 51758)
Lower Explosion Limit:	9.3 %(V)
Upper Explosion Limit:	83.4 %(V)
Vapor Pressure:	15 mbar @ 20 °C (68 °F)
Specific Gravity:	Approximately 1.021 @ 20 °C (68 °F)
Solubility in Water:	Soluble
Autoignition Temperature:	> 310 °C (> 590 °F)
Viscosity, Dynamic:	Approximately 1.26 mPa.s @ 20 °C (68 °F)
Molecular Weight:	50.06 For the active ingredient.

10. Stability and Reactivity

Hazardous Reactions
Hazardous polymerization does not occur.

Stability
Stable under normal conditions of use and storage.

Materials to avoid
Oxidizing agents, catalytic metals, Lead, Copper, Zinc, Cobalt, Silver, certain alloys (such as bronze and brass)

Conditions to avoid
Avoid extreme heat. Slow reaction with oxygen from the air is possible at room temperature.

Hazardous decomposition products
By catalytic influence or elevated temperatures: Hydrogen; Nitrogen; Ammonia; other toxic or flammable nitrogen compounds

11. Toxicological Information

<u>Toxicity Data for K-35 CERTIFIED HYDRAZINE 35%</u>
Acute dermal toxicity
LD50: > 200 mg/kg (rabbit)

Skin Irritation
Irritating to skin.

Eye Irritation
Irritating to eyes.

<u>Toxicity Data for Hydrazine</u>
Acute Oral Toxicity
LD50: 60 - 129 mg/kg (Rat)

Acute Inhalation Toxicity
LC50: 4.2 mg/l, 1 hrs (Rat, Male/Female)
LC50: 570 ppm, 4 hrs (rat)

Acute dermal toxicity
LD50: 91 mg/kg (rabbit)

Skin Irritation
rabbit, Draize Test, Corrosive
rabbit, Draize, irritating
35% aqueous solution
rabbit, OECD Test Guideline 404, Non-irritating
5% aqueous solution

Eye Irritation
rabbit, Corrosive
rabbit, OECD Test Guideline 405, Non-irritating
5% aqueous solution

Sensitization
dermal: sensitizer (Human, Patch Test)

Repeated Dose Toxicity
6 months, inhalation: NOAEL: 1.31 mg/m3, LOAEL: 6.55 mg/m3, (Dog, male, 6 hrs/day 5 days/week)
Reduced body weight gain. Changes in blood parameters. Changes in: liver
lifetime, oral: NOAEL: 10 mg/l, (rat,)
Reduced body weight gain.

Mutagenicity
Genetic Toxicity in Vitro:
Ames: positive (Salmonella typhimurium, Metabolic Activation: with/without)

Positive and negative results were seen in various in vitro studies.
Genetic Toxicity in Vivo:
Dominant Lethal Assay: negative (mouse, Male, intraperitoneal)
Mouse Spot test: positive (mouse, Male/Female, intraperitoneal)
Positive and negative results were seen in various in vivo studies.

Carcinogenicity
Hydrazine was tested for carcinogenicity by oral administration to mice in several experiments, producing mammary and lung tumours. When tested by oral administration or inhalation exposure in rats, it produced lung, liver and nasal tumours and a few colon tumours. In hamsters, it produced liver tumours and thyroid adenomas following oral or inhalation exposure.

The cancer risk of men exposed to hydrazine was investigated in two small cohort studies. In neither of these studies was an elevated risk observed for all cancers combined or for any specific cancer type.

Toxicity to Reproduction/Fertility
Fertility Screening, inhalation, 5 hrs/day, 5 days/week, (Rat, Male/Female) NOAEL (F2): 0.85 mg/m3
Animal testing did not show any effects on fertility. Fetotoxicity has been observed in animal studies.

Developmental Toxicity/Teratogenicity
rat, Female, dermal, gestation, NOAEL (teratogenicity): 50 mg/kg, NOAEL (maternal): < 5 mg/kg,
Fetotoxicity seen only with maternal toxicity.
Rat, female, oral, gestation days 6-15, daily, NOAEL (teratogenicity): 10 mg/kg, NOAEL (maternal): 2.5 mg/kg,
Fetotoxicity seen only with maternal toxicity.

12. Ecological Information

<u>Ecological Data for Hydrazine</u>
Bioaccumulation
Guppy (Poecilia reticulata), Exposure time: 96 hrs, 316 BCF

Acute and Prolonged Toxicity to Fish
LC50: 1.08 mg/l (Bluegill (Lepomis macrochirus), 96 hrs)
LC50: 5.98 mg/l (Fathead minnow (Pimephales promelas), 96 hrs)

Acute Toxicity to Aquatic Invertebrates
EC50: 2.3 mg/l (Water flea (Daphnia magna), 24 hrs)

Toxicity to Aquatic Plants
EC50: 0.01 mg/l, End Point: growth (Green algae (Chlorella pyrenoidosa), 6 Days)
EC50: 0.0161 mg/l, End Point: growth (Green algae (Selenastrum capricornutum), 6 Days)

Toxicity to Microorganisms
EC50: 0.01 mg/l, (Photobacterium phosphoreum, 20 min)
Tlm: 0.019 mg/l, (Pseudomonas putida, 16 hrs)

13. Disposal considerations

Waste Disposal Method
Oxidize or incinerate in accordance with federal, state and local environmental control regulations.

Empty Container Precautions
Recondition or dispose of empty container in accordance with governmental regulations. Do not reuse empty container without proper cleaning. Label precautions also apply to this container when empty. Empty containers retain product residue (dust, liquid, vapor and/or gases) and can be dangerous. Do not heat or cut container with electric or gas torch.

14. Transportation information

Land transport (DOT)

Proper Shipping Name:	Hydrazine, aqueous solution
Hazard Class or Division:	6.1
UN/NA Number:	UN3293
Packaging Group:	III
Hazard Label(s):	Toxic

RSPA/DOT Regulated Components:
Hydrazine

Reportable Quantity: 2 lb

Sea transport (IMDG)

Proper Shipping Name:	HYDRAZINE, AQUEOUS SOLUTION
Hazard Class or Division:	6.1
UN-No:	UN3293
Packaging Group:	III
Hazard Label(s):	Toxic

Air transport (ICAO/IATA)

Proper Shipping Name:	Hydrazine, aqueous solution
Hazard Class or Division:	6.1
UN-No:	UN3293
Packaging Group:	III
Hazard Label(s):	Toxic

15. Regulatory Information

United States Federal Regulations

OSHA Hazcom Standard Rating: Hazardous

US. Toxic Substances Control Act: Listed on the TSCA Inventory.

US. EPA CERCLA Hazardous Substances (40 CFR 302):
Components
Hydrazine — Reportable quantity: 1 lbs

SARA Section 311/312 Hazard Categories:
Acute Health Hazard, Chronic Health Hazard, Reactivity Hazard

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A):

Components
Hydrazine

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 313 Toxic Chemicals (40 CFR 372.65) - Supplier Notification Required:
Components
Hydrazine

US. EPA Resource Conservation and Recovery Act (RCRA) Composite List of Hazardous Wastes and Appendix VIII Hazardous Constituents (40 CFR 261):
When discarded in its purchased form, this product is a listed RCRA hazardous waste and should be managed as a hazardous waste. (40 CFR 261.20-24), Any contaminated soil, water, debris, or residue resulting from the cleanup of a spill of this product is considered to be a hazardous waste.

RCRA Regulated Components	
Hydrazine	U133

State Right-To-Know Information
The following chemicals are specifically listed by individual states; other product specific health and safety data in other sections of the MSDS may also be applicable for state requirements. For details on your regulatory requirements you should contact the appropriate agency in your state.

Massachusetts, New Jersey or Pennsylvania Right to Know Substance Lists:

Weight %	Components	CAS-No.
>=1%	Water	7732-18-5
30 - 40%	Hydrazine	302-01-2

New Jersey Environmental Hazardous Substances List and/or New Jersey RTK Special Hazardous Substances Lists:

Weight %	Components	CAS-No.
30 - 40%	Hydrazine	302-01-2

Pennsylvania Right to Know Special Hazard Substance List:

Weight %	Components	CAS-No.
30 - 40%	Hydrazine	302-01-2

MA Right to Know Extraordinarily Hazardous Substance List:

Weight %	Components	CAS-No.
30 - 40%	Hydrazine	302-01-2

California Prop. 65:
Warning! This product contains chemical(s) known to the State of California to be Carcinogenic.

Weight %	Components	CAS-No.
30 - 40%	Hydrazine	302-01-2

16. Other Information

NFPA 704M Rating

Health	2
Flammability	1
Reactivity	1
Other	

0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme

HMIS Rating

Health	2*
Flammability	1
Physical Hazard	1

0=Minimal 1=Slight 2=Moderate 3=Serious 4=Severe
* = Chronic Health Hazard

LANXESS Corporation's method of hazard communication is comprised of Product Labels and Material Safety Data Sheets. HMIS and NFPA ratings are provided by LANXESS Corporation as a customer service.

Contact Person: Product Safety Department
Telephone: (800) LANXESS
MSDS Number: R304639
Version Date: 06/26/2007
Report Version: 3.1

This information is furnished without warranty, express or implied. This information is believed to be accurate to the best knowledge of LANXESS Corporation. The information in this MSDS relates only to the specific material designated herein. LANXESS Corporation assumes no legal responsibility for use of or reliance upon the information in this MSDS.

Changes since the last version will be highlighted in the margin. This version replaces all previous versions.

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Boiler Chemical Additives

a. Manufacturers Product Identification Number: **Disodium Phosphate**

b. Product Use: **Scale Inhibition and pH Adjustment**

c. Chemical Composition: **Na2HPO4**

d. Classification (non-persistent, persistent or bioaccumulative): **Believed Non-Persistent**

e. Product or active ingredient half-life: **Not Available**

f. Frequency of product use: **Continuous low concentration feed during operation**

g. Product toxicity data: **See attached MSDS**

h. Concentration of whole product or active ingredient: **Not Available**

i. Outfall: **002**

ICL Performance Products LP

Material Safety Data Sheet

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Identification

Product Name: DISODIUM PHOSPHATE ANHYDROUS
Reference Number: AST10007
Date: April 24, 2006

Use of the substance or preparation

Food Ingredient, water treatment

Company/Undertaking Identification

ICL PERFORMANCE PRODUCTS LP
622 Emerson Road - Suite 500
St. Louis, Missouri 63141

Emergency telephone

In USA call CHEMTREC: 1 800 424 9300
In Canada call CANUTEC: 1 613 996 6666

General Information: +1 800 244 6169 (Worldwide)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Composition

Substance	CAS No.	%w/w	EINECS No.	Risk Phrase
Disodium Phosphate Anhydrous	7558-79-4	100	231-448-7	R36/37/38

3. HAZARDS IDENTIFICATION

Classification of the substance/preparation

EC Classification none
Safety Phrase S26 S36

Human Health Effects

Contact with eyes or skin may cause irritation. Inhalation of dust may cause coughing and sneezing. Inhalation may cause respiratory irritation. Ingestion of large amounts may cause gastrointestinal irritation including nausea, vomiting and diarrhea.

Environmental Effects

This material is not expected to product any significant adverse environmental effects when recommended use instructions are followed.

4. FIRST AID MEASURES

General

Treatment is symptomatic and supportive. The product may cause eye and skin irritation. May cause abdominal discomfort if ingested in quantity.

Eye contact

Avoid contact with eyes. In case of contact with eyes, immediately flush the eyes with plenty of water. Seek medical attention if needed. This dry powder may cause foreign body irritation in some individuals.

Skin contact

Remove this material from skin with plenty of soap and water. Prolonged contact with dry powder may cause drying or chapping of the skin.

Inhalation

Inhalation of the dust may cause coughing and sneezing. Remove to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Ingestion

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. No significant health effects are expected if small amounts (less than a mouthful) are swallowed. Swallowing large amounts may cause abdominal discomfort and diarrhea.

5. FIRE FIGHTING MEASURES

Extinguishing media

Non-combustible
No special requirement.
To extinguish fire use water spray, dry chemical, carbon dioxide, or appropriate foam

Unsuitable extinguishable media

Non-combustible
No special requirement.

Exposure hazards

No special considerations

Protective equipment

As a general precaution, firefighters and others exposed, wear self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Avoid unnecessary exposure and remove all material from eyes, skin and clothing.

Environmental precautions

Small quantities: Avoid discharge into the environment

Large quantities: Avoid discharge into the environmental – See section 15

Method for cleaning up

Sweep, scoop or vacuum spill material, contaminated soil and other contaminated material and place in clean, dry containers for removal. If possible, complete cleanup on a dry basis. Residual material can be flushed with water.

7. HANDLING AND STORAGE

Handling:

Handle in accordance with good industrial hygiene and safety practices.
Avoid contact with eyes.
Wash hands immediately after handling
Remove material from clothing.

Engineering measures

Ensure adequate ventilation. The use of local mechanical exhaust ventilation is preferred at sources of air contamination such as open process equipment.

Storage

Store in cool, dry place to maintain product performance. Product is hygroscopic and should be stored in a dry area.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure limit

ACGIH TLV	10 mg/m3 (inhalable) 8-hr TWA, 3 mg/m3 (respirable) 8-hr TWA
OSHA PEL	15 mg/m3 (total dust) 8-hr TWA, 5 mg/m3 (respirable) 8-hr TWA

OSHA and ACGIH have not established specific exposure limits for this material. However, OSHA and ACGIH have established limits for particulates not otherwise regulated (PNOR) and particulates not otherwise classified (PNOC) which are the least stringent exposure limits applicable to dusts.

Respiratory protection

Avoid breathing dust. In case of insufficient ventilation, use approved respiratory protective equipment as described in OSHA 29 CFR 1910.134 or European Standard EN149. A dust respirator is recommended.

Hand/Skin protection

Wear protective gloves is recommended; wash hands and contaminated skin thoroughly after handling.

Eye protection

Wear appropriate protective eyeglasses or chemical safety goggles as described in OSHA eye and face regulation in 29 CFR 1910.133 or European Standard EN166.

9. PHYSICAL AND CHEMICAL PROPERTIES

General Information

Chemical Formula:	Na_2HPO_4
Form:	Crystals
Color:	White

Odor:	Odorless

Important health, safety and environmental information

pH:	9.0 (as a 1% solution)
Vapor Density	4.9
Specific Gravity	1.679'
Melting Point	243 – 245 ^{0}C
Solubility in Water:	(g./100 g. H_2O): 1.7 @ 0 degrees C 11.5 @ 25 degrees C 51.7 @ 40 degrees C 78.8 @ 60 degrees C 102.4 @ 100 degrees C

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

10. STABILITY AND REACTIVITY

Product is stable under normal conditions of storage and handling. Store in a cool, dry place to maintain product performance.

Conditions to avoid

Store product in dry areas away from moisture. The product is hygroscopic.

Materials to avoid

Incompatible with acids, alkaloids, lead acetate, antipyrine, chloral hydrate, resorcinol and pyrogallol.

Hazardous decomposition

Oxides of sodium and phosphorus may form when heated to decomposition

11. TOXICOLOGICAL INFORMATION

Laboratory data

Data from ICL Performance Products LP single-dose (acute) animal studies with this material are given below:

Oral - rat LD50:	5,950 mg/kg; practically nontoxic
Dermal - rabbit LD50:	>7,940 mg/kg; practically nontoxic
Eye Irritation - rabbit:	4.2/110.0; slightly irritating
Skin Irritation - rabbit:	0.0/8.0 (24-hr. exp.); nonirritating
DOT skin corrosion - rabbit (4-hr. exp.):	not corrosive

The dry powder or granules may cause foreign body irritation in some individuals. Prolonged contact with the dry powder may cause drying or chapping of the skin. Due to the high alkalinity of this product, prolonged contact with the eyes or skin may cause slight irritation. Inhalation of dust has been reported to produce a mild drying effect on the respiratory tract membranes of exposed workers. Excessive inhalation of dust may be annoying and can mechanically impede respiration.

Sodium phosphates have been used as therapeutic agents in medicinal preparations for their laxative effects. These phosphate salts are incompletely absorbed from the intestinal tract. Due to their osmotic activity, they draw water into the intestine and produce purging.

This product (in anhydrous and hydrated forms) has produced no genetic changes in standard tests using bacterial cells.

12. ECOLOGICAL INFORMATION

Environmental toxicity

This product (in anhydrous and hydrated forms) has produced no genetic changes in standard tests using bacterial cells.

Rainbow trout, Inland silversides and Mysid shrimp 96 hr. LC50 >100 mg/L, non-toxic. [FMC I89-1085, 1086 & 1087]
Daphnia magna: 48 hr. EC50 >100 mg/L, non-toxic. [FMC I89-1088]
No algal toxicity data was available for this material.

Environmental fate

Inorganic compounds in contact with the soil, sub-surface or surface waters may be taken up by plants and utilized as essential nutrients. Phosphates may also form precipitates, usually with calcium or magnesium. The resultant compounds are insoluble in water and become a part of the soil or sediment. The term biodegradability, as such, is not applicable to inorganic compounds.

13. DISPOSAL CONSIDERATIONS

European waste catalog number

Unknown

Disposal Considerations

This material when discarded is not a hazardous waste as that term is defined by the Resource, Conservation and Recovery Act (RCRA), 40 CFR 261. Dry material may be landfilled or recycled in accordance with local, state and federal regulations. Consult your attorney or appropriate regulatory officials for information on such disposal.

14. TRANSPORT INFORMATION

The data provided in this section is for information only. Please apply the appropriate regulations to properly classify your shipment for transportation.

Road/Rail, Sea and Air

IMDG/UN	Environmentally hazardous substance, solid, n.o.s., UN 3077, Class 9, PG III
ICAO/IATA passenger aircraft	Environmentally hazardous substance, solid, n.o.s., UN 3077, Class 9, PG III
RID/ADR	Unknown
Canadian TDG	Environmentally hazardous substance, solid, n.o.s., UN 3077, Class 9, PG III+
US DOT	Environmentally hazardous substance, solid, n.o.s. (contains sodium phosphate, dibasic),UN 3077, 9, PG III*

\+ Applies only to packages containing a Reportable Limit of 230 kg or more
* Applies only to a package containing a Reportable Quantity (RQ) of 5000 lbs or more.

15. REGULATORY INFORMATION

EC Label

Hazard symbol:	none
R36/37/38	Irritating to eyes, respiratory system and skin
S26	In cased of contact with eyes, rinse immediately with plenty of water and

	seek medical attention
S36	Wear suitable protective clothing

Chemical Inventory

USA TSCA:	Listed
Canada DSL:	Listed
EC:	Listed
Japan	Listed
Australia	Listed
Korea	Listed
Philippines	Listed
China	Listed

Other information

WHMIS Classification	Not Controlled
SARA Hazard Notification	
Hazard Categories Under Title III Rules (40 CFR 370):	Not applicable
Section 302 Extremely Hazardous Substances:	Not Applicable
Section 313 Toxic Chemical(s):	Not Applicable

CERCLA Reportable Quantity: 5,000 lb. RQ of sodium phosphate, dibasic

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulation and the MSDS contain all the information required by the Canadian Controlled Products Regulation.

16. OTHER INFORMATION

	Health	Fire	Reactivity	Additional Information
Suggested NFPA Rating	1	0	0	
Suggested HMIS Rating	1	0	0	E E = safety glasses, gloves, dust respirator

Reason for revision: Revised section 1. Supersedes MSDS dated: November 1, 2005
Drafted in accordance with ECC Dir 2001/58/EC

Although the information and recommendations set forth herein (hereinafter "Information") are presented in good faith and believed to be correct as of the date hereof, ICL Performance Products LP makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will ICL Performance Products LP be responsible for damages of any nature whatsoever resulting from the use of or reliance upon information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Boiler Chemical Additives

a. Manufacturers Product Identification Number: **Trisodium Phosphate**

b. Product Use: **Scale Inhibition and pH Adjustment**

c. Chemical Composition: **Na3PO4**

d. Classification (non-persistent, persistent or bioaccumulative): **Believed Non-Persistent**

e. Product or active ingredient half-life: **Not Available**

f. Frequency of product use: **Continuous low concentration feed during operation**

g. Product toxicity data: **See attached MSDS**

h. Concentration of whole product or active ingredient: **Not Available**

i. Outfall: **002**

ICL Performance Products LP

Material Safety Data Sheet

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Identification

Product Name:	TRISODIUM PHOSPHATE ANHYDROUS
Reference Number:	AST10064
Date:	April 17, 2006

Use of the substance or preparation

Industrial and household cleaners, water conditioner, photograph developer bath ingredient, paint remover, denture cleaners, emulsifier and pH control agent for foods. May be used to treat drinking water.

Company/Undertaking Identification

ICL PERFORMANCE PRODUCTS LP
622 Emerson Road - Suite 500
St. Louis, Missouri 63141

Emergency telephone

In USA call CHEMTREC: 1 800 424 9300
In Canada call CANUTEC: 1 613 996 6666

General Information: +1 800 244 6169 (Worldwide)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Composition

Substance	CAS No.	%w/w	EINECS No.	Risk Phrase
Trisodium Phosphate Anhydrous	7601-54-9	100	231-509-8	R34R37/38 R41

3. HAZARDS IDENTIFICATION

Classification of the substance/preparation

EC Classification	Xi - Irritant
Safety Phrase	S26 S36/37/39

Human Health Effects

This product causes eye burns and may cause skin irritation. Inhalation of dust may cause coughing and sneezing. Inhalation may cause respiratory irritation. Ingestion of this product may cause severe nausea, vomiting, abdominal discomfort and burning sensation.

Environmental Effects

This material is not expected to product any significant adverse environmental effects when recommended use instructions are followed.

4. FIRST AID MEASURES

WARNING STATEMENTS

DANGER!
CAUSES EYE IRRITATION
MAY CAUSE RESPIRATORY TRACT IRRITATION

General

Treatment is symptomatic and supportive. The product causes eye and skin irritation. May be harmful if swallowed. This product is destructive to mucous membranes.

Eye contact

In case of contact with eyes, immediately flush the eyes with plenty of water for at least 15 minutes. Seek medical attention if irritation, pain, swelling, lacrimation, or photophobia persists.

Skin contact

Immediately remove this material from skin and wash with plenty of water. Remove contaminated clothing. Wash clothing and thoroughly clean shoes before reuse.

Inhalation

Inhalation of the dust may cause coughing and sneezing. Remove to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Ingestion

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Get medical attention immediately. Contact a Poison Control Center. Swallowing this product may cause severe nausea, vomiting, abdominal discomfort, and burning sensation.

5. FIRE FIGHTING MEASURES

Extinguishing media

Non-combustible
No special requirement.
To extinguish fire use water spray, dry chemical, carbon dioxide, or appropriate foam

Unsuitable extinguishable media

Non-combustible
No special requirement.

Exposure hazards

No special considerations

Protective equipment

As a general precaution, firefighters and others exposed, wear self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions

Avoid unnecessary exposure and remove all material from eyes, skin and clothing.

Environmental precautions

Small quantities: Avoid discharge into the environment
Large quantities: Avoid discharge into the environmental – See section 15

Method for cleaning up

Sweep, scoop or vacuum spill material, contaminated soil and other contaminated material and place in clean, dry containers for removal. If possible, complete cleanup on a dry basis.

7. HANDLING AND STORAGE

Handling:

Do not get in eyes, on skin, or on clothing.
Avoid breathing dust.
Do not taste or swallow.
Use only in adequate ventilation.
Wash thoroughly after handling
Remove material from clothing.

Engineering measures

Ensure adequate ventilation. The use of local mechanical exhaust ventilation is preferred at sources of air contamination such as open process equipment.

Storage

Store in cool, dry place to maintain product performance. Product should be stored in sealed containers and be kept free of water due to product corrosivity.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure limit

OSHA and ACGIH have not established specific exposure limits for this material. However, OSHA and ACGIH have established limits for particulates not otherwise regulated (PNOR) and particulates not otherwise classified (PNOC) which are the least stringent exposure limits applicable to dusts.

ACGIH TLV	10 mg/m3 (inhalable) 8-hr TWA, 3 mg/m3 (respirable) 8-hr TWA
OSHA PEL	15 mg/m3 (total dust) 8-hr TWA, 5 mg/m3 (respirable) 8-hr TWA

Respiratory protection

Avoid breathing dust. In case of insufficient ventilation, use approved respiratory protective equipment as described in OSHA 29 CFR 1910.134 or European Standard EN149. A vapor respirator is recommended.

Hand/Skin protection

Wear protective gloves is recommended; wash hands and contaminated skin thoroughly after handling.

Eye protection

Wear appropriate protective eyeglasses or chemical safety goggles as described in OSHA eye and face regulation in 29 CFR 1910.133 or European Standard EN166.

9. PHYSICAL AND CHEMICAL PROPERTIES

General Information

Chemical Formula:	Na_3PO_4
Form:	Free-flowing granular product
Color:	White
Odor:	Odorless

Important health, safety and environmental information

pH:	11.5 – 12.0 (as a 1% solution)
Specific Gravity	2.54
Melting Point	1340 ^{0}C
Solubility in Water:	(g./100 g. H_2O): 5.4 @ 0 degrees C
	14.5 @ 25 degrees C
	23.3 @ 40 degrees C
	54.3 @ 60 degrees C
	94.6 @ 100 degrees C

NOTE: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specifications for the product.

10. STABILITY AND REACTIVITY

Product is stable under normal conditions of storage and handling.

Conditions to avoid

Store product in dry areas away from moisture. This product could be corrosive to aluminum surfaces due to high pH. When wet, mild steel and brass may be corroded.

Materials to avoid

Incompatible with strong mineral acids, aluminum and moisture.

Hazardous decomposition

Oxides of sodium and phosphorus may form when heated to decomposition

11. TOXICOLOGICAL INFORMATION

Laboratory data

Data from ICL Performance Products LP single-dose (acute) animal studies with this material are given below:

Oral - rat LD50:	4,150 mg/kg; slightly toxic
Dermal - rabbit LD50:	>7,940 mg/kg; practically nontoxic
Eye Irritation - rabbit:	corrosive
Skin Irritation - rabbit:	2.2/8.0 (24-hr. exp.); slightly irritating

This product produced no mutagenic effects is standard assays using fruit flies.

This material has been defined as a hazardous chemical under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

12. ECOLOGICAL INFORMATION

Environmental toxicity

The following data have been classified using the criteria adopted by the European Economic Community (EEC) for aquatic organism toxicity.

Invertebrate: 50-hr EC50 Daphnia magna:	177 mg/L; Practically Nontoxic
Warmwater fish: 96-hr LC50 Bluegill sunfish:	220 mg/L; Practically Nontoxic
Coldwater fish: 96-hr LC50 Rainbow trout:	120 mg/L; Practically Nontoxic

No definitive algal data was available for this material.

Environmental fate

Inorganic compounds in contact with the soil, sub-surface or surface waters may be taken up by plants and utilized as essential nutrients. Phosphates may also form precipitates, usually with calcium or magnesium. The resultant compounds are insoluble in water and become a part of the soil or sediment. The term biodegradability, as such, is not applicable to inorganic compounds.

13. DISPOSAL CONSIDERATIONS

European waste catalog number

Unknown

Disposal Considerations

This material when discarded is not a hazardous waste as that term is defined by the Resource, Conservation and Recovery Act (RCRA), 40 CFR 261. Dry material may be landfilled or recycled in accordance with local, state and federal regulations. Consult your attorney or appropriate regulatory officials for information on such disposal.

14. TRANSPORT INFORMATION

The data provided in this section is for information only. Please apply the appropriate regulations to properly classify your shipment for transportation.

Road/Rail, Sea and Air

IMDG/UN	Environmentally hazardous substance, solid, n.o.s., UN 3077, Class 9, PG III
ICAO/IATA passenger aircraft	Environmentally hazardous substance, solid, n.o.s., UN 3077, Class 9, PG III
RID/ADR	Unknown
Canadian TDG	Sodium Phosphate Tribasic, NA9148, Class 9.2, PG III+
US DOT	Environmentally hazardous substance, solid, n.o.s. (contains sodium phosphate, Tribasic),UN 3077, 9, PG III*

+ Applies only to packages containing a Reportable Limit of 230 kg or more
* Applies only to a package containing a Reportable Quantity (RQ) of 5000 lbs or more.

15. REGULATORY INFORMATION

EC Label

Hazard symbol:	Xi - Irritant
R34	Causes burns
R37/38	Irritating to respiratory system and skin
R41	Risk of serious damage to eyes
S26	In cased of contact with eyes, rinse immediately with plenty of water and

	seek medical attention
S36/37/39	Wear suitable protective clothing, gloves and eye/face protection

Chemical Inventory

USA TSCA:	Listed
Canada DSL:	Listed
EC:	Listed
Japan	Listed
Australia	Listed
Korea	Listed
Philippines	Listed
China	Listed

Other information

Germany:	WGK = 1
WHMIS Classification:	D2(B) – Materials Causing Other Toxic Effects
SARA Hazard Notification	
Hazard Categories Under Title III Rules (40 CFR 370):	Immediate
Section 302 Extremely Hazardous Substances:	Not Applicable
Section 313 Toxic Chemical(s):	Not Applicable

CERCLA Reportable Quantity: 5,000 lb. RQ of sodium phosphate, tribasic

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulation and the MSDS contain all the information required by the Canadian Controlled Products Regulation.

16. OTHER INFORMATION

	Health	Fire	Reactivity	Additional Information
Suggested NFPA Rating	3	0	0	
Suggested HMIS Rating	3	0	0	G G = safety glasses, gloves, vapor respirator

Reason for revision: Revised sections 8 and 11. Supersedes MSDS dated: November 1, 2005
Drafted in accordance with ECC Dir 2001/58/EC

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Boiler Chemical Additives

a. Manufacturers Product Identification Number: **Anodamine**

b. Product Use: **Scale and corrosion inhibition**

c. Chemical Composition: **Proprietary**

d. Classification (non-persistent, persistent or bioaccumulative): **Believed Non-Persistent**

e. Product or active ingredient half-life: **Not Available**

f. Frequency of product use: **Continuous low concentration feed during operation**

g. Product toxicity data: **See attached MSDS**

h. Concentration of whole product or active ingredient: **Not Available**

i. Outfall: **002**

ADDITIONAL INFORMATION: None.

COMMENTS: None.

5. FIRE FIGHTING MEASURES

FLASHPOINT AND METHOD: None Expected.

FLAMMABLE LIMITS: None flammable.

AUTOIGNITION TEMPERATURE: None

6. ACCIDENTAL RELEASE MEASURES

SMALL SPILL: The HPFG has an LD50 of 89,500 mg/kg, accordingly small leaks of less than 100 lt can be diluted with water and washed with no known risk to the waterways or alternatively, spilt material can be absorbed on to absorbent materials and discarded without regulations at appropriate waste disposal facilities according to current applicable local laws and regulations.

LARGE SPILL: Good practice would dictate that large spills should be absorbed on to absorbent materials and discarded without regulations at appropriate waste disposal facilities according to current applicable local laws and regulations.

ENVIRONMENTAL PRECAUTIONS

WATER SPILL:
This material will not cause adverse environmental impact if it reaches waterways. The material is considered as NON-HAZARDOUS to the aquatic environment.

LAND SPILL: None

AIR SPILL: None known.

GENERAL PROCEDURES: Absorb material, shovel up and dispose of at an appropriate waste disposal facility according to current applicable laws and regulations, and product characteristics at time of disposal.

RELEASE NOTES:
This material will not cause adverse environmental impact if it reaches waterways. The material is considered as NON-HAZARDOUS to the aquatic environment.
In case of accident or road spill notify: CHEMTREC in USA at 800-424-9300 CANUTEC in Canada at 613-996-6666 CHEMTREC, other countries, at (International code) +1 703 527 3887
SPECIAL PROTECTIVE EQUIPMENT: CHEMTREC in USA at 800-424-9300 CANUTEC in Canada at 613-996-6666 CHEMTREC, other countries, at (International code) +1 703 527 3887
COMMENTS: See Section 13 for disposal information and Section 15 for regulatory requirements. Large and small spills may have a broad definition depending on the user's handling system. Therefore technically qualified personnel must define the spill category at the point of release.

7. HANDLING AND STORAGE

GENERAL PROCEDURES: Store the product out of direct sun and ideally under roof. Storage of the product at temperatures > 33 °F (freeze protection) or < 180 °F typically ensure a useable shelf life of 3 – 5 years. Even after freezing, thawing allows re-use of the product without limitations.

HANDLING: Use appropriate personal protective equipment as specified in Section 8. Handle and use in a manner consistent with good industrial/manufacturing techniques and responsible chemical handling practices.

STORAGE: Store in unopened containers under cool and dry conditions.

STORAGE TEMPERATURE: Ambient conditions. Avoid extended exposure to direct sun with open containers. There is no known product degradation during exposure to these storage conditions.

LOADING TEMPERATURE: NA = Not Applicable

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE GUIDELINES:

OSHA HAZARDOUS COMPONENTS (29 CFR 1910.1200)

Toxicological results for bioassays on corrosion inhibitor anodamine HPFG.

Investigative Species	*Observations*
	LC50
Daphnia Pulex 48 hour	**89,531.36 ppm** 95 % Lower Confidence Limit: 86,079.85 ppm 95 % Upper Confidence Limit: 93,121.27 ppm
Pimephales Promelas 96 hour	**49,210.46 ppm** 95 % Lower Confidence Limit: 55,755.86 ppm 95 % Upper Confidence Limit: 43,433.46 ppm

Environmental Protection Agency's Trimmed Spearman-Karber statistical program was used to analyze all data.
The 48-Hour LC-50 (concentration at which 50% mortality is expected to occur) for anodamine™ HPFG, Daphnia pulex survival data, was calculated by the Spearman- Karber program, as 89,531.36 ppm.
The 96-Hour LC-50 (concentration at which 50% mortality is expected to occur) for anodamine™ HPFG, Pimephales promelas survival data, was calculated by the Spearman-Karber program, as 49,210.46 ppm.
Both the lethal and sub-lethal endpoints were statistically calculated according to their respective EPA guidelines. The Chronic Freshwater organisms were calculated according to EPA-821-R-02-013, October 2002 Fourth Edition. The Chronic Marine and Estuarine organisms were calculated according to EPA-821-R-02-014, October 2002 Third Edition. The Acute Freshwater and Marine organisms were calculated according to EPA-821-R-02-012, October 2002 Fifth Edition.

ENGINEERING CONTROLS: Normal ventilation is required when handling or using this material.

PERSONAL PROTECTIVE EQUIPMENT

EYES AND FACE: Wear safety glasses with side shields or goggles when handling this material.

SKIN: Wear basic nitrile or latex disposable protective gloves.

RESPITORY: No special precautions are necessary under normal operating conditions and with adequate ventilation.

PROTECTIVE CLOTHING: None

WORK HYGIENIC PRACTICES: Good Personal hygiene practices should always be followed.

OTHER USE PRECAUTIONS: None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE:	Liquid
ODOR:	Trace smell of amine
APPEARANCE:	Clear liquid, depending on age/concentration slight straw color.
COLOR:	Colorless
pH:	~ 6.0
PERCENT VOLATILE:	~ 1 % of non hazardous active in water steam phase at > 250°C
BOILING POINT:	similar to water
SPECIFIC GRAVITY:	0.98

10. STABILITY AND REACTIVITY

STABLE:	YES
HAZARDOUS POLYMERIZATION:	NO
CONDITIONS TO AVOID:	None

STABILITY: The product is stable under normal ambient conditions of temperature and pressure.

POLYMERIZATION: None

HAZARDOUS DECOMPOSITION PORDUCTS: At temperatures above 600°C decomposition products in the presence of oxygen may include trace quantities of carbon dioxide.

INCOMPATIBLE MATERIALS: Strong Acids.

COMMENTS: None Expected

11. TOXICOLOGICAL INFORMATION

ACUTE

DERMAL LD_{50}: ~ 90,000 Dermal LD50 (rabbit) = 90,000 mg/kg

EYE EFFECTS: This material is not expected to cause significant irritation to the eyes.

SKIN EFFECTS: This material is not expected to cause significant irritation to the skin.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL DATA: This material will not cause adverse environmental impact if it reaches waterways. The material is considered as NON-HAZARDOUS to the aquatic environment.

ECOTOXICOLOGICAL INFORMATION:

Acute toxicity test in *Daphnia sp.* (OECD 202, 2004)
It was established, Environmental Protection Agency's Trimmed Spearman-Karber statistical program was used to analyze all data. The 48-Hour LC-50 (concentration at which 50% mortality is expected to occur) for anodamine™ HPFG, Daphnia pulex survival data, was calculated by the Spearman- Karber program, as 89,531.36 ppm. The 96-Hour LC-50 (concentration at which 50% mortality is expected to occur) for anodamine™ HPFG, Pimephales promelas survival data, was calculated by the Spearman-Karber program,

as 49,210.46 ppm, for the corrosion inhibitor sample anodamine HPFG food grade was well above 100 **mg/L, therefore the sample is classified as NON-HAZARDOUS to the aquatic environment.**
Other information:
Biological Degradability: >554% (BSB_{12}/CSB*100), product may be slightly retained by silicate containing soil.
Class of Water Endangerment: 1 (self classification): slight danger to water

DISTRIBUTION: The material is readily biodegradable based on a 28-day study with oxygen depletion of at least 90% of the theoretical maxima.

CHEMICAL FATE INFORMATION: Class of Water Endangerment: 1 (self classification): slight danger to water.

COMMENTS: Information based upon data for an equivalent product and analog.

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13. DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Dispose of waste at an appropriate waste disposal facility according to current applicable laws and regulations.

FOR LARGE SPILLS: This material will not cause adverse environmental impact if it reaches waterways.

PRODUCT DISPOSAL: Collect in appropriate containers. Dispose of at an appropriate waste disposal facility in accordance with current applicable laws and regulation, and product characteristics at time of disposal.

EMPTY CONTAINER: Triple rinse (or equivalent) all containers and offer for recycling or reconditioning, or punctures and disposes of in a sanitary landfill or other procedures approved by state and local authorities.

RCRA/EPA WASTE INFORMATION: NA

RCRA HAZARD CLASS: None Expected

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14. TRANSPORTATION INFORMATION

DOT (DEPARTMENT OF TRANSPORTATION)	
TECHNICAL NAME:	Proprietary Formulation.
PRIMARY HAZARD CLASS/DIVISION:	Non-Hazardous Material.
LABEL:	N/A
MARINE POLLUTANT #1:	None Expected
MARINE POLLUTANT #2:	No Data Available Contact Env. Dept.
OTHER SHIPPING INFORMATION:	Not a regulated material.
Road Transport ADR/RID and GGVS/GGVE:	Non-dangerous goods
Sea Transport IMDG/GGVSee:	Non-dangerous goods
Air Transport ICAO-TI and IATA-DGR:	Non-dangerous goods

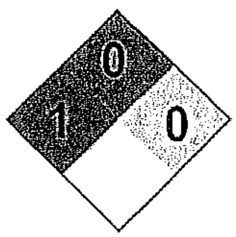
15. REGULATORY INFORMATION

UNITED STATES SARA TITLE III
(SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT)

311/312 HAZARD CATEGORIES:		NA	
FIRE: NO	PRESSURE GENERATING:	NO	REACTIVITY: NO
ACUTE: NO	CHRONIC:	NO	

313 REPORTABLE INGREDIENTS:	NA
TITLE III NOTES:	NOT YET DETERMINED
CERCLA (COMPREHENSIVE RESPONSE, COMPENSATION, AND LIABILITY ACT)	
CERCLA REGULATORY:	NOT YET DETERMINED
EPA	
EPA RQ INGREDIENT:	NONE EXPECTED
EPA RQ PRODUCT:	NONE KNOWN
TSCA (TOXIC SUBSTANCE CONTROL ACT)	
TSCA REGULATORY:	NA
TSCA STATUS:	NA

16. OTHER INFORMATION:



PREPARED BY: Paul R. Hattingh
INFORMATION CONTACT: Product Stewardship Analyst.
MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

ADDITIONAL MSDS INFORMATION: The information given is based on the present state of knowledge and experience according to the law on declaration and preparation of dangerous chemicals as well as on toxicological investigations for self-classification in the class of water endangerment according the concept of self-classification of preparations.

GENERAL STATEMENTS: This product and its handling should attract sensible and good housekeeping practice, the use of PPE typical for handling of any chemicals.

Made in America

All anodamine™ proprietary metal surface-active protection products are exclusively manufactured in the USA using locally sourced raw materials.

Sole manufacture and distribution by anodamine™ Inc
2590 Oakmont Drive
Building 300
Round Rock Texas, 78665
Tel: + 1 (512) 244 2318
www.anodamine.com

MATERIAL SAFETY DATA SHEET

Manufactured exclusively in the USA using
locally manufactured and supplied raw materials

Date Issued: 5/24/2013
Revised: 24 May 2013
MSDS Ref.
No: MSDS-USA-05-24-HPFG+
Revision No: 20 New MSDS original.

1. PRODUCT AND COMPANY IDENTIFICATION

GENERAL USE: High Pressure Boiler Metal Passivation Scale and Corrosion Inhibition.
PRODUCT DESCRIPTION: Proprietary non-toxic mixture of surface-active polyamines.
PRODUCT CODE: anodamine™ **HPFG+** proprietary blend.
PRODUCT FORMULATION NAME: anodamine™ **HPFG+**
CHEMICAL FAMILY: Surface active amines.
MOLECULAR FORMULA: Proprietary

2. COMPOSITION / INFORMATION OF INGREDIENTS

Chemical Name	Wt. %	CAS #	EINECS #
Typical CAS components (unknown)	Proprietary Non Toxic Components		

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW
PHYSICAL APPEARANCE: Clear to colorless organic liquid with limited odor.
IMMEDIATE CONCERNS: None.

POTENTIAL HEALTH EFFECTS
EYES: Expected to cause mild irritation to the eyes with exposed contact.
SKIN: May cause mild irritation to the skin of some.
SKIN ABSORPTION: None expected.
INGESTION: May cause mild irritation to the digestive tract if ingested in small quantities.
INHALATION: No irritation to the lungs, upper respiratory tract and nose with extended exposure.
ACUTE TOXICITY: No test data is available for acute dermal toxicity.
No test data is available for acute ingestion toxicity.

4. FIRST AID MEASURES

EYES: Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. Get medical attention.

SKIN: Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. Wash contaminated clothing and shoes before reuse.

INGESTION: Wash out mouth with water. Seek medical attention.

INHALATION: No affects or symptoms are expected when handling the product. No respiratory PPE is required.

Attachment J

Once-Through Cooling Chemical Additives

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Once-Through Cooling Chemical Additives

a. Manufacturers Product Identification Number: **Sodium Bromide**

b. Product Use: **Biocide (Oxidizing)**

c. Chemical Composition: **NaBr**

d. Classification (non-persistent, persistent or bioaccumulative): **Believed Non-Persistent**

e. Product or active ingredient half-life: **Not Available**

f. Frequency of product use: **Intermittent use; not exceeding 2 hours/unit/day**

g. Product toxicity data: **See attached MSDS**

h. Concentration of whole product or active ingredient in wastestream: **Not Detectable**

i. Outfall: **001**

NALCO

MATERIAL SAFETY DATA SHEET

PRODUCT

ACTI-BROM® 1318

EMERGENCY TELEPHONE NUMBER(S)
(800) 424-9300 (24 Hours) CHEMTREC

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME : ACTI-BROM® 1318

APPLICATION : BIOCIDE

COMPANY IDENTIFICATION : Nalco Company
1601 W. Diehl Road
Naperville, Illinois
60563-1198

EMERGENCY TELEPHONE NUMBER(S) : (800) 424-9300 (24 Hours) CHEMTREC

NFPA 704M/HMIS RATING
HEALTH : 1 / 1 FLAMMABILITY : 0 / 0 INSTABILITY : 0 / 0 OTHER :
0 = Insignificant 1 = Slight 2 = Moderate 3 = High 4 = Extreme

2. COMPOSITION/INFORMATION ON INGREDIENTS

Our hazard evaluation has identified the following chemical substance(s) as hazardous. Consult Section 15 for the nature of the hazard(s).

Hazardous Substance(s)	CAS NO	% (w/w)
Sodium Bromide	7647-15-6	30.0 - 60.0

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

CAUTION
Causes moderate eye irritation.
Avoid contact with eyes, skin and clothing. Wash with soap and water after handling. Remove contaminated clothing and wash before reuse.
May evolve hydrogen bromide and bromine under fire conditions.

PRIMARY ROUTES OF EXPOSURE :
Eye, Skin

HUMAN HEALTH HAZARDS - ACUTE :

EYE CONTACT :
Can cause mild to moderate irritation.

SKIN CONTACT :
May cause irritation with prolonged contact.

INGESTION :
Not a likely route of exposure. No adverse effects expected.

INHALATION :
Not a likely route of exposure. Aerosols or product mist may irritate the upper respiratory tract.

SYMPTOMS OF EXPOSURE :
Acute :
A review of available data does not identify any symptoms from exposure not previously mentioned.
Chronic :
A review of available data does not identify any symptoms from exposure not previously mentioned.

AGGRAVATION OF EXISTING CONDITIONS :
A review of available data does not identify any worsening of existing conditions.

HUMAN HEALTH HAZARDS - CHRONIC :
No adverse effects expected other than those mentioned above.

4. FIRST AID MEASURES

IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

IF SWALLOWED: Call poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center or doctor. Do not give anything by mouth to an unconscious person.

IF INHALED: Remove victim to fresh air. If not breathing, give artificial respiration, preferably, mouth-to-mouth. Get medical attention.^

5. FIRE FIGHTING MEASURES

FLASH POINT : None

EXTINGUISHING MEDIA :
Not expected to burn. Keep containers cool by spraying with water. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD :
May evolve hydrogen bromide and bromine under fire conditions.

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING :
In case of fire, wear a full face positive-pressure self contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS :
Restrict access to area as appropriate until clean-up operations are complete. Ensure clean-up is conducted by trained personnel only. Ventilate spill area if possible. Do not touch spilled material. Stop or reduce any leaks if it is safe to do so. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Notify appropriate government, occupational health and safety and environmental authorities.

METHODS FOR CLEANING UP :
SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labeled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Wash site of spillage thoroughly with water. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

ENVIRONMENTAL PRECAUTIONS :
This pesticide is toxic to fish and aquatic organisms. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or other waters, unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

7. HANDLING AND STORAGE

HANDLING :
Avoid eye and skin contact. Do not take internally. Do not get in eyes, on skin, on clothing. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labelled. Keep the containers closed when not in use. Use with adequate ventilation.

STORAGE CONDITIONS :
Store the containers tightly closed. Store in suitable labelled containers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS :
This product does not contain any substance that has an established exposure limit.

ENGINEERING MEASURES :
General ventilation is recommended.

RESPIRATORY PROTECTION :
Respiratory protection is not normally needed.

HAND PROTECTION :
Neoprene gloves, Nitrile gloves, Butyl gloves, PVC gloves

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Keep an eye wash fountain available. Keep a safety shower available.

HUMAN EXPOSURE CHARACTERIZATION :
Based on our recommended product application and personal protective equipment, the potential human exposure is: Moderate

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE Liquid

APPEARANCE Colorless

ODOR None

SPECIFIC GRAVITY	1.45 @ 77 °F / 25 °C
DENSITY	12.1 lb/gal
SOLUBILITY IN WATER	Complete
pH (100 %)	7.9
VISCOSITY	5 cps
FREEZING POINT	7 °F / -14 °C
BOILING POINT	218 °F / 103.5 °C
VAPOR PRESSURE	5.6 mm Hg @ 68 °F / 20 °C
VOC CONTENT	0.00 %

Note: These physical properties are typical values for this product and are subject to change.

10. STABILITY AND REACTIVITY

STABILITY :
Stable under normal conditions.

HAZARDOUS POLYMERIZATION :
Hazardous polymerization will not occur.

CONDITIONS TO AVOID :
Freezing temperatures.

MATERIALS TO AVOID :
Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors.

HAZARDOUS DECOMPOSITION PRODUCTS :
Under fire conditions: None known

11. TOXICOLOGICAL INFORMATION

ACUTE ORAL TOXICITY :

Species	LD50	Test Descriptor
Rat	> 5,000 mg/kg	Similar Product

Rating : Non-Hazardous

ACUTE DERMAL TOXICITY :

Species	LD50	Test Descriptor
Rabbit	> 2,000 mg/kg	Similar Product

Rating : Non-Hazardous

PRIMARY SKIN IRRITATION :

Draize Score	Test Descriptor
0.0 / 8.0	Similar Product

Rating : Essentially non-irritating

PRIMARY EYE IRRITATION :

Draize Score	Test Descriptor
16.0 / 110.0	Similar Product

Rating : Mildly irritating

SENSITIZATION :
This product is not expected to be a sensitizer.

CARCINOGENICITY :
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

HUMAN HAZARD CHARACTERIZATION :
Based on our hazard characterization, the potential human hazard is: Low

12. ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS :

The following results are for the product and a similar product. The following results are for the active components. The following results are for the hypobromous acid (as Br2) generated from sodium bromide and hypochlorite.

ACUTE FISH RESULTS :

Species	Exposure	LC50	Test Descriptor
Fathead Minnow	96 hrs	> 5,000 mg/l	Product
Rainbow Trout	96 hrs	> 1,000 mg/l	Similar Product
Bluegill Sunfish	96 hrs	> 1,000 mg/l	Similar Product
Fathead Minnow	96 hrs	0.097 mg/l	HOBr (Generated from NaBr)
Rainbow Trout	96 hrs	0.23 mg/l	HOBr (Generated from NaBr)
Bluegill Sunfish	96 hrs	0.52 mg/l	HOBr (Generated from NaBr)
Sheepshead Minnow	96 hrs	0.19 mg/l	HOBr (Generated from NaBr)

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	LC50	EC50	Test Descriptor
Daphnia magna	48 hrs	7,900 mg/l		Active Substance (Sodium Bromide)
Ceriodaphnia dubia	48 hrs	> 5,000 mg/l		Product
Daphnia magna	48 hrs	0.038 mg/l		HOBr (Generated from NaBr)
American Oyster	96 hrs	0.54 mg/l		HOBr (Generated from NaBr)
Mysid Shrimp (Mysidopsis bahia)	96 hrs	0.17 mg/l		HOBr (Generated from NaBr)

ADDITIONAL ECOLOGICAL DATA:
AOX information: Product contains no organic halogens.

PERSISTENCY AND DEGRADATION :

Biological Oxygen Demand (BOD) : This material is an oxidizing biocide and is not expected to persist in the environment.

Greater than 95% of this product consists of inorganic substances for which a biodegradation value is not applicable.

MOBILITY :
The environmental fate was estimated using a level III fugacity model embedded in the EPI (estimation program interface) Suite TM , provided by the US EPA. The model assumes a steady state condition between the total input and output. The level III model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models. If released into the environment this material is expected to distribute to the air, water and soil/sediment in the approximate respective percentages;

Air	Water	Soil/Sediment
<5%	30 - 50%	50 - 70%

The portion in water is expected to be soluble or dispersible.

BIOACCUMULATION POTENTIAL
This preparation or material is not expected to bioaccumulate.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERIZATION
Based on our hazard characterization, the potential environmental hazard is: Low
Based on our recommended product application and the product's characteristics, the potential environmental exposure is: Moderate

If released into the environment, see CERCLA/SUPERFUND in Section 15.

13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it is not a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261, since it does not have the characteristics of Subpart C, nor is it listed under Subpart D.

As a non-hazardous waste, it is not subject to federal regulation. Consult state or local regulation for any additional handling, treatment or disposal requirements. For disposal, contact a properly licensed waste treatment, storage, disposal or recycling facility.

DO NOT REUSE EMPTY CONTAINER. Triple rinse the container (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incinerate. Burn only if allowed by state and local authorities. If burned, stay out of smoke.

14. TRANSPORT INFORMATION

The information in this section is for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties, and mode of transportation. Typical Proper Shipping Names for this product are as follows.

LAND TRANSPORT :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

AIR TRANSPORT (ICAO/IATA) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

MARINE TRANSPORT (IMDG/IMO) :

Proper Shipping Name : PRODUCT IS NOT REGULATED DURING TRANSPORTATION

15. REGULATORY INFORMATION

NATIONAL REGULATIONS, USA :

OSHA HAZARD COMMUNICATION RULE, 29 CFR 1910.1200 :
Based on our hazard evaluation, the following substance(s) in this product is/are hazardous and the reason(s) is/are shown below.

Sodium Bromide : Eye irritant

CERCLA/SUPERFUND, 40 CFR 117, 302 :
Notification of spills of this product is not required.

SARA/SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (TITLE III) - SECTIONS 302, 311, 312, AND 313 :

SECTION 302 - EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355) :
This product does not contain substances listed in Appendix A and B as an Extremely Hazardous Substance.

SECTIONS 311 AND 312 - MATERIAL SAFETY DATA SHEET REQUIREMENTS (40 CFR 370) :
Our hazard evaluation has found this product to be hazardous. The product should be reported under the following indicated EPA hazard categories:

X	Immediate (Acute) Health Hazard
-	Delayed (Chronic) Health Hazard
-	Fire Hazard
-	Sudden Release of Pressure Hazard
-	Reactive Hazard

Under SARA 311 and 312, the EPA has established threshold quantities for the reporting of hazardous chemicals. The current thresholds are: 500 pounds or the threshold planning quantity (TPQ), whichever is lower, for extremely hazardous substances and 10,000 pounds for all other hazardous chemicals.

SECTION 313 - LIST OF TOXIC CHEMICALS (40 CFR 372) :
This product does not contain substances on the List of Toxic Chemicals.

TOXIC SUBSTANCES CONTROL ACT (TSCA) :
This product is exempted under TSCA and regulated under FIFRA. The inerts are on the Inventory List.

FOOD AND DRUG ADMINISTRATION (FDA) Federal Food, Drug and Cosmetic Act :
When use situations necessitate compliance with FDA regulations, this product is acceptable under : 21 CFR 176.170 Components of paper and paperboard in contact with aqueous and fatty foods and 21 CFR 176.180 Components of paper and paperboard in contact with dry foods., 21 CFR 176.300 Slimicides, The following limitations apply:

This product may be used to treat pulp and papermill water systems in situations requiring FDA sanction provided the bromide concentration in the water is kept below 22 ppm. The product must be used in conjunction with an oxidant such as bleach or gaseous chlorine. Follow instructions for use in pulp and papermill on the product label.

FEDERAL INSECTICIDE, FUNGICIDE AND RODENTICIDE ACT (FIFRA) :
EPA Reg. No. 5185-467-1706
In all cases follow instructions on the product label.

This product has been certified as KOSHER/PAREVE for year-round use INCLUDING THE PASSOVER SEASON by the CHICAGO RABBINICAL COUNCIL.

FEDERAL WATER POLLUTION CONTROL ACT, CLEAN WATER ACT, 40 CFR 401.15 / formerly Sec. 307, 40 CFR 116.4 / formerly Sec. 311 :
None of the substances are specifically listed in the regulation.

CLEAN AIR ACT, Sec. 112 (40 CFR 61, Hazardous Air Pollutants), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
None of the substances are specifically listed in the regulation.

CALIFORNIA PROPOSITION 65 :
This product does not contain substances which require warning under California Proposition 65.

MICHIGAN CRITICAL MATERIALS :
None of the substances are specifically listed in the regulation.

STATE RIGHT TO KNOW LAWS :
This product is a registered biocide and is exempt from State Right to Know Labelling Laws.

NATIONAL REGULATIONS, CANADA :

WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS) :
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS CLASSIFICATION :
Pesticide controlled products are not regulated under WHMIS.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substances in this preparation are listed on the Domestic Substances List (DSL), are exempt, or have been reported in accordance with the New Substances Notification Regulations.

INTERNATIONAL CHEMICAL CONTROL LAWS

AUSTRALIA
All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

EUROPE
The substances in this preparation have been reviewed for compliance with the EINECS or ELINCS inventories.

JAPAN
All substances in this product comply with the Law Regulating the Manufacture and Importation Of Chemical Substances and are listed on the Ministry of International Trade & industry List (MITI).

KOREA
All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL)

THE PHILIPPINES
All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippine Inventory of Chemicals & Chemical Substances (PICCS).

16. OTHER INFORMATION

Due to our commitment to Product Stewardship, we have evaluated the human and environmental hazards and exposures of this product. Based on our recommended use of this product, we have characterized the product's general risk. This information should provide assistance for your own risk management practices. We have evaluated our product's risk as follows:

* The human risk is: Low

* The environmental risk is: Low

Any use inconsistent with our recommendations may affect the risk characterization. Our sales representative will assist you to determine if your product application is consistent with our recommendations. Together we can implement an appropriate risk management process.

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programs can be established to insure safe workplace operations. Please consult your local sales representative for any further information.

REFERENCES

Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Hazardous Substances Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organization, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Program, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Ariel Insight# (An integrated guide to industrial chemicals covered under major regulatory and advisory programs), North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight# CD-ROM Version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS# CD-ROM Version), Micromedex, Inc., Englewood, CO.

Prepared By : Product Safety Department
Date issued : 05/08/2006
Version Number : 1.17

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Once-Through Cooling Chemical Additives

a. Manufacturers Product Identification Number: **Sodium Hypochlorite**

b. Product Use: **Biocide (oxidizing)**

c. Chemical Composition: **NaOCl**

d. Classification (non-persistent, persistent or bioaccumulative): **Believed Non-Persistent**

e. Product or active ingredient half-life: **Not Available**

f. Frequency of product use: **Intermittent use; not exceeding 2 hours/day/unit**

g. Product toxicity data: **See attached MSDS**

h. Concentration of whole product or active ingredient in wastestream: **Not Detectable**

i. Outfall: **001**

Material Safety Data Sheet

Provided by:

DPC Industries, Inc. DX Systems Company
DPC Enterprises, LP DX Terminals
DXI Industries, Inc.

PO Box 24600
Houston, Tx 77229-4600
281-457-4888
888-647-7717
www.dxgroup.com

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name DIXICHLOR MAX

Synonyms BLEACH

Chemical Name SODIUM HYPOCHLORITE 12.5%

Date of Issue: 01/08/01

Emergency phone: *281-457-4888*

Chemtrec: *800-424-9300*

Reviewed / Revision Date: 2/26/2010

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENTS	PERCENT	CAS NO.
SODIUM HYPOCHLORITE	12.5%	7681-52-9
SODIUM CHLORIDE	9% - 10%	7647-14-5
SODIUM HYDROXIDE	0.5% - 2%	1310-73-2
WATER	REMAINDER	7732-18-5

SECTION 3 - HAZARDS IDENTIFICATION

Potential Health Effects

ACGIH - TLV: NOT ESTABLISHED; 1 ppm AS CHLORINE

Eye Contact MAY CAUSE SEVERE PAIN, BLURRED VISION, TEARING AND SWELLING. CONCENTRATED SOLUTIONS MAY CAUSE BURNING.

Skin Contact MAY CAUSE MODERATE SKIN IRRITATION. CONTACT WITH CONCENTRATED SOLUTIONS MAY BLEACH THE SKIN AND CAUSE REDNESS, PAIN, BLISTERING, ITCHY ECZEMA AND POSSIBLE CHEMICAL BURNS.

Ingestion MAY CAUSE PAIN AND INFLAMMATION OF THE MOUTH, THROAT, ESOPHAGUS, AND STOMACH. CAN CAUSE EROSION OF MUCOUS MEMBRANES, ESPECIALLY IN THE STOMACH.

Inhalation VAPORS MAY CAUSE SLIGHT TO SEVERE IRRITATION OF THE RESPIRATORY TRACT. HIGH CONCENTRATIONS MAY CAUSE SORE THROAT, BLISTERING, DELAYED PULMONARY EDEMA (SWELLING OF LUNG TISSUE) AND SHORTNESS OF BREATH.

Carcinogenicity: *NTP* NO *IARC* NO *OSHA* NO

SECTION 4 - FIRST AID PROCEDCURES

Eye Contact: IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE HOLDING EYELIDS OPEN. GET MEDICAL ATTENTION.

Skin Contact: IMMEDIATELY REMOVE CONTAMINATED CLOTHING OR SHOES, WIPE EXCESS FROM SKIN AND FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. USE SOAP IF AVAILABLE OR FOLLOW BY WASHING WITH SOAP AND WATER. DO NOT REUSE CLOTHING UNTIL THOROUGHLY CLEANED. GET MEDICAL ATTENTION.

Inhalation: REMOVE VICTIM TO FRESH AIR AND PROVIDE OXYGEN IF BREATHING IS DIFFICULT. GIVE ARTIFICIAL RESPIRATION IF NOT BREATHING. GET MEDICAL ATTENTION.

Ingestion: DO NOT INDUCE VOMITING. RINSE MOUTH WITH WATER. IF CONSCIOUS, GIVE LARGE QUANTITIES OF WATER OR MILK AND GET IMMEDIATE MEDICAL ATTENTION. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON!

SECTION 5 -FIRE FIGHTING MEASURES

Flash Point (°F) NONFLAMMABLE.

Extinguishing Media USE MEDIA APPROPRIATE FOR SURROUNDING AREA.

Special Firefighting Procedures/Precautions WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE GEAR. STAY UPWIND AND KEEP OUT OF LOW AREAS.

SECTION 6 -ACCIDENTAL RELEASE MEASURES

For Spill: CLEAN-UP PERSONNEL SHOULD USE PROTECTIVE EQUIPMENT TO PREVENT CONTACT. CONTAIN MATERIAL. PLACE COLLECTED MATERIAL IN A DISPOSAL CONTAINER. PREVENT LIQUID FROM ENTERING SEWERS OR WATERWAYS. DO NOT USE COMBUSTIBLE ABSORBENTS.

SECTION 7 - HANDLING AND STORAGE

Keep container tightly closed when not in use. Store in a cool, dry, well-ventilated area, away from heat and incompatible materials. Protect containers from physical damage.

AVOID CONTACT WITH EYES AND SKIN AND INHALATION OF VAPORS, MISTS, AND FUMES. AVOID DIRECT SUNLIGHT, HEAT, FLAMES AND OTHER IGNITION SOURCES.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory Protection NOT NECESSARY UNDER NORMAL USE AND CONDITIONS. FOR AREAS WITH HIGH VAPOR CONCENTRATIONS, USE NIOSH APPROVED RESPIRATOR PROTECTION. FOR CANISTER TYPE RESPIRATORS, USE CHLORINE FILTERS. IN CASE OF FIRE, WEAR SELF-CONTAINED BREATHING APPARATUS.

Ventilation LOCAL AND MECHANICAL RECOMMENDED.

Protective Gloves CHEMICAL IMPERVIOUS GLOVES.

Eye/Face Protection CHEMICAL SAFETY GOGGLES AND/OR FULL-FACE SHIELD.

Other Protection CHEMICAL RESISTANT CLOTHING SUCH AS COVERALLS/APRON, BOOTS, ETC.

Work Practices USE GOOD PERSONAL HYGIENE PRACTICES. WASH HANDS BEFORE EATING, DRINKING, SMOKING, OR USING TOILET FACILITIES. PROMPTLY REMOVE SOILED CLOTHING AND WASH THOROUGHLY BEFORE REUSE. SHOWER AFTER WORK USING PLENTY OF SOAP AND WATER.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point (°F):	DECOMPOSES	*Vapor Pressure (mmHg):*	17.5 (@ 20 C)
Freezing Point (°F):	7 - 10	*Vapor Density (Air=1):*	NOT ESTABLISHED.
Solubility (H2O):	COMPLETE	*Specific Gravity (H2O=1):*	1.20 - 1.40
pH	12 - 13	*Evaporation Rate:*	NOT ESTABLISHED.

Appearance/Odor: CLEAR, PALE YELLOW OR GREENISH LIQUID WITH A CHLORINE ODOR.

SECTION 10 - STABILITY AND REACTIVITY

Chemical Stability: YES

Incompatible Material: ANY ACIDIC MATERIAL, AMMONIA, UREA, OXIDIZABLE MATERIALS AND METALS, SUCH AS NICKEL, COPPER, TIN, ALUMINUM AND IRON.

Hazardous Polymerization: WILL NOT OCCUR.

Decomposition Products: HYDROGEN CHLORIDE AND CHLORINE. CHLORINE GAS RATE OF DECOMPOSITION INCREASES WITH THE CONCENTRATION WITH TEMPERATURES ABOVE 85 DEGREES F.

SECTION 11 - TOXICITY INFORMATION

Oral = > 8000 mg/kg (Rat) Dermal LD50 = N.E. Inhalation LC50= > 10.5 mg/l (Rat)

SECTION 12 - ECOLOGICAL INFORMATION

DAPHNIA MAGNA 24 HR. LC50 = > 500 MG/L; ZEBRA FISH STATIC 24 HR. LC50 = > 500 MG/L

SECTION 13 - DISPOSAL CONSIDERATIONS

DO NOT DISCHARGE INTO WATERWAYS OR SEWER SYSTEMS WITHOUT PRIOR APPROVAL. EMPTY DRUMS, AS DEFINED BY RCRA, MAY BE SENT TO LICENSED DRUM RECONDITIONED FOR REUSE.

DISPOSE OF WASTE MATERIALS ACCORDING TO ALL FEDERAL, STATE AND LOCAL REGULATIONS.

SECTION 14 - TRANSPORT INFORMATION

USA DOT Shipping Name: HYPOCHLORITE SOLUTION

Hazard Class: 8

UN/NA Number: UN1791

Packing Group: III

Subsidiary Hazard:

Marine Pollutant: NO

SECTION 15 - REGULATORY INFORMATION

CERCLA RQ (lbs): 100

SARA Title III Section 312:

☑ *Acute* ☐ *Chronic* ☐ *Flammable* ☐ *Sudden Release of Pressure* ☐ *Reactive*

SARA Title III Section 313: No

SARA Extremely Hazardous Substance: No

HMIS HAZARD RATING

Health: 2 *Fire:* 0 *Reactivity:* 1

0 - Least 1 - Slight 2 - Moderate 3 - High 4 - Extreme

SECTION 16 - OTHER INFORMATION

EPA Pesticide Registration Number: 813-15

NSF Maximum Use Level for Potable Water (Standard 60): CHECK BOL FOR FACILITY DATA (37 mg/l TO 84 mg/l)

TSCA (Toxic Substance Control Act), 40 CFR 710:

Sources of the raw materials used in this mixture assure that all chemical ingredients present are in compliance with Section 8(b) Chemical Substance Inventory, or are otherwise in compliance with TSCA.

DISCLAIMER

THE DATA PRESENTED IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF; HOWEVER, NEITHER SELLER NOR PREPARER MAKES ANY WARRANTIES, EXPRESSED OR IMPLIED, CONCERNING THE INFORMATION PRESENTED. THE USER IS CAUTIONED TO PERFOM HIS OWN HAZARD EVALUATION AND TO RELY UPON HIS OWN DETERMINATIONS.

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Once-Through Cooling Chemical Additives

a. Manufacturers Product Identification Number: **Ammonia**

b. Product Use: **Biocide (oxidizing)**

c. Chemical Composition: **NH3**

d. Classification (non-persistent, persistent or bioaccumulative): **Believed Non-Persistent**

e. Product or active ingredient half-life: **Not Available**

f. Frequency of product use: **Intermittent use; not exceeding 2 hours/day/unit**

g. Product toxicity data: **See attached MSDS**

h. Concentration of whole product or active ingredient in wastestream: **Not Available**

i. Outfall: **001**

Buckman

SAFETY DATA SHEET

OXAMINE 6150

Section 1. Identification

GHS product identifier	:	OXAMINE 6150
Other means of identification	:	Biocides
Product type	:	Liquid.

Relevant identified uses of the substance or mixture and uses advised against

See label and/or technical data sheet, if available.

Supplier's details	:	Buckman Laboratories, Inc. 1256 North McLean Boulevard Memphis, TN 38108 Phone 1-800-282-5626
Emergency telephone number (with hours of operation)	:	24 Hour Emergency Phone (901) 767-2722

Section 2. Hazards identification

OSHA/HCS status	:	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture	:	ACUTE TOXICITY (inhalation) - Category 4 SKIN IRRITATION - Category 2 EYE IRRITATION - Category 2B

<u>**GHS label elements**</u>

Hazard pictograms :

Signal word : Warning

Hazard statements : Harmful if inhaled.
Causes skin and eye irritation.

<u>**Precautionary statements**</u>

Prevention : Wear protective gloves. Use only outdoors or in a well-ventilated area. Avoid breathing vapor. Wash hands thoroughly after handling.

Response : IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER or physician if you feel unwell. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing and wash it before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Not applicable.

Disposal : Not applicable.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Biocides

Product code : OXM6150

Ingredient name	%	CAS number
Ammonia	<8	7664-41-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

While some substances are claimed as trade secret in accordance with the provision of OSHA 29 CFR 1910.1200(i), all known hazards are clearly communicated within this document.

Per Appendix D 1910.1200 OSHA, ranges can be used when there is batch-to-batch variability in a mixture or a trade secret claim.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : - Hold eye open and rinse slowly and gently with water for 15-20 minutes.
- Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye.
- Call a poison control center or doctor for further treatment advice.

Inhalation : - Move person to fresh air.
- If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth if possible.
- Call a poison control center or doctor for further treatment advice.

Skin contact : - Take off contaminated clothing.
- Rinse skin immediately with plenty of water for 15-20 minutes.
- Call a poison control center or doctor for treatment advice.

Ingestion : - Call poison control center or doctor immediately for treatment advice.
- Have person sip a glass of water, if able to swallow.
- Do not induce vomiting unless told to do so by the poison control center or doctor.
- Do not give anything by mouth to an unconscious person.

Notes to physician : Not available.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : In a fire or if heated, a pressure increase will occur and the container may burst.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
nitrogen oxides

Section 5. Fire-fighting measures

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Section 7. Handling and storage

Conditions for safe storage, including any incompatibilities	: Store in accordance with local regulations. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.
Satisfactory Materials of Construction	: ABS Plastic Aluminum 6063 Buna-N Rubber (Nitrile) butyl rubber C-Flex Tubing Clear C-Flex Tubing White Dow Silastic Tubing EPDM rubber MDPE Fiberglass-Reinforced Plastic (FRP) Hastaloy C-276 Alloy Hypalon (CSPE) Kynar Norprene Tubing Nylon 6-6 Perfluoroalkoxy (PFA) PharMed Tubing Polycarbonate Polyethylene - Crosslinked (XLPE) Polyethylene - High Density (HDPE) Polyethylene - Terephthalate (PET) Polyisoprene Latex Rubber (PIB) Polypropylene (PP) Polystyrene (PS) Polyurethane (PUR) PVC Chlorinated (CPVC) PVC Flexible PVC Rigid REHAU Tubing (LDPE) Silicone Rubber Steel - 304 L Stainless Steel - 316 L Stainless Teflon Tenite Plastic Tygon R3400 Tygon R3603 Tygon R4040/F4040 Viton NOTE: With respect to all other materials not listed above, user should be aware that use of such materials with this product may be hazardous and result in damages to such materials and other property and personal injuries. No data concerning such materials not listed above should be implied by the user.

Section 8. Exposure controls/personal protection

<u>Control parameters</u>

<u>Occupational exposure limits</u>

Section 8. Exposure controls/personal protection

Ingredient name	Exposure limits
Ammonia	**ACGIH (United States).** TWA: 18 mg/m³ STEL: 27 mg/m³ TWA: 25 ppm STEL: 35 ppm **OSHA (United States).** TWA: 50 ppm TWA: 35 mg/m³ **ACGIH TLV (United States, 3/2016).** TWA: 25 ppm 8 hours. TWA: 17 mg/m³ 8 hours. STEL: 35 ppm 15 minutes. STEL: 24 mg/m³ 15 minutes. **OSHA PEL 1989 (United States, 3/1989).** STEL: 35 ppm 15 minutes. STEL: 27 mg/m³ 15 minutes. **OSHA PEL (United States, 2/2013).** TWA: 50 ppm 8 hours. TWA: 35 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Section 8. Exposure controls/personal protection

Respiratory protection	: Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

Appearance

Physical state	: Liquid.
Color	: Clear
Odor	: Ammoniacal. [Slight]
Odor threshold	: Not available.
pH	: 9.1 to 9.3
Melting point	: -6.7°C (19.9°F)
Boiling point	: 111°C (231.8°F)
Flash point	: Closed cup: >93.3°C (>199.9°F) [Pensky-Martens.]
Evaporation rate	: Not available.
Flammability (solid, gas)	: Not available.
Lower and upper explosive (flammable) limits	: Not available.
Vapor pressure	: Not available.
Vapor density	: Not available.
Relative density	: 1.15
Dispersibility properties	: Not available.
Solubility	: Soluble in the following materials: cold water and hot water.
Partition coefficient: n-octanol/water	: Not available.
Auto-ignition temperature	: Not available.
Decomposition temperature	: Not available.
Viscosity	: Not available.
VOC	: 0 % (w/w) [Method 24]

Aerosol product

Section 10. Stability and reactivity

Reactivity	: No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	: No specific data.
Incompatible materials	: No specific data.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Ammonia	LC50 Inhalation Gas.	Rat	9500 ppm	1 hours
	LC50 Inhalation Gas.	Rat	2000 ppm	4 hours
OXAMINE 6150	LC50 Inhalation Dusts and mists	Rat	>2.08 mg/l	4 hours
	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat - Female	>5000 mg/kg	-

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
OXAMINE 6150	Skin - Mild irritant	Rabbit	-	-	-
	Eyes - Mild irritant	Rabbit	-	-	-

Sensitization

Product/ingredient name	Route of exposure	Species	Result
OXAMINE 6150	skin	Guinea pig	Not sensitizing

Mutagenicity

Not available.

Carcinogenicity

This product has not been tested unless noted in summary results.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Routes of entry anticipated: Dermal, Inhalation.
Routes of entry not anticipated: Oral.

Potential acute health effects

Eye contact : Causes eye irritation.

Inhalation : Harmful if inhaled.

Skin contact : Causes skin irritation.

Ingestion : No known significant effects or critical hazards.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Section 11. Toxicological information

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
OXAMINE 6150	Acute EC50 >131 mg/l Acute EC50 491 mg/l Acute LC50 259 mg/l Acute LC50 >117 mg/l Acute LC50 >126 mg/l	Daphnia - *Daphnia magna* Daphnia - *Daphnia pulex* Fish Fish Fish	48 hours 48 hours 96 hours 96 hours 96 hours

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a

Section 13. Disposal considerations

safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	IMDG	IATA
UN number	3266	3266	3266
UN proper shipping name	CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (ammonia, anhydrous, solution) RQ (ammonia, anhydrous)	CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (ammonia, anhydrous, solution). Marine pollutant (ammonia, anhydrous)	CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (ammonia, anhydrous, solution)
Transport hazard class(es)	8 	8  	8 
Packing group	III	III	III
Environmental hazards	No.	Yes.	Yes. The environmentally hazardous substance mark is not required.
Additional information	**Reportable quantity** 1262.6 lbs / 573.23 kg [131.68 gal / 498.46 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements. **Remarks** ERG Guide 154	The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg. **Emergency schedules (EmS)** F-A, S-B **IMDG Code Segregation group** 2 - Ammonium compounds **Remarks** ERG Guide 154, HazMat Code 4935258	The environmentally hazardous substance mark may appear if required by other transportation regulations. **Remarks** ERG Guide 154, ERG Code 8L

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

Potential impurities present in trace quantities are included in the regulatory listings of this section.

U.S. Federal regulations : **United States inventory (TSCA 8b)**: This product is subject to regulation under the US Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) and is therefore exempt from US Toxic Substances Control Act (TSCA) Inventory listing requirements.

Clean Water Act (CWA) 307: Nickel; chromium; mercury; Cyanide, solid

Clean Water Act (CWA) 311: ammonia, anhydrous

Clean Air Act (CAA) 112 regulated toxic substances: ammonia, anhydrous

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
Ammonia	<8	Yes.	500	-	100	-

SARA 304 RQ : 1262.6 lbs / 573.2 kg [131.7 gal / 498.5 L]

SARA 311/312

Classification : Immediate (acute) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
Ammonia	<8	Yes.	Yes.	No.	Yes.	No.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	Ammonia Mercury	7664-41-7 7439-97-6	<8 0.0000039
Supplier notification	Ammonia	7664-41-7	<8

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

Product contains up to approximately 8% aqueous ammonia which is subject to reporting under section 313 of the Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR § 372.

CERCLA : CERCLA: Hazardous substances.:
Ammonia, CAS# 7664-41-7, RQ = 100 pounds
Ammonium hydroxide, CAS# 1336-21-6, RQ = 1,000 pounds
Mercury, CAS# 7439-97-6, RQ = 1 pounds
Chromium, CAS# 7440-47-3, RQ = 5000 pounds
Nickel, CAS# 7440-02-0, RQ = 100 pounds
Cyanide, solid, CAS# 57-12-5, no RQ is being assigned to the generic or broad class

FDA : This product is allowed under the following FDA (21 CFR) sections :176.170.

BfR : XXXVI

EPA Reg. No. : 1448-433

Section 15. Regulatory information

FIFRA : This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals. The hazard information required on the pesticide label is reproduced below. The pesticide label also includes other important information, including directions for use.

CAUTION: Harmful if swallowed. Avoid breathing vapor. Avoid contact with skin, eyes, or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco, or using the toilet. Remove and wash contaminated clothing before reuse.

ENVIRONMENTAL HAZARDS: The pesticide is toxic to fish and aquatic organisms. Do not discharge effluent containing this product into lakes, streams, ponds, estuaries, oceans or other waters unless in accordance with the requirements of a National Pollutant Discharge Elimination System (NPDES) permit and the permitting authority has been notified in writing prior to discharge. Do not discharge effluent containing this product to sewer systems without previously notifying the local sewage treatment plant authority. For guidance contact your State Water Board or Regional Office of the EPA.

State regulations

California Prop. 65

WARNING: This product contains less than 0.1% of a chemical known to the State of California to cause cancer.
WARNING: This product contains less than 1% of a chemical known to the State of California to cause birth defects or other reproductive harm.

Ingredient name	Cancer	Reproductive
Nickel	Yes.	No.
mercury	No.	Yes.
Cyanide, solid	No.	Yes.

Section 16. Other information

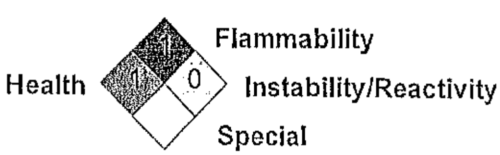
Hazardous Material Information System (U.S.A.)

Health	*	1
Flammability		1
Physical hazards		0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)



Section 16. Other information

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of printing	:	9/16/2016
Date of issue/Date of revision	:	9/16/2016
Date of previous issue	:	8/25/2016
Version	:	3.07
Prepared by	:	Buckman Regulatory Affairs
Key to abbreviations	:	ATE = Acute Toxicity Estimate BCF = Bioconcentration Factor GHS = Globally Harmonized System of Classification and Labelling of Chemicals IATA = International Air Transport Association IBC = Intermediate Bulk Container IMDG = International Maritime Dangerous Goods LogPow = logarithm of the octanol/water partition coefficient MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution) UN = United Nations

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Buckman Laboratories, Inc. warrants that this product conforms to its chemical description and is reasonably fit for the purpose referred to in the directions for use when used in accordance with the directions under normal conditions. Buyer assumes the risk of any use outside of such directions.

Seller makes no other warranty or representation of any kind, express or implied, concerning the product, including NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS OF THE GOODS FOR ANY OTHER PARTICULAR PURPOSE. No such warranties shall be implied by law and no agent of seller is authorized to alter this warranty in any way except in writing with a specific reference to this warranty.
The exclusive remedy against seller shall be in a claim for damages not to exceed the purchase price of the product, without regard to whether such a claim is based upon breach of warranty or tort.

Any controversy or claim arising out or relating to this contract, or breach thereof, shall be settle by arbitration in accordance with the commercial arbitration rules of the American Arbitration Association, and judgment upon the rendered by the Arbitrator(s) may be entered in any court having jurisdiction thereof.

Attachment L

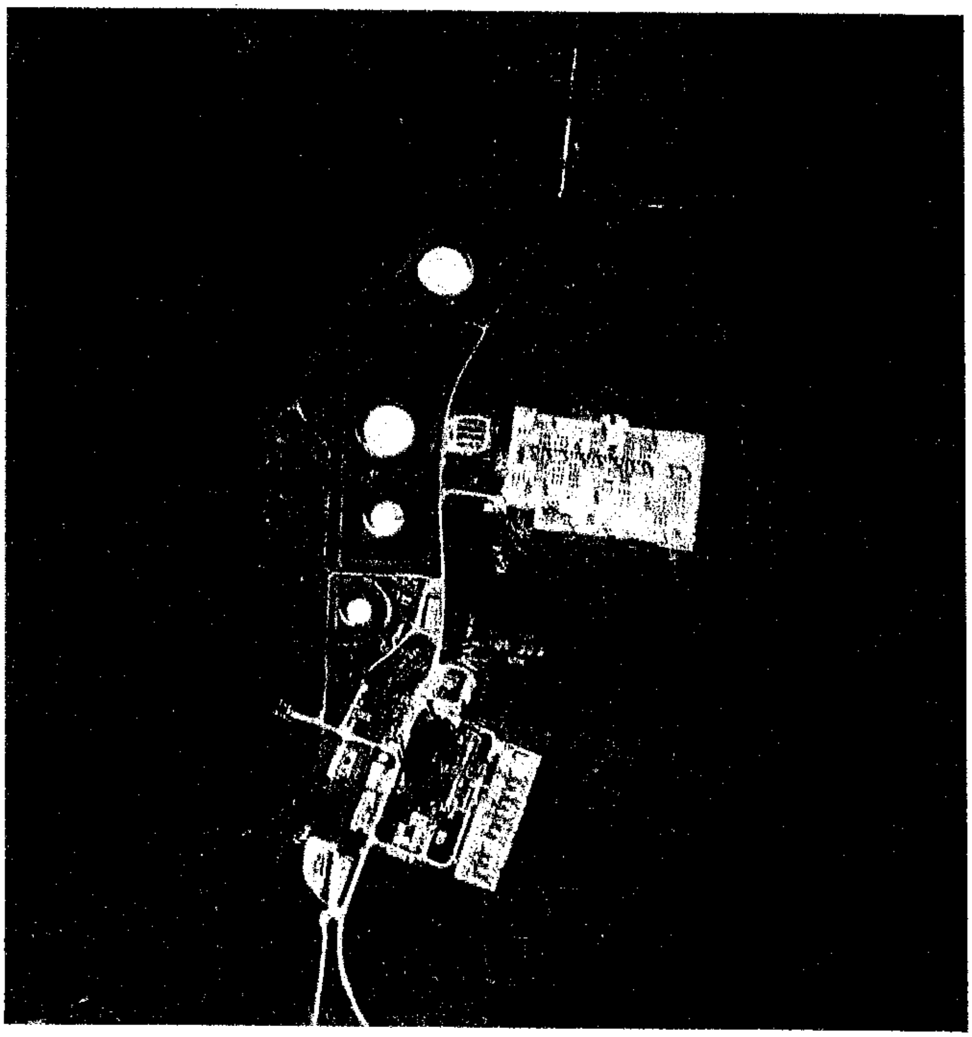
Graham Steam Electric Station
§ 316(b) Information to Inform the Entrainment BTA Determination and Select the Chosen Method of Compliance for Impingement BTA

Final Report, August 2018

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Graham Power Plant § 316(b) §125.98(f) and §122.21(r)(6) Information to Inform the Entrainment BTA Determination and Select the Chosen Method of Compliance for Impingement BTA

Final Report, May 2018



ACKNOWLEDGMENTS

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Acronyms

AIF – Actual Intake Flow

BPJ – Best Professional Judgement

BTA - Best Technology Available

CCRS – Closed-cycle Recirculating System

cfs – Cubic Feet per Second

CWA – Clean Water Act

CWIS – Cooling Water Intake Structure

EPA - United States Environmental Protection Agency

GRSES – Graham Steam Electric Station – Level of Effort

MGD – Million Gallons per Day

NPDES – National Pollution Discharge Elimination System

TCEQ – Texas Commission on Environmental Quality

T&E – Threatened and Endangered

TPWD – Texas Parks and Wildlife Department

USFWS – United States Fish and Wildlife Service

EXECUTIVE SUMMARY

This document is submitted in compliance with U.S. Environmental Protection Agency (EPA) final § 316(b) regulations (Rule) for existing facilities that became effective on October 14, 2014 for Luminant's Graham Steam Electric Station (GRSES). The three objectives of this document are to:

1. Formally request a waiver from submittal of the § 122.21(r)(2) through (12) information as allowed by § 125.95(a)(3) of the Rule.
2. Provide the Texas Commission on Environmental Quality (TCEQ) with information to support the entrainment best technology available (BTA) determination required by the permitting authority at § 125.98(f) of the Rule.
3. Formalize the chosen method of compliance for impingement required at § 122.21(r)(6) of the Rule.

The Rule requires all facilities using >2 MGD to employ or install BTA to reduce entrainment and impingement mortality. All facilities are required to submit the § 122.21(r)(2) and (3) information and applicable provisions of the (r)(4) through (8) information for impingement that includes:

(r)(2) – Source Water Physical Data
(r)(3) – Cooling Water Intake Structure Data
(r)(4) – Source Water Baseline Biological Characterization Data
(r)(5) – Cooling Water System Data
(r)(6) – Chosen Method of Compliance with the Impingement Mortality Standard
(r)(7) – Entrainment Performance Studies
(r)(8) – Operational Status

For facilities that withdraw >125 million gallons per day (MGD) of actual cooling water flow (AIF) are required to submit entrainment information that includes the § 122.21(r)(9) - (12) information as follows:

- (9) – Entrainment Characterization Study
- (10) – Comprehensive Technical Feasibility and Cost Evaluation Study
- (11) – Benefits Valuation Study
- (12) – Non-water Quality Environmental and Other Impacts Study

However, the Rule at § 125.95(a)(3) includes a provision that states: "*The Director may waive some or all of the information requirements of 40 CFR 122.21(r) if the intake is located in a manmade lake or reservoir and the fisheries are stocked and managed by a State or Federal natural resources agency or the equivalent. If the manmade lake or reservoir contains Federally-listed threatened and endangered species, or is designated critical habitat, such a waiver shall not be granted*".

GRSES withdraws cooling water from a man-made lake (Lake Graham/Lake Eddleman) and the fisheries are stocked and managed by the Texas Parks and Wildlife Department (TPWD). Luminant is requesting that the Texas Department of Environmental Quality (TCEQ) grant a information waiver request for GRSES (see Chapter 4). Luminant recognizes that TCEQ must still make a site-specific BTA determination for entrainment as required at § 125.98(f) of the Rule and Luminant is still required to choose how it will comply with the BTA standards for impingement at § 125.94(c) of the Rule.

The objective of this document is to provide site-specific information to support:
1. GRSES's § 122.21(r) information request waiver,
2. Provide information to support TCEQ's entrainment BTA determination, and
3. Select Luminant's chosen method of compliance to satisfy the impingement mortality reduction BTA requirements.

The results of the information provided in this document relative to each of these objectives is as follows:

Request for § 122.21(r) Information Waiver

In terms of the information request waiver, Chapter 3 documents that GRSES:

1. withdraws cooling water from a man-make lake or reservoir,
2. Lake Graham/Lake Eddleman have a stocked and managed fishery, and
3. no risk is posed to federally threatened or endangered species or their designated critical habitat.

Information Provided to Support the Entrainment BTA Determination

Relative to providing information to assist TCEQ in the entrainment BTA determination, Section 5 of this document provides information on the factors that the agency must and may consider at § 125.98(f) of the Rule. A summary of key considerations includes:

- Based on information provided in subsections 5.2.1, 5.3.1 and 5.3.2, the TPWS and 2013 Lake Graham fishery monitoring survey the fishery appears healthy and is rated good for the majority of recreational species. Additionally, the thermal discharge provides a winter recreational fishery as a result of the GRSES.
- There are no federally threatened or endangered species nor designated critical habitat for such species at risk in Lake Graham/Lake Eddleman from GRSES cooling water intake structure (CWIS) operations.
- While not required, three entrainment fish protection technologies were evaluated consistent with § 122.21(r)(10)(i) of the Rule that included retrofit of a CCRS using mechanical draft cooling towers, fine-mesh screens and an alternative source of cooling water with the following results:
    - Retrofit with a mechanical draft CCRS is estimated to cost between $65 million and $200 million
    - Two types of fine-mesh screens were evaluated that included fine-mesh modified traveling screens estimated to cost in excess of $12 million and narrow-slot wedgewire screens (an exclusion technology) that were estimated to have a

capital cost of over \$30 million for a 0.5 mm slot size and approximately \$19 million for a 2.0 mm slot size.
    - An alternative water supply source was deemed infeasible for GRSES.
    - Given the magnitude of the estimated capital cost and GRSES capacity utilization over the past five years of just over 2%, if any of these entrainment reduction technologies were required the facility would most likely be retired.
    - Capital cost generally makes up in excess of 75% of the social cost and additional social cost would include loss of tax revenue to the local economy, loss of jobs at the facility and loss of the purchase of goods and services by the facility from the local community in addition to an increase in electric prices since more costly generation would be necessary to replace power should GRSES retire.
- In terms of biological benefits of the evaluated technologies, all are expected to have cost that are wholly disproportional to their benefits considering:
    - TCEQ has already acknowledged that GRSES uses a CCRS as defined at § 125.92(c)(2) of the Rule and regarding that technology the EPA states *"Closed-cycle cooling is indisputably the most effective technology at reducing entrainment."* (pg. 48342, column 1, 14 lines from bottom of the page).
    - Actual intake flow (AIF) over the past three years has averaged just under 104 MGD that is just under 80% below the design intake flow (DIF).
    - The current condition of the Lake Graham/Lake Eddleman fishery relative to estimated technology costs and current GRSES operations.

The above considerations support a determination that the existing CWIS is BTA for entrainment that is consistent with § 125.98(f)(4) of the Rule, where it states *"The Director may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits."* and *"the Director may determine that no additional control requirements are necessary beyond what the facility is already doing."*

Chosen Method of Compliance for Impingement BTA

As discussed in Section 6 of this document, Luminant selects use of a CCRS at § 125.94(c)(1) of the Rule.

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1 INTRODUCTION

The purpose of this document is to provide TDEQ with information to support a site-specific entrainment BTA determination for Luminant's GRSES to comply with § 316(b) of the Clean Water Act (CWA) and identify the chosen method for BTA for impingement. The introduction consists of three sections that include a general overview of the Rule, a brief discussion of the compliance approach for GRSES and a summary of the organization of the remainder of this document.

General §316(b) Rule Overview

The U.S. Environmental Protection Agency ("USEPA") issued the Rule for existing facilities that became effective on October 14, 2014. These regulations require all facilities using >2 MGD to install best technology available (BTA) for entrainment and impingement at cooling water intake structures (CWIS). All facilities are required to submit the § 122.21(r)(2) and (3) information and applicable provisions of the (r)(4) through (8) information for impingement that includes:

(r)(2) – Source Water Physical Data
(r)(3) – Cooling Water Intake Structure Data
(r)(4) – Source Water Baseline Biological Characterization Data
(r)(5) – Cooling Water System Data
(r)(6) – Chosen Method of Compliance with the Impingement Mortality Standard
(r)(7) – Entrainment Performance Studies
(r)(8) – Operational Status

The BTA determination for entrainment is based on information provided to the National Pollution Discharge Elimination System (NPDES) permitting authority. The BTA determination for entrainment is made on a site-specific basis. At a minimum, all facilities using >125 MGD actual intake flow (AIF) are required to submit entrainment information that includes the § 122.21(r)(9) - (12) information as follows:

- (9) – Entrainment Characterization Study
- (10) – Comprehensive Technical Feasibility and Cost Evaluation Study
- (11) – Benefits Valuation Study
- (12) – Non-water Quality Environmental and Other Impacts Study

However, Rule provides a provision at § 125.95(a)(3) that allows TCEQ to waive some or all of the §122.21(r) information requirements if the facility is located on a manmade lake or reservoir with a stocked and managed fishery. While TCEQ can waive the § 122.21(r) information, it is still required to make a site-specific BTA determination for entrainment as required at § 125.98(f) of the Rule. Once the BTA determination for entrainment is made, the facility must select from one of seven alternatives to reduce impingement mortality. The seven impingement mortality BTA alternatives include:

1. Closed-cycle Cooling Recirculating System (CA1)
2. 0.5 fps Through-Screen Design Velocity (CA2)
3. 0.5 fps Through-Screen Actual Velocity (CA3)
4. Existing Offshore Velocity Cap (CA4)
5. Modified Traveling Screens (CA5)
6. System of Technologies as the BTA for Impingement Mortality (CA6)
7. Impingement Mortality Performance Standard (CA7)

However, the Rule includes a number of potential exemptions that include:

- a *de minimis* exemption for *de minimis* levels of impingement,
- a provision for less stringent standards for low capacity utilization,
- an exemption from use of technologies at nuclear facilities that conflict with federal nuclear safety requirements.

The Rule provides broad discretionary authority to TCEQ to deny exemptions or even impose additional requirements, especially if federally protected threatened or endangered species or their designated critical habitat are at risk.

Compliance Approach for Graham Steam Electric Station

The compliance approach for GRSES is as follows:

1. Request a waiver of information at § 122.21(r)(2) – (12) by demonstrating it meets the requirements for the waiver specified at §125.95(a)(3) of the Rule. Note per Section 2 below that GRSES's AIF is <125 MGD AIF and therefore is not required to submit the entrainment information at § 122.21(r)(9) – (12) of the Rule.

2. Provide information to support the entrainment BTA determination for TCEQ as specified at § 125.98(f) of the Rule.

3. Select the chosen method or compliance for impingement BTA.

Report Organization

The report is organized into six chapters. Following this Introduction, Chapter 2 provides a description of the GRSES facility and the source waterbody used to provide condenser cooling water. Chapter 3 provides information on the source waterbody fish and shellfish affected by the GRSES CWIS. Chapter 4 provides information to support Luminant's request for a waiver of the § 122.21(r)(2) – (12) information. Chapter 5 provides information to support TCEQ's site-specific entrainment BTA information and Chapter 6 provides Luminant's chosen method of compliance for impingement BTA. Chapter 7 provides references used in the document. Also attached are the following Appendices:
Appendix A – Volumetric Survey of Lake Graham.
Appendix B – Source Waterbody Biological Information
Appendix C – Approval of Lake Graham as a CCRS
Appendix D – Evaluation of Fine-mesh Screens

2 SOURCE WATERBODY AND FACILITY INFORMATION

This chapter provides information on the source waterbody used by GRSES to provide cooling water and a description of the facility. Information is similar to that required at § 122.21(r)(2), (3), (5) and (8) of the Rule.

2.1 Source Waterbody Information

GRSES) is located on the eastern shore of Lake Graham in Young County, TX. GRSES withdraws condenser cooling water from Lake Graham and Lake Eddleman. The facility is located just south of the man-made canal connecting the two lakes. The two lakes are located two miles northwest of Graham, TX (Figure 2-1) on Flint and Salt Creeks, tributaries to the Brazos River in Young County. Records indicate the drainage area is approximately 221 square miles. At the conservation pool elevation, the lake has approximately 38 miles of shoreline and is 5.3 miles long. The widest point of the reservoir is approximately 1.5 miles (located about 0.16 miles upstream of the dam). Eddleman Dam was built on Flint Creek in 1928 while Graham Dam was built on Salt Creek in 1958. Both creeks are tributaries of the Brazos River. The two lakes were connected via canal sometime after June of 1959.

Lake Graham contains a volume of 45,302 acre-feet water encompassing 2,444 surface acres at the conservation pool elevation of 1,075.0 feet. The drainage area is approximately 221 square miles. Details on the history of the lakes and a volumetric survey is provided as Appendix A. Further information on the source waterbody is provided in Chapter 4.

Figure 2-1. Ariel view of Lake Graham (lake on left) and Lake Eddleman (Lake on Right)

2.2 Facility Information

GRSES is a two unit, natural gas fired facility with rated at 615 MW (total) and utilizes a closed-cycle recirculating system as defined at § 125.92(c)(2). The average capacity utilization between 2013 through 2017 was about 2.1%. (Table 2.1)

GRSES's CWIS is located along the eastern shoreline of Lake Graham, facing the main body of the reservoir and is just south of the man-made canal that links Lake Graham and Lake Eddleman (Figure 2-1). The CWIS has four bays (two for each Unit), each with one vertical, mixed flow circulating water pump, located downstream of the traveling water screens. There is a trash rack at the front of the intake which prevents large debris from reaching the traveling water screens. The traveling water screens are located about 13 ft downstream of the trash racks. The two screens for Unit 1 are 8 ft wide and the two screens for Unit 2 are 10 ft wide. All four of the screens are equipped with 3/8 in. square mesh. The two circulating water pumps used for Unit 1 has a rated capacity of 184.9 CFS (83,000 GPM), and the two circulation pumps used for Unit 2 has a rated capacity of 206 CFS (92,500 GPM). When all four circulating water pumps are operating, the design intake flow (DIF) to the facility is 781.8 CFS (351,000 GPM or 505.4 MGD). Consistent with the definition of AIF in the Rule at § 125.92(a) GRSES's AIF for the past three years is 103.9 MGD per year. This is <125 MGD and, therefore, GRSES is not required to provide the entrainment information at § 122.21(r)(9) – (12) of the Rule.

Velocities within the CWIS were calculated at the conservation pool water level (El. 1075.0 ft.) and the maximum design flow capacity (505.4 MGD). Velocities approaching the traveling water screens are estimated at 1.02 ft/sec. The through-screen velocity was not calculated since the exact porosity of the traveling water screens is not known. However, the through-screen velocity would be approximately twice the screen approach velocity.

Appendix C provides a copy of a letter dated August 17, 2015 providing information to support that GRSES did satisfy the requirements necessary to meet the definition of a CCRS. In a letter dated September 2, 2015, TCEQ approved Luminant's request to designate that GRSES's source waterbody qualified as a CCRS based on Luminant providing:

1. The 2004 (most recent amendment) Certification of Adjudication for water rights issued by TCEQ indicating that the reservoir was built for industrial cooling water purposes, and
2. Stating that the use of a reservoir by GRSES as a CCRS minimizes use of make-up water by eliminating blowdown and drift.

Table 2-1 Flow and capacity utilization data for GRSES over the past 5 years

Flow/Capacity Utilization	2013	2014	2015	2016	2017	5 Year Average
Average Flow (MGD)			128.3	88.9	94.4	103.9
Capacity Utilization	2.65	2.79	2.43	1.98	0.65	2.1

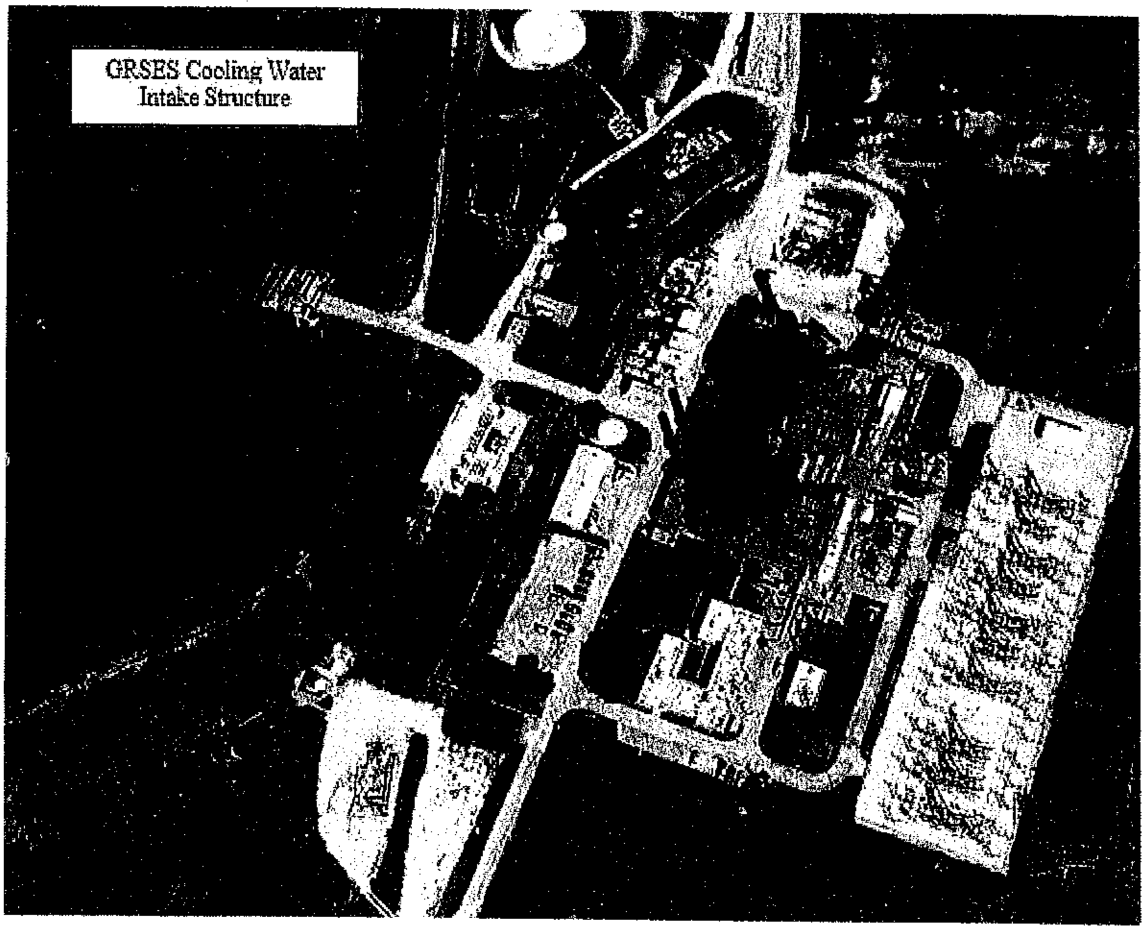

Figure 2-2. Ariel of GRSES CWIS on Lake Graham.

3 SOURCE WATER BIOLOGICAL CHARACTERIZATION INFORMATION

For facilities that are required to provide the source water biological characterization data at §122.21(r)(4), the provision's introductory paragraph states:
"§122.21(r)(4) Source water baseline biological characterization data. This information is required to characterize the biological community in the vicinity of the cooling water intake structure and to characterize the operation of the cooling water intake structures. The Director may also use this information in subsequent permit renewal proceedings to determine if your Design and Construction Technology Plan as required in §125.86(b)(4) of this chapter should be revised. This supporting information must include existing data (if they are available). However, you may supplement the data using newly conducted field studies if you choose to do so."

This paragraph is followed by a list of twelve subsections. For GRSES, the source waterbody is Lake Graham/Lake Eddleman and most of the information is being provided. Following is a list of each of the twelve subsections followed by either information relevant to that subsection or a summary of the information with more detail provided in Appendix B.

(i) A list of data required in paragraphs (r)(4)(ii) through (r)(4)(vi) that were not available with an explanation of efforts to identify sources of that data.

All of the information was available and was provided in Appendix B.

(ii) A list of species (or relevant taxa) for all life stages and their relative abundance near the CWIS.

A list of relevant taxa is provided in Table 1 of Appendix B.

(iii) Identification of species and life stage that would be most susceptible to impingement and entrainment. Species evaluated must include the forage base as well as those important in terms of significance to commercial and recreational fisheries.

Gizzard and threadfin shad, both forage species, are the two species most vulnerable to entrainment and impingement. They are vulnerable to entrainment since they are pelagic spawners and eggs and larvae remain in the water column where they can be drawn into the CWIS by the cooling water pumps. Juveniles are vulnerable to impingement, however, due to their size and swimming speed, adults tend to be less vulnerable to impingement. Centrarchids, such as sunfish and largemouth bass (recreationally important species) are nest builders such that eggs and early stage larvae are not vulnerable to entrainment since they remain on the bottom near the nest. However, later stage larvae can become more vulnerable as they leave their nests and juvenile sunfish are vulnerable to impingement.

(iv) Identification and evaluation of the primary period of reproduction, larval recruitment, and period of peak abundance of relevant taxa.

This information for the relevant species in Lake Graham/Lake Eddleman is provided in Appendix B.

(v) Data representative of the seasonal and daily activities (e.g., feeding and water column migration) of biological organisms near the cooling water intake structure.

This information for the relevant species in Lake Graham/Lake Eddleman is provided in Appendix B.

(vi) *Identification of <u>all</u> threatened and endangered species and/or designated critical habitat that are or may be present in the action area*[1].

There are no aquatic species federally listed as threatened or endangered that occur in the Lake Graham or Lake Eddleman reservoir (U.S. Fish and Wildlife Service [USFWS], 2018). The only species federally listed as threatened or endangered for Young County are 5 species of birds and two species of fish (Table 1), which have the potential to occur near the power plant. For the five species of birds none have a nexus with the GRSES CWIS. While the two shiner species listed in Table 1 may occur in the vicinity of the lakes, the lakes themselves do not provide suitable habitat for either shiner species. Both species require shallow moving water in well aerated streams. See Appendix B for more details on all of the species listed in Table 1.

[1] The "action area" can be generally considered the area in the vicinity of impingement and entrainment at the CWIS.

Table 3.1 Federally Listed Species in Graham Reservoir Area

Common Name	Scientific Name	Federal Status*	Potential Habitat in Lake Area	Affected by Normal Operations
BIRDS				
Red Knot	*Calidris canutus rufa*	T	Yes	No
Piping Plover	*Charadrius melodus*	T	Yes	No
Golden-cheeked Warbler	*Setophaga chrysoparia*	E	No	No
Whooping Crane	*Grus americana*	E	Yes	No
Interior Least Tern	*Sternula antillarum*	E	Yes	No
FISH				
Sharpnose Shiner	*Notropis oxyrhynchus*	E	No	No
Smalleye Shiner	*Notropis buccula*	E	No	No

Source: USFWS (2018).

* T = Threatened; E = Endangered

(vii) Documentation of any public participation or consultation with Federal or State agencies undertaken in development of the plan.

The Rule provides no information or explanation of what is meant by the "plan" relative to this requirement and as a result of the litigation, the EPA informed EPRI it is unable to elaborate on their intention regarding use of the term. However, there has been no public participation or consultation with Federal or State Agencies regarding source waterbody biological sampling.

(viii)—If the information requested in paragraph (r)(4)(i) of this section is supplemented with data collected using field studies, supporting documentation for the Source Water Baseline Biological Characterization must include a description of all methods and quality assurance procedures for sampling, and data analysis including a description of the study area; taxonomic identification of sampled and evaluated biological assemblages (including all life stages of fish and shellfish); and sampling and data analysis methods. The sampling and/or data analysis methods you use must be appropriate for a quantitative survey and based on consideration of methods used in other biological studies performed within the same source water body. The study area should include, at a minimum, the area of influence of the cooling water intake structure.

Luminant did not nor has no plans to collect new data by conducting field studies to supplement existing data and information for GRSES.

(ix) this part clarifies that the Source Water Baseline Characterization Data for owners/operators of existing facilities or new units at existing facilities is the information in paragraphs (r)(4)(i) through (xii) of this section.

This is simply a statement for clarification and does not require any specific information.

(x) Identification of protective measures and stabilization activities that have been implemented, and a description of how these measures and activities affected the baseline water condition near the intake.

No specific protective measures or stabilization activities have been implemented or required for GRSES.

(xi) A listing of fragile species, as defined at 40 CFR 125.92(m).

The EPA defines a fragile species of fish or shellfish at §125.92(m) of the Rule as either one of 14 listed species or as those that have an impingement survival rate of less than 30 percent to ensure that a facility's performance in reducing impingement mortality would only reflect effects of its improvements to the CWIS technology and not be biased by effects of data collection that are not caused by impingement. One listed "fragile" species, Gizzard Shad (*Dorosoma cepedianum*), is reported by TPWD to be present in Lake Graham/Lake Eddleman.

(xii) For owners/operators of existing facilities that have incidental take exemptions or authorization for its cooling water intake structure(s) from the U.S. Fish and Wildlife Service or the National Marine Fisheries Service, to provide any information submitted to obtain those exemptions or authorizations to satisfy the permit application information requirement of paragraph 40 CFR 125.95(f) if included in the application.

Luminant has no incidental take exemptions or letters of authorization for GRSES's CWIS.

4 122.21(R) INFORMATION WAIVIER REQUEST

The Rule at § 125.95(a)(3) includes a provision that states: *"The Director may waive some or all of the information requirements of 40 CFR 122.21(r) if the intake is located in a manmade lake or reservoir and the fisheries are stocked and managed by a State or Federal natural resources agency or the equivalent. If the manmade lake or reservoir contains Federally-listed threatened and endangered species, or is designated critical habitat, such a waiver shall not be granted."*

The purpose of this chapter is to document that Luminant's GRSES qualifies for the § 122.21(r) information waiver and to formally request that the information be waived. The provision at § 125.95(a)(3) has three key components for facilities to qualify for the wavier and each is discussed separately.

4.1 GRSES Withdraws Condenser Cooling Water from a Manmade Lake or Reservoir

Cooling makeup water for GRSES's CCRS is withdrawn from Lake Graham/Lake Eddleman. A description of the history of dam construction was extracted from the Texas Water Development Board (http://www.twdb.texas.gov/surfacewater/rivers/reservoirs/graham/index.asp). *"Lake Graham is unique in that it is basically two lakes, Lake Eddleman and Lake Graham, connected by a canal. Lake Graham is located about two miles northwest of Graham in Young County. Eddleman Dam was built on Flint Creek in 1928 while Graham Dam was built on Salt Creek in 1958. Both creeks are tributaries of the Brazos River. The two lakes were connected via canal sometime after June of 1959. The project is owned and operated by the City of Graham. According to Handbook of Texas Online, "The lake was probably named for the brothers Edwin S. and Gustavus Graham, who purchased 125,000 acres of land near Graham in 1871." Records indicate the construction for the original Eddleman Dam started in 1928 and was completed in 1929. Deliberate impoundment of water began that same year. Freese and Nichols were the design engineers and Womack-Henning Construction Company was the general contractor. The construction for Graham Dam started on September 17, 1956 and was completed in July of 1958. During this construction phase, work began in 1957 and ended in 1958 to the raise the height of Eddleman Dam. Deliberate impoundment of water began April 28, 1958. Freese and Nichols were the design engineers and Weldon C. Jourdan was the general contractor. The top of the earthfill dam is at elevation of 1,093.3 feet above mean sea level. The uncontrolled spillway is cut in the natural ground with crest at elevation of 1,076.3 feet above mean sea level. Although the maximum capacity is estimated at 195,000 acre-feet, Lake Graham contains a volume of 45,302 acre-feet water encompassing 2,444 surface acres at the conservation pool elevation of 1075.0 feet. The drainage area is approximately 221 square miles."*

The purpose of the dam is to provide water storage and industrial use.

4.2 Lake Graham Has a Stocked and Managed Fishery

Lake Graham's fishery is stocked and managed by the Texas Parks and Wildlife Department (TPWD). A description of the fishery and management plan for the reservoir can be found on the TPWD website (https://tpwd.texas.gov/publications/pwdpubs/lake_survey/pwd_rp_t3200_1250/) and is provided below:

Fish Community

- Prey species: Threadfin Shad continued to be present in the reservoir. Electrofishing catch of Gizzard Shad has increased, and many Gizzard Shad were available as prey to most sport fish. Bluegill were abundant. Redear Sunfish and Longear Sunfish also added to the prey fish community.
- Catfishes: The Blue Catfish population has continued to improve through additional stocking; however, stocked Blue Catfish have yet to reach sexual maturity. The Channel Catfish population was excellent with fish collected in gill netting surveys as long as 28 inches. Flathead Catfish were also present in the reservoir.
- White bass: White Bass were present in the reservoir; however, few anglers targeted them. Because spawning habitat is limited for White Bass, population relative abundance is generally low.
- Largemouth bass: Largemouth Bass catch rate in the most recent electrofishing survey was lower than it was in previous years. This is likely due to low water levels in the reservoir for the past 4 years. Largemouth Bass had fast growth (age at 14 inches long was 2.0 years). Approximately 35% of angling effort was directed at Largemouth Bass from June 2013 through May 2014. Spotted Bass were also present and provided additional opportunities to anglers.
- Crappie: Directed angling effort was higher for crappie during the 2013/2014 creel survey. Trap netting catch rates for White Crappie and Black Crappie were low.

Management Strategies

- Continue stocking Largemouth Bass at 50 fish/acre every two years.
- Conduct additional electrofishing in fall 2015 to monitor the Largemouth Bass and prey fish populations.
- Conduct low-pulse electrofishing during summer 2015 to evaluate natural reproduction of Blue Catfish.
- Conduct additional gill netting in spring 2016 to monitor the Blue Catfish population.
- Inform the public about the negative impacts of aquatic invasive species.
- Conduct general monitoring surveys with trap nets, gill nets, and electrofishing in 2017-2018.

The stocking history can be found on the website and is shown in Table 4-1. As shown in Table 4-1, stocking took place most recently in 2014 with the stocking of just under a half million Largemouth Bass. According to the website, the fishery management strategy calls for stocking of Largemouth Bass at the rate of 50 fish per acre every two years in addition to monitoring the fishery Largemouth Bass population via fall electrofishing and use of electrofishing gill netting to monitor Blue Catfish populations.

Table 4-1. Stocking History for Lake Graham.

Species	Year	Number Stocked	Size
Bass, Florida Largemouth	2016	65,007	Fingerling
Bass, Florida Largemouth	2015	43,906	Fingerling
Bass, Florida Largemouth	1997	151,247	Fingerling
Bass, Florida Largemouth	1994	150,217	Fingerling
Bass, Florida Largemouth	1992	151,869	Fry
Bass, Largemouth	1971	4,000	
Bass, Largemouth	1970	50,000	
Bass, Largemouth	1969	10,000	
Bass, Largemouth	1967	60,000	
Bass, Largemouth	1966	303,000	
Bass, Palmetto	2017	15,135	Fingerling
Bass, Palmetto	2016	33,943	Fingerling
Bass, Palmetto	2015	9,151	Fingerling
Bass, Palmetto	2013	24,228	Fingerling
Bass, Palmetto	2011	18,343	Fingerling
Bass, Palmetto	2008	17,272	Fingerling
Bass, Palmetto	2007	24,001	Fingerling
Bass, Palmetto	2006	12,000	Fingerling
Bass, Palmetto	2005	12,867	Fingerling

Bass, Palmetto	2004	16,816	Fingerling
Bass, Palmetto	2002	15,050	Fingerling
Bass, Palmetto	1999	22,655	Fingerling
Bass, Palmetto	1998	30,536	Fingerling
Bass, Palmetto	1997	30,974	Fingerling
Bass, Palmetto	1996	45,334	Fingerling
Bass, Palmetto	1995	52,277	Fingerling
Bass, Palmetto	1994	46,350	Fingerling
Bass, Palmetto	1992	25,415	Fingerling
Bass, Palmetto	1991	56,235	Fingerling
Bass, Palmetto	1989	69,426	Fingerling
Bass, Palmetto	1988	60,868	Fingerling
Bass, Palmetto	1987	59,900	Fingerling
Bass, Palmetto	1986	59,900	Fingerling
Bass, Palmetto	1985	60,600	Fingerling
Bass, Palmetto	1983	148,500	
Bass, Palmetto	1981	100,000	
Bass, Palmetto	1979	100,000	
Bass, Sunshine	2017	13,328	Fingerling
Catfish, Channel	1970	50,000	

4.3 Lake Graham/Lake Eddleman Do Not Have Federally Protected Threatened and Endangered Species or Designated Critical Habitat

As discussed in Chapter 3, there is no risk to federally threatened or endangered species nor their designated critical habitat due to GRSES CWIS operations. While there are five federally listed bird species in the area none are affected by GRSES's CWIS. There are also two minnow species in the area, however, the Lake Graham/Lake Eddleman Reservoir does not provide suitable habitat for either species as they require wide, shallow, and flowing waters less than 1.6 feet deep with sandy substrates in the arid prairie region. Such habitat is not present in these reservoirs.

4.4 REQUEST FOR WAIVER OF THE §122.21(r) INFORMATION

As shown in Table 2-1 in Chapter 2, GRSES's AIF over the past five years is 103.9 MGD and therefore well below the 125 MGD that requires submittal of the entrainment information required at § 122.21(r)(9) through (12). Additionally, as discussed above in this chapter, GRSES should qualify for the waiver of the § 122.21(r) information at § 125.95(a)(3) of the Rule and based on the information provided in Subsections 4.1, 4.2 and 4.3 in this chapter formally requests a waiver of that information.

5 INFORMATION TO INFORM THE SITE-SPECIFIC ENTRAINMENT BTA DETERMINATION

5-1 Director Requirements at §125.98(f)

While Luminant is not required to submit the entrainment information at § 122.21(r)(7) and (9) through (12), since the facility's AIF is <125 MGD and GRSES qualifies for a waiver of the other § 122.21(r) information, TCEQ is still required to make an entrainment BTA determination for the facility as discussed at § 125.98(f) of the Rule which states:

"(f) Site-specific entrainment requirements. The Director must establish site-specific requirements for entrainment after reviewing the information submitted under 40 CFR 122.21(r) and § 125.95. These entrainment requirements must reflect the Director's determination of the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility. These entrainment requirements may also reflect any control measures to reduce entrainment of Federally-listed threatened and endangered species and designated critical habitat (e.g. prey base). The Director may reject an otherwise available technology as a basis for entrainment requirements if the Director determines there are unacceptable adverse impacts including impingement, entrainment, or other adverse effects to Federally-listed threatened or endangered species or designated critical habitat. Prior to any permit reissuance after July 14, 2018, the Director must review the performance of the facility's installed entrainment technology to determine whether it continues to meet the requirements of § 125.94(d).

> *(1) The Director must provide a written explanation of the proposed entrainment determination in the fact sheet or statement of basis for the proposed permit under 40 CFR 124.7 or 124.8. The written explanation must describe why the Director has rejected any entrainment control technologies or measures that perform better than the selected technologies or measures, and must reflect consideration of all reasonable attempts to mitigate any adverse impacts of otherwise available better performing entrainment technologies.*
>
> *(2) The proposed determination in the fact sheet or statement of basis must be based on consideration of any additional information required by the Director at § 125.98(i) and the following factors listed below. The weight given to each factor is within the Director's discretion based upon the circumstances of each facility.*
>
> > *(i) Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species, and designated critical habitat (e.g., prey base);*
> >
> > *(ii) Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;*
> >
> > *(iii) Land availability inasmuch as it relates to the feasibility of entrainment technology;*
> >
> > *(iv) Remaining useful plant life; and*

(v) Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

(3) The proposed determination in the fact sheet or statement of basis may be based on consideration of the following factors to the extent the applicant submitted information under 40 CFR 122.21(r) on these factors:

(i) Entrainment impacts on the waterbody;

(ii) Thermal discharge impacts;

(iii) Credit for reductions in flow associated with the retirement of units occurring within the ten years preceding October 14, 2014;

(iv) Impacts on the reliability of energy delivery within the immediate area;

(v) Impacts on water consumption; and

(vi) Availability of process water, gray water, waste water, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water.

(4) If all technologies considered have social costs not justified by the social benefits, or have unacceptable adverse impacts that cannot be mitigated, the Director may determine that no additional control requirements are necessary beyond what the facility is already doing. The Director may reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits."

While detailed studies are not required for GRSES to fully quantify the social costs and benefits of alternative entrainment reduction technologies, Luminant is providing information in this Chapter to aid TCEQ in making the GRSES entrainment BTA determination.

5.2 Factors That Must Be Considered

Each of the five factors that **must be considered** in making the entrainment BTA determination are discussed below.

5.2.1 Numbers and Types of Organisms Entrained

The Rule states for this factor "*(i) Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species, and designated critical habitat (e.g., prey base);*"

The numbers and types of organisms expected to be entrained is discussed in Section 3 with entrainment expected to be dominated by gizzard and threadfin shad. According to the most recently available TPWS 2013 Lake Graham fisheries monitoring report, gizzard shad remain in high abundance, close to their historical average.

5.2.2 Impact of Particulate Emissions or Other Pollutants

The Rule states for this factor "*(ii) Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;*"

A CCRS with a mechanical draft cooling tower is the only technology that would generate particulate emissions. However, due to the low capacity utilization over the past five years (i.e., just over 2%) and the estimated cost of a CCRS retrofit (i.e., $63.5 million to over $200 million) GRSES would most likely be retired if a retrofit was required.

5.2.3 Land Availability

The Rule states for this factor "*(iii) Land availability inasmuch as it relates to the feasibility of entrainment technology;* - As shown in Figure 5-1 there is adequate space for a mechanical draft CCRS at GRSES.

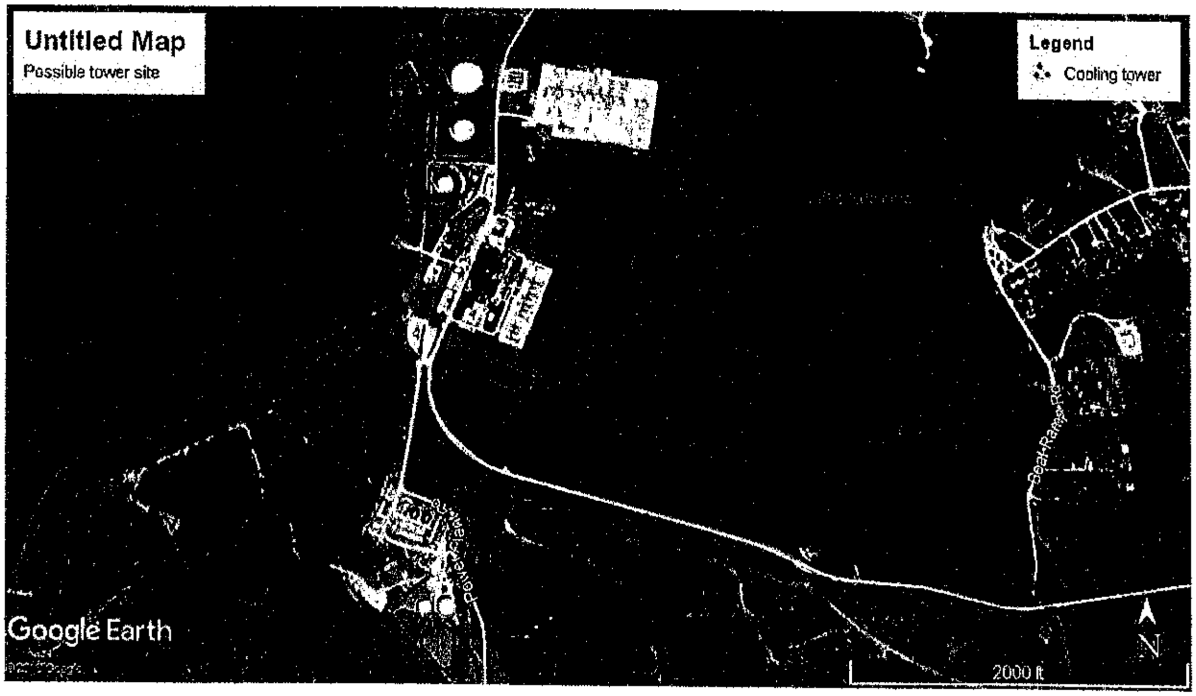

Figure 5-1 Possible location (shown in red rectangle just south of the generating station) of a closed-cycle cooling mechanical draft cooling tower at GRSES

5.2.4 Remaining Useful Plant Life

The Rule states for this factor "*(iv) Remaining useful plant life;* - No retirement data has been announced for GRSES.

5.2.5 Quantified Benefits and Costs

The Rule states for this factor "*(v) Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.* In terms of the costs of entrainment reduction technologies, an evaluation of these technologies required by the Rule at § 122.21(r)(10)(i) is provided below in subsection 5.2.5.1.

5.2.5.1 Entrainment Reduction Technology Costs

For facilities required to submit the Comprehensive Technical Feasibility and Cost Evaluation Study (i.e., § 122.21(r)(10) information), the Rule requires that three technologies be evaluated that include:

1. Flow reduction using a closed-cycle recirculating system (i.e., CCRS)
2. Fine-mesh screens that include both fine-mesh traveling water screens and narrow-slot wedgewire screens
3. Alternative water sources

Each of these alternatives is discussed below.

5.2.5.1.1 Use of a CCRS

GRSES already employs a CCRS as documented in Appendix C. The Rule states "*EPA assumes that entrainment and impingement (and associated mortality) at a site are proportional to source water intake volume. Thus, if a facility reduces its intake flow, it similarly reduces the amount of organisms subject to impingement and entrainment.*" (page 48331, column 2, 1. Flow Reduction). The EPA further states:

"*The technology* (referring to a CCRS) *is also highly effective, generally achieving greater than 95 percent reductions in IM and E (mechanical draft (wet) cooling towers achieve flow reductions of 97.5 percent for freshwater and 94.9 percent for saltwater sources, or by operating the towers at a minimum of 3.0 and 1.5 cycles-of concentration, respectively). These reductions in flow and the concurrent reductions in impingement and entrainment impacts are among the highest reductions in adverse environmental impact possible at an intake structure.*"

Thus, Luminant's use of Lake Graham/Lake Eddleman as a CCRS, means GRSES is currently reducing entrainment by 95% or more. TCEQ, however, could require use of a cooling tower as defined at § 129.92(c)(1). EPRI conducted a study to inform the § 316(b) Rulemaking on the cost and implications of designating a CCRS as BTA for entrainment. In that study, EPRI used a method referred to as the "degree of difficulty" approach to estimate the cost of retrofitting 125 once-through cooled facilities with mechanical draft cooling towers. A detailed description of the methodology and results are provided in EPRI Technical Report No. 1022491 (EPRI 2011). The EPA reviewed EPRI's method and decided to use this method in their Technical Development Document (TDD) for the Rule to estimate the cost of CCRS retrofits (USEPA 2014b). That method rates CCRS retrofits from easy to more difficult based on consideration of eleven site-specific factors and the costs for each of the four degree of difficulty rating is provided in Figure 5-1. While a site-specific evaluation was not conducted for GRSES, based on GRSES's cooling water flow (351,000 gpm) a CCRS mechanical draft retrofit cost depending on the degree of difficulty would be:

1. Easy -$77.6 million
2. Average - $117.9 million
3. Difficult - $173.4 million

4. Very Difficult - $231.3 million

Note that the estimates are made after scaling up the difficulty cost factors shown in Figure 5-1 from 2010 to January 1st 2018 dollars using the Engineering News Record's Construction Cost Index.

In terms of social costs, given that GRSES's capacity utilization rate over the past five years is <3% it would not be economical to perform a retrofit even if at the easy retrofit cost. If required, it would, therefore, most likely be retired and the social costs would include:

- Loss of jobs at the facility
- Loss of taxes to area that support schools and public projects
- Loss of income for businesses that provide goods and services to the facility

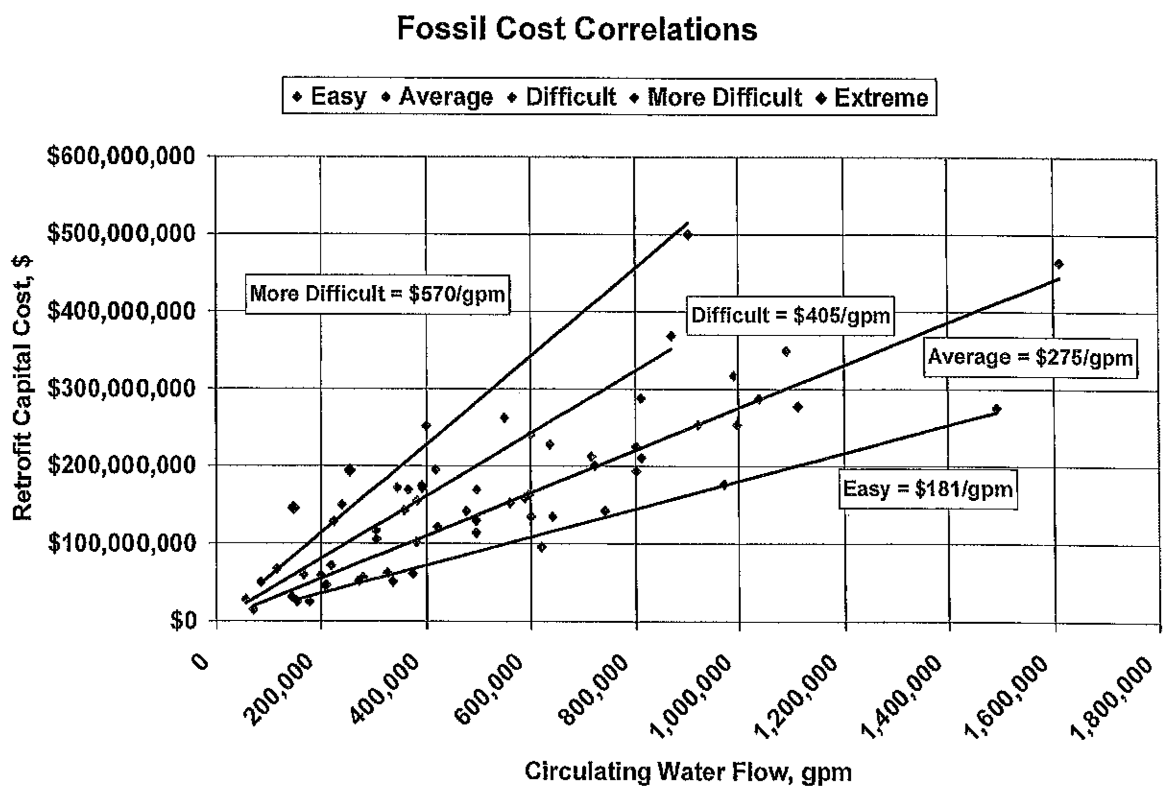

Figure 5-2. Degree of difficulty CCRS retrofit costs based on EPRI cost of CCRS retrofit study (EPRI 2010).

5.2.5.1.2 Use of Fine-mesh Screens

This subsection provides a summary of the information required at § 122.21(r)(10)(i) for installation of fine-mesh screens at GRSES to reduce entrainment. A detailed report providing the full set of information is provided as Appendix D. This summary section begins with an overall discussion of the different types of screens. The discussion is followed by a description of the methodology used to estimate the specific screen types evaluated for GRSES and concludes by discussing the technical feasibility and compliance cost for both fine-mesh modified traveling screens and narrow-slot wedgewire screens.

5.2.5.1.2.1 Fine-mesh Modified Traveling Screens

Modified traveling water screens are a fish collection and transfer technology and is defined at § 125.92(s) of the Rule. The technology involves modifying traveling water screens in a manner designed to collect fish off the screens to maximize survival, then return them to a location in the source waterbody outside the hydraulic zone of influence of the CWIS and the thermal discharge to reduce the chance of re-impingement or exposure to elevated water temperatures. Key features of this technology that are specified in the Rule's definition include:

- fish collection buckets at the bottom of the screens designed to minimize turbulence;
- a guard rail or barrier designed to prevent fish from jumping out of the buckets;
- use of a smooth fabric or material for the screens to minimize abrasion and/or descaling;
- continuous or near continuous screen rotation;
- use of a low pressure wash or gentle vacuum to remove fish from the screens; and
- use of a fish return with adequate flow to transport fish to the source waterbody, predation prevention and avoiding a high drop from the return to the source waterbody.

The technology is generally feasible for facilities usually can be installed in existing screen wells, as a replacement for an existing conventional traveling water screens. There have been a number of new screens developed for use in the U.S. over the last decade, and screen types, in addition to modified ("Ristroph") screens, include screens manufactured by Aqseptance Group (rotary), Hydrolox (molded polymer) and Beaudrey (vacuum). Most of the new screens have advantages in terms of preventing by-pass of debris and organisms and improving overall debris management.

While fine-mesh traveling screens tend to be the lowest cost entrainment reduction technology, biological performance (i.e., entrainment survival) for early life stages (e.g., larvae <12 mm) is generally poor (<0 to 15%) as the larvae have not yet developed scales and musculature needed to survive the collection and handling process associated with this technology (EPRI 2010). After development of scales and musculature, biological performance improves (depending on species and life stage), however, for fragile species, such as clupeids (including gizzard and threadfin shad), that are likely to dominate entrainment at GRSES, survival continues to be poor and is often <30% (EPRI 2006).

For GRSES's CWIS the estimated capital and O&M cost for modified fine-mesh traveling screens are provided in Table 5-1 below and the estimated net present value and annualized costs discounted at 7% and 3% are provided in Table 5-2 below. A detailed discussion of these screens is provided in Section 3 of Appendix D.

Table 5-1. Estimated cost of modified fine-mesh traveling water screens for GRSES.

Capital Cost (millions)	Pre-construction Study Cost	Annual O&M Cost
$12.15	**$270,000**	**$267,000**

Table 5-2 Estimated net present value and equivalent annual costs at both 7% and 3% discount rates for fine-mesh modified traveling screens at GRSES.

Technology	IPS Fine-mesh Modified Traveling Screens with a New Fish Return (millions)
Net Present Value (2016 $) (7% Discount rate)	$13.50 M
Net Present Value (2016 $) (3% Discount rate)	$16.81 M
Equivalent Annual Cost (2016 $) (7% Discount rate)	$1.09 M
Equivalent Annual Cost (2016 $) (3% Discount rate)	$1.35

5.2.5.1.2.2 Narrow-slot Wedgewire Screens

Narrow-slot (i.e., <2mm) cylindrical wedgewire screens are a passive exclusion technology and generally designed to have a low maximum through-screen velocity (i.e., <0.5 ft/sec). The low through-screen velocity combined with ambient current in the source waterbody tend to carry fish eggs and larvae past the screen modules and, thereby, exclude them from entering the cooling water system. Other than use of a CCRS, these devices tend to be the best performing fish protection technology for both entrainment and impingement. Depending on the species and their life stages present in the source waterbody, performance can potentially exceed that of a CCRS. Cylindrical wedgewire screens are constructed by wrapping a wedge shaped wire around a support frame resulting in a smooth surface with no mesh. Instead, there is a continuous slot from one end of the cylinder to the other. A discussion of cylindrical wedgewire screens is provided in the Rule Preamble (see page 48334, column 2) and EPRI Technical Report 3002000231 (EPRI 2013). In order for the screens not to exceed a through-screen velocity of 0.5 ft/sec, for a smaller slot size, either more or larger screen modules are required to increase the screen surface area to not exceed the 0.5 ft/sec criterion.

There have been improvements in the design of cylindrical wedgewire screens, most notably in methods to control debris accumulation and biofouling. Depending on the nature of debris and biofouling in the source waterbody, material can be removed via a burst of compressed air to blow material off the screens or use of a mechanical brush cleaning system, but in some cases manual cleaning by divers may be required. The number and size of narrow-slot wedgewire screen modules is a function of the facility cooling water flow volume, depth of the source waterbody, navigation issues and required slot size. Issues that can affect use of the technology include debris loading, biofouling, frazil ice in the winter, source waterbody depth and potential source waterbody navigation issues and loss of surface water area to public access.

The GRSES evaluation determined that it would be feasible to deploy this technology in the Lake Graham Reservoir in the front of the GRSES CWIS. However, permits and approvals would be required, as well as some additional cost for permitting and approvals, since Luminant does not own the reservoir and there would be loss of area in the reservoir for public use. Two screen slot sizes were evaluated and included 0.5 mm and 2 mm. The 0.5 mm is considered the smallest slot size technically feasible and would the best biological performance. However, it would also have the highest cost since more screen modules are required to not exceed the 0.5 fps through screen velocity criterion. The basis for 2.0 mm is that the EPA in the Rule stated that this is the largest mesh (slot) size they considered to be effective for entrainment reduction. Potential deployment at GRSES for 0.5 mm and 2.0 mm slot widths are shown in Appendix D in Figures 4-2 and 4-3, respectively. As shown in Figures 4-2 and 4-3, for both slot sizes a sheet pile bulk head isolation wall would be constructed across the existing intake and four seven ft diameter header pipes would be extended out from the sheet pile wall and the screen modules would be mounted on the header pipes. For deployment of 0.5 mm slot screens it would require 40 – 72-inch diameter cylindrical wedgewire screen modules to supply condenser cooling water and for the 2.0 mm slot size 16 – 72 in. diameter cylindrical wedgewire screen modules would be needed (see Appendix D Table 4-1). Based on the proposed design the analysis estimated the capital and O&M costs to accommodate mesh sizes of 0.5 mm and 2.0 mm slot sizes for GRSES. The results of the analysis are provided in Table 10-3 below. Capital costs to accommodate the total GRSES flow range from $30.41 million for 0.5 mm screens to $18.94 million for 2 mm screens. Additional costs would be incurred to conduct studies to verify biofouling and debris control management, since there is very little sweeping flow in Lake Graham and the impact of the screens on cooling water pump performance. Table 10-4 below provides the estimated net present value and annualized cost estimates at a 7% and 3% discount rate for both slot sizes as required by the Rule.

A detailed discussion of the evaluation methods and assumptions for the evaluation can be found in Appendix D.

Table 5-3 Estimated cost for narrow-slot wedgewire screens at GRSES

Slot-size	Capital Cost (millions)	Pre-construction Study Cost	Annual O&M Cost
0.5 mm	$30.41	$648,000	$569,000
2.0 mm	$18.94	$516,000	$221,000

Table 5-4 Estimated net present value and annualized costs for 0.5 mm and 2.0 mm narrow-slot wedgewire screens for GRSES at discount rates of 7% and 3%

Technology	Narrow-slot Wedgewire Screens with 0.5 mm Slots (millions)	Narrow-slot Wedgewire Screens with 2.0 mm Slots (millions)
Net Present Value (2017 $) (7% Discount rate)	$33.23	$19.34
Net Present Value (2017 $) (3% Discount rate)	$39.12	$22.17
Equivalent Annual Cost (2017 $) (7% Discount rate)	$1.09	$1.56
Equivalent Annual Cost (2017 $) (3% Discount rate)	$1.35	$1.79

In summary, at capital costs in excess of $12 million dollars for modified fine-mesh screens and almost $19 million for narrow-slot wedgewire screens, installation of these technologies would not make economic sense given GRSES's low capacity utilization and would place the facility at a severe economic disadvantage and threaten its future viability.

5.2.5.1.3 Use of Alternative Cooling Water Sources and Water Reuse

The Rule at § 122.21(r)(10)(i) requires evaluation of *"water reuse or alternate sources of cooling water"* and in subsection (C) of that provision *"A discussion of available sources of process water, grey water, waste water, reclaimed water, or other waters of appropriate quantity and quality for use as some or all of the cooling water needs of the facility"*. However, the EPA in the Rule's Technical Development Document (USEPA 2014) Section 6.1.4 titled Water Reuse states *"For power plants, water reuse (outside of closed-cycle cooling) is typically not an available option, as there is very little water that is used for purposes other than non-contact cooling; the "credit" would be extremely small. EPA has seen examples where cooling water is reused in air pollution control processes."* GRSES is no exception to this finding, and water reuse, other than through use of a CCRS as discussed in Section 10.2 of this document is not considered technically feasible. The Technical Development Document provides a similar conclusion for use of alternative cooling water sources in Section 6.1.5 titled Alternative Cooling Sources and this section states:

"Unfortunately, many facilities have cooling needs that substantially outpace the volume of water available to them from alternate sources, especially for once-through cooling systems. In the California's Coastal Power Plants: Alternate Cooling System Analysis, OPC analyzed alternate sources as cooling tower makeup water but concluded that even for power plants located in densely populated areas of southern California (where infrastructure to facilitate alternate sources such as grey water may already exist), alternate sources of cooling water were not a viable option for most, if not all, facilities (see DCN 6631). Similarly, EPA did not consider any regulatory analyses or alternatives that relied on alternative cooling water sources." While there are a few power plants with a CCRS, such as Palo Verde in Arizona that make use of water from wastewater treatment plants as makeup for the CCRS, such facilities were designed from the beginning for use of that water.

The closest municipal wastewater plant identified is the City of Graham. However, the Graham City website for this facility (http://www.cityofgraham.com/departments/utilities/) states *"The present permitted capacity of the WWTP is 3.5 million gallons per day. The Graham WWTP treats an average of 1.34 million gallons of wastewater each day."* The next closest wastewater treatment plant is in Breckenridge, TX and their website (http://www.ubsd.org/) states *"Today, the UBSD operates two advanced treatment facilities with a total capacity of 4.5 million gallons per day, as well as a decentralized facility in the Town of Blue River. In 2008 the UBSD treated and discharged 605 million gallons of water."* Thus neither of these two facilities comes close to providing the 351,000 GPM of cooling water needed by Graham.

5.2.5.2 Benefits of Evaluated Technologies

There are not likely to be any significant benefits for the evaluated entrainment reduction technologies based on the facts that include:

1. GRSES currently uses a CCRS,
2. under current operations GRSES is significantly reducing flow, and
3. expected biological benefits that are significantly lower than the cost for any technology.

Each of the factors is discussed separately

5.2.5.2.1 GRSES's Use of a CCRS

Luminant provided information to TCEQ that GRSES operates a CCRS as defined in the Rule at § 125.92(c)(2) and based on that information TCEQ acknowledged it agreed in a letter dated September 2, 2015. Relative to use of a CCRS, the Rule preamble makes the following statements:

1. *"Closed-cycle cooling is indisputably the most effective technology at reducing entrainment." (pg. 48342, column 1, 14 lines from bottom of the page)*
2. *"EPA concluded that site-specific proceedings are the appropriate forum for weighing all relevant considerations in establishing BTA entrainment requirements. Closed-cycle cooling is indisputably the most effective technology at reducing entrainment. Closed-*

cycle reduces flows by 95 percent and entrainment is similarly highly reduced." (pg. 48344, column 1, last paragraph)

3. *"EPA agrees that facilities employing a closed-cycle recirculating system for entrainment should also be deemed in compliance with the impingement mortality standard, as long as the system is properly operated. While a closed-cycle recirculating system is the most effective technology for reducing entrainment, EPA has not established BTA based on closed-cycle cooling because EPA concluded it was not BTA, for the reasons specified in Section VI." Regarding the definition of closed-cycle cooling...*(pg. 48355, Column 3, Response at bottom of page)
4. *"The cost estimates reflect the incremental costs attributed only to this final rule. For example, facilities already having closed-cycle recirculating systems as defined at § 125.92 will meet the impingement mortality and entrainment standards of today's rule and, therefore, will not incur costs to retrofit new technologies."* (48384, column 1, first full paragraph)

The EPA in the Rule Preamble states that properly operated CCRSs in freshwater can achieve a flow reduction of 97.5% (pg. 38338, column 3, last paragraph). Since, as discussed in 5.2.5.1.1 of this document, GRSES employs a CCRS that meets the Rule's definition at § 125.92(c)(2) of the Rule and that in EPA's opinion is *"indisputably the most effective technology at reducing entrainment"*, GRSES should be determined to employ BTA for entrainment on this basis alone.

5.2.5.2.2 Flow Reduction under Current Operations

As noted in Section 2 of the Rule GRSES's AIF over the past three years is 103.9 MGD and capacity utilization over the past five years is 2.1%. EPA in the Rule states that *"Flow reduction is commonly used to reduce impingement and entrainment. For purposes of this rulemaking, EPA assumes that entrainment and impingement (and associated mortality) at a site are proportional to source water intake volume. Thus, if a facility reduces its intake flow, it similarly reduces the amount of organisms subject to impingement and entrainment.*[48]" The result is that under current operations has reduced flow by 79.4%. The flow reduction of 79.4% means there is a significant reduction in entrainment from Lake Graham/Lake Eddleman. As required by the Rule, capacity utilization and flow must be updated at each permit renewal and may change in the future..

5.2.5.2.3 Expected Biological Benefits Relative to Cost

Based on the current health of the Lake Graham fishery based on the most recently available TWPS 2013 fishery survey and current GRSES operations, the cost of the evaluated technologies is expected to be wholly disproportionate relative their biological benefits. With regard to the Clean Water Act (CWA), the idea of weighing costs relative to benefits appears in Section 304(b)(1)(B) of the Act, referring to effluent limitation guidelines. The actual phraseology of "wholly disproportionate" as rendered in the judicial history states that *"[t]he balancing test between total cost and effluent reduction benefits is intended to limit the application of technology only where the additional degree of effluent reduction is wholly out of proportion to the costs of achieving such marginal level of reduction for any class or category of sources"* (*Kennecott v. United States EPA*). The "wholly disproportionate cost test" was first applied to Section § 316(b) during *In the Matter of Public Service Company of New Hampshire* 10 ERC

1257 (May and Van Rossum 1995) and in the decision for that case, the sole basis for applying the "wholly disproportionate" cost test came from the aforementioned legislative history of the CWA. The ruling stated that Section § 316(b) did not require implementation of technology whose cost was "wholly disproportionate" to its environmental benefits.

5.3 Factors That May Be Considered

Each of the five factors that **may be considered** in making the entrainment BTA determination are discussed below.

5.3.1 Entrainment Waterbody Impacts

The Rule states for this factor "*(i) Entrainment impacts on the waterbody;*" – No site-specific entrainment study was conducted in Lake Graham/Lake Eddleman, since GRSES's AIF is <125 MGD as well as the fact that the facility qualifies for the § 122.21(r) information waiver as discussed in Chapter 4 of this document. GRSES Unit 1 began operation in 1960 and Unit 2 in 1969. After over 55 years of operation, Lake Graham is rated by TPWS as good for recreational fishing for catfish, crappie, white bass and striped bass hybrids and fair for largemouth bass and sunfish. Relative to the thermal discharge, the TPWS further states *"The hot-water discharge is an excellent area to fish during the winter, especially for hybrid striped bass and white bass. Hybrid stripers are also consistently caught in the equalization channel between Graham and Eddleman and around the dam on the Graham side."* (https://tpwd.texas.gov/fishboat/fish/recreational/lakes/graham/). This information suggest that there have not been significant impacts as a result of entrainment.

5.3.2 Thermal Discharge Impacts

The Rule states for this factor "*(ii) Thermal discharge impacts;* - As discussed in subsection 5.2.1, TCEQ has acknowledged in the September 2, 2015 letter to Luminant that one of the reasons for the construction of Lake Graham was to provide cooling water to GRSES and meets the definition of a CCRS under the Rule's definition at § 125.92(c)(2). In spite of the fact, as noted in the prior section 5.3.2, TPWS's website states relative to the thermal discharge *"The hot-water discharge is an excellent area to fish during the winter, especially for hybrid striped bass and white bass. Hybrid stripers are also consistently caught in the equalization channel between Graham and Eddleman and around the dam on the Graham side."* (https://tpwd.texas.gov/fishboat/fish/recreational/lakes/graham/). Additionally, the TPWS 2013 monitoring report stated *"Threadfin Shad abundance (274.0/h) could decline if the power plant continues to function on a standby basis, especially during cold winters."*

5.3.3 Credit for Retired Unit Flow Reductions

The Rule states for this factor "*(iii) Credit for reductions in flow associated with the retirement of units occurring within the ten years preceding October 14, 2014;* - No units were retired at GRSES prior to October 14, 2014.

5.3.4 Impacts on Energy Delivery

The Rule states for this factor "*(iv) Impacts on the reliability of energy delivery within the immediate area;* - If Luminant were required to install a mechanical or natural draft cooling tower at GRSES it would most likely be retired. As a result another less economical unit would need to provide the electric power currently provided by GRSES resulting in a higher cost of electricity to the consumer.

5.3.5 Impacts on Water Consumption

The Rule states for this factor "*(v) Impacts on water consumption;*" - Water availability is limited in most of Texas, including the Brazos River watershed. Water for the site and reservoir is authorized by a contract with the City of Graham, which has a Certificate of Adjudication (e.g., water right) which limits the volume of water that can be stored, used, and consumed for cooling. Any additional consumptive use of water would require additional water rights or contracted water. There are not, however, any non-interruptible water rights available in the Brazos watershed, and contracted water from the Brazos River Authority is severely limited in both quantity of water and duration of the contract.

The estimated 50-100% increase in consumed water associated with conversion to a cooling tower will be compounded by the need for additional water treatment for the blowdown wastestream. This is because of the high total dissolved solids found in the Brazos River and the concentrating effect of the cooling tower, and the fact that any discharge would be back into the reservoir.

5.3.6 Availability of Other Cooling Water Sources

Due to the significant amount of water needed for condenser cooling at GRSES (i.e., 351,000 GPM). As discussed in Subsection 5.2.5.1.3 there are no water sources within reasonable proximity to GRSES to make this alternative feasible.

6 CHOSEN METHOD OF COMPLIANCE FOR IMPINGEMENT BTA

The Rule at § 122.21(r)(6) requires Luminant to discuss the chosen method of compliance with the impingement mortality standard for GRSES. Facilities must either select one of the seven alternatives at § 125.95(c)(1) through (7) unless the facilities qualifies for an exemption or a less stringent standard. The owner/operator must identify the chosen compliance method for the entire facility; alternatively, the applicant must identify the chosen compliance method for each cooling water intake structure at its facility. For impingement mortality BTA for the GRSES CWIS, Luminant chooses use of a CCRS discussed at § 125.94(c)(1) of the Rule. For this alternative the Rule states: *"A facility must operate a closed-cycle recirculating system as defined at §125.92(c). In addition, you must monitor the actual intake flows at a minimum frequency of daily. The monitoring must be representative of normal operating conditions, and must include measuring cooling water withdrawals, make-up water, and blow down volume. In lieu of daily intake flow monitoring, you may monitor your cycles of concentration at a minimum frequency of daily".*

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A LAKE GRAHAM VOLUMETRIC SURVEY

VOLUMETRIC SURVEY OF LAKE GRAHAM

Prepared for:

City of Graham

Prepared by:

The Texas Water Development Board

March 10, 2003

Texas Water Development Board

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Published and Distributed
by the
Texas Water Development Board
P.O. Box 13231
Austin, Texas 78711-3231

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INTRODUCTION

Staff of the Hydrographic Survey Unit of the Texas Water Development Board (TWDB) conducted a hydrographic survey of Lake Graham during the period of April 14 – 15, 1998. The purpose of the survey was to determine the capacity of the lake at the conservation pool elevation. From this information, future surveys will be able to determine the location and rates of sediment deposition in the conservation pool over time. Survey results are presented in the following pages in both graphical and tabular form. All elevations presented in this report will be reported in feet above mean sea level based on the National Geodetic Vertical Datum of 1929 (NGVD '29) unless the elevation is noted otherwise. The conservation pool elevation for Lake Graham is 1075.0 feet. The 1945 design information/field survey estimates the original surface area at this elevation to be 2,550 acres and the storage volume to be 53,680 acre-feet of water.

HISTORY AND GENERAL INFORMATION OF THE RESERVOIR

Lake Graham is unique in that it is basically two lakes connected by a canal. Eddleman Dam was built on Flint Creek in 1928 and created Lake Eddleman. In 1958, Graham Dam was built on Salt Creek and formed Lake Graham. The two lakes were connected via canal sometime after June of 1959 and are considered to be one lake, known as Lake Graham.

The lake is located two miles northwest of Graham, TX. on Flint and Salt Creeks, tributaries to the Brazos River (see Figure 1) in Young County. Records indicate the drainage area is approximately 221 square miles. At the conservation pool elevation, the lake has approximately 38 miles of shoreline and is 5.3 miles long. The widest point of the reservoir is approximately 1.5 miles (located about 0.16 miles upstream of the dam).

The project is owned and operated by the City of Graham. The water rights date back to two permits. Permit No. 1061 (Application No. 1136) issued by the State Board of Water Engineers on May 1, 1928 authorized the City to construct a dam on Flint Creek to impound 6,500 acre-feet of water and use annually 5,000 acre-feet of water for municipal purposes. Permit No. 1747 (Application 1871) dated May 10, 1955 authorized the City to construct a dam on Salt Creek and to impound 39,000 acre-feet of water. The City of Graham was allowed an annual diversion of 15,000 acre-feet of water (7,000 acre-feet for municipal use and 8,000 acre-feet for industrial use). Due to the water requirements increasing beyond the water supply available from both lakes, plans were made to raise the dam on Lake Eddleman to the same height as Lake Graham. Permit No. 1747A (Application No. 2064) dated February 27, 1958 authorized the City of Graham to raise the height of Eddleman Dam, thus increasing the storage capacity of the original Lake Eddleman and to combine the two lakes into one lake known today as Lake Graham. The Texas Water Commission issued Certificate of Adjudication No. 12-3458 on February 20, 1985 to the City of Graham. The owner was authorized to maintain an existing dam on Flint Creek (Lake Eddleman) and impound therein not to exceed 13,386 acre-feet of water. The owner was also authorized to maintain an existing dam on Salt Creek (Lake Graham) and impound therein not to exceed 39,000 acre-feet of water. The City of Graham was authorized to annually divert and use not to exceed 11,000 acre-feet of water for municipal purposes, 8,400 acre-feet of water for industrial purposes and 500 acre-feet of water for mining purposes.

Records indicate the construction for the original Eddleman Dam started in 1928 and was completed in 1929. Deliberate impoundment of water began that same year. Freese and Nichols were the design engineers and Womack-Henning Construction Company was the general contractor. The cost of the original dam was estimated at $237,100.

The construction for Graham Dam started on September 17, 1956 and was completed in July of 1958. During this construction phase, work began in 1957 and ended in 1958 to the raise the height of Eddleman Dam. Deliberate impoundment of water began April 28, 1958. Freese and Nichols were the design engineers and Weldon C. Jourdan was the general contractor for both projects. The estimated cost for both projects was $486,490. The canal that connects the two lakes was dredged sometime in the later half of 1959.

The original Eddleman Dam consist of an earthfill embankment 1,400 feet in length with a maximum height of 35 feet and a crest width of 20 feet at a crest elevation of 1,075.0 feet. The 1958 dam enlargement lengthened the embankment to 4,495 feet and raised it to a maximum height of 57 feet with a crest elevation of 1,093.3 feet.

Graham Dam is a rolled-earth structure 3,700 feet in length, with a maximum height of 82 feet and a crest elevation of 1,093.3 feet. The emergency spillway (located to the west of Graham Dam is uncontrolled and cut in natural ground. The crest width is 1,050 feet at elevation 1,075.0 feet. The outlet works structure consists of a concrete tower rising up through the dam about 30 feet from the crest and about 700 feet from the left end. There are two control valves, each 20-inches in diameter that release water downstream through a 24-inch diameter conduit from a submerged 18-inch pipe extending out into the lake. The inlet elevation for the submerged pipe is 1,051.3 feet. A low-flow flapper valve at elevation 1,031.3 feet is available for small releases when the inlet pipe is above water.

Texas Utilities operates an electricity generating plant that pumps water for circulation and cooling purposes from the Graham Dam side of the lake and returns the water to the Eddleman Dam side.

HYDROGRAPHIC SURVEYING TECHNOLOGY

The following sections will describe the theory behind Global Positioning System (GPS) technology and its accuracy. Equipment and methodology used to conduct the subject survey and previous hydrographic surveys are also addressed.

GPS Information

The following is a brief and simple description of Global Positioning System (GPS) technology. GPS is a relatively new technology that uses a network of satellites, maintained in precise orbits around the earth, to determine locations on the surface of the earth. GPS receivers continuously monitor the broadcasts from the satellites to determine the position of the receiver. With only one satellite being monitored, the point in question could be located anywhere on a sphere surrounding the satellite with a radius of the distance measured. The observation of two satellites decreases the possible location to a finite number of points on a circle where the two spheres intersect. With a third satellite observation, the unknown location is reduced to two points where all three spheres intersect. One of these points is obviously in error because its location is in space, and it is ignored. Although three satellite measurements can fairly accurately locate a point on the earth, the minimum number of satellites required to determine a three dimensional position within the required accuracy is four. The fourth measurement compensates for any time discrepancies between the clock on board the satellites and the clock within the GPS receiver.

The United States Air Force and the defense establishment developed GPS technology in the 1960's. After program funding in the early 1970's, the initial satellite was launched on February 22, 1978. A four-year delay in the launching program occurred after the Challenger space shuttle disaster. In 1989, the launch schedule was resumed. Full operational capability was reached on April 27, 1995 when the NAVSTAR (NAVigation System with Time And Ranging) satellite constellation was composed of 24 Block II satellites. Initial operational capability, a full constellation of 24 satellites, in a combination of Block I (prototype) and Block II satellites, was achieved December 8, 1993. The NAVSTAR satellites provide data based on the World Geodetic System (WGS '84) spherical datum. WGS '84 is essentially identical to the 1983 North American Datum (NAD '83).

The United States Department of Defense (DOD) is currently responsible for implementing and maintaining the satellite constellation. In an attempt to discourage the use of these survey units as a guidance tool by hostile forces, the DOD has implemented means of false signal projection called Selective Availability (S/A). Positions determined by a single receiver when S/A is active result in errors to the actual position of up to 100 meters. These errors can be reduced to centimeters by performing a static survey with two GPS receivers, one of, which is set over a point with known coordinates. The errors induced by S/A are time-constant. By monitoring the movements of the satellites over time (one to three hours), the errors can be minimized during post processing of the collected data and the unknown position computed accurately.

Differential GPS (DGPS) is an advance mode of satellite surveying in which positions of moving objects can be determine in real-time or "on-the-fly." This technological breakthrough was the backbone of the development of the TWDB's Hydrographic Survey Program. In the early stages of the program, one GPS receiver was set up over a benchmark with known coordinates established by the hydrographic survey crew. This receiver remained stationary during the survey and monitored the movements of the satellites overhead. Position corrections were determined and transmitted via a radio link once per second to another GPS receiver located on the moving boat. The boat receiver used these corrections, or differences, in combination with the satellite information it received to determine its differential location. This type of operation can obtain a horizontal positional accuracy of within one meter. In addition, the large positional errors experienced by a single receiver when S/A is active are negated. Since a greater accuracy is needed in the vertical direction, the depth sounder supplies vertical data during a survey. The lake surface during the survey serves as the vertical datum for the readings from the depth sounder.

The need for setting up a stationary shore receiver for current surveys has been eliminated by registration with a fee-based satellite reference position network (OmniSTAR). This service works in a differential mode basically the same way as the shore station, except on a worldwide basis. For a given area in the world, a network of several monitoring sites (with known positions) collect GPS signals from the NAVSTAR network. GPS corrections are computed at each of these sites to correct the GPS signal received to the known coordinates of the site. The corrections from each of the sites within the network are automatically sent via a leased line to a "Network Control Center" where the data corrections are checked and repackaged for up-link to a "Geostationary" L-band satellite. The "real-time" corrections for the entire given area in the world are then broadcast by the satellite to users of the system in the area covered by the satellite. The OmniSTAR receiver translates the information and supplies it to the on-board Trimble receiver for correction of the boat's GPS positions. The accuracy of this system in a real-time mode is normally 1 meter or less.

Equipment and Methodology

The equipment used in the performance of the hydrographic survey consisted of a 23-foot aluminum tri-hull SeaArk craft with cabin, equipped with twin 90-Horsepower Johnson outboard motors. Installed within the enclosed cabin are an Innerspace Helmsman Display (for navigation), an

Innerspace Technology Model 449 Depth Sounder and Model 443 Velocity Profiler, a Trimble Navigation, Inc. 4000SE GPS receiver, an OmniSTAR receiver, and an on-board 486 computer. A water-cooled generator through an in-line uninterruptible power supply provides electrical power. Reference to brand names does not imply endorsement by the TWDB.

The GPS equipment, survey vessel, and depth sounder combine together to provide an efficient hydrographic survey system. As the boat travels across the lake surface, the depth sounder gathers approximately ten readings of the lake bottom each second. The depth readings are stored on the survey vessel's on-board computer along with the corrected positional data generated by the boat's GPS receiver. The daily data files collected are downloaded from the computer and brought to the office for editing after the survey is completed. During editing, bad data is removed or corrected, multiple data points are averaged to get one data point per second, and average depths are converted to elevation readings based on the daily-recorded lake elevation on the day the survey was performed. Accurate estimates of the lake volume can be quickly determined by building a 3-D model of the reservoir from the collected data. The level of accuracy is equivalent to or better than previous methods used to determine lake volumes, some of which are discussed below.

Previous Survey Procedures

Originally, reservoir surveys were conducted with a rope stretched across the reservoir along pre-determined range lines. A small boat would manually pole the depth at selected intervals along the rope. Over time, aircraft cable replaced the rope and electronic depth sounders replaced the pole. The boat was hooked to the cable, and depths were again recorded at selected intervals. This method, used mainly by the Soil Conservation Service, worked well for small reservoirs.

Larger bodies of water required more involved means to accomplish the survey, mainly due to increased size. Cables could not be stretched across the body of water, so surveying instruments were utilized to determine the path of the boat. Monumentation was set for the end points of each line so the same lines could be used on subsequent surveys. Prior to a survey, each end point had to be located (and sometimes reestablished) in the field and vegetation cleared so that line of sight could be maintained. One surveyor monitored the path of the boat and issued commands via radio to insure that it remained on line while a second surveyor determined depth measurement locations by turning angles. Since it took a major effort to determine each of the points along the line, the depth readings were spaced quite a distance apart. Another major cost was the land surveying required prior to the reservoir survey to locate the range line monuments and clear vegetation.

Electronic positioning systems were the next improvement. If triangulation could determine the boat location by electronic means, then the boat could take continuous depth soundings. A set of microwave transmitters positioned around the lake at known coordinates would allow the boat to receive data and calculate its position. Line of site was required, and the configuration of the transmitters had to be such that the boat remained within the angles of 30 and 150 degrees with respect to the shore stations. The maximum range of most of these systems was about 20 miles. Each shore station had to be accurately located by survey, and the location monumented for future use. Any errors in the land surveying resulted in significant errors that were difficult to detect. Large reservoirs required multiple shore stations and a crew to move the shore stations to the next location as the survey progressed. Land surveying remained a major cost with this method.

More recently, aerial photography has been used prior to construction, to generate elevation contours from which to calculate the volume of the reservoir. Fairly accurate results could be obtained, although the vertical accuracy of the aerial topography was generally one-half of the contour interval or $\pm$ five feet for a ten-foot contour interval. This method could be quite costly and was only applicable in areas that were not inundated.

PRE-SURVEY PROCEDURES

The reservoir's surface area was determined prior to the survey by digitizing with AutoCad software the lake's pool boundary (elevation 1075.0). The boundary file was created from the following 7.5 minute USGS quadrangle maps: NEWCASTLE, TX (photo-revised 1981), SOUTH BEND, TX (photo-revised 1981), and LAKE EDDLEMAN, TX (photo-revised 1981). The graphic boundary file created was then transformed into the proper datum, from NAD '27 datum to NAD '83, using Environmental Systems Research Institute's (ESRI) Arc/Info project command with the

NADCOM (standard conversion method within the United States) parameters. The area of the lake boundary was checked to verify that the area was the same in both datums.

The survey layout was designed by placing survey track lines at 500-foot intervals across the lake. The survey design for this lake required approximately 89 survey lines to be placed along the length of the lake. Survey setup files were created using Coastal Oceangraphics, Inc. Hypack software for each group of track lines that represented a specific section of the lake. The setup files were copied onto diskettes for use during the field survey.

SURVEY PROCEDURES

The following procedures were followed during the hydrographic survey of Lake Graham performed by the TWDB. Information regarding equipment calibration and operation, the field survey, and data processing is presented.

Equipment Calibration and Operation

At the beginning of each surveying day, the depth sounder was calibrated with the Innerspace Velocity Profiler. The Velocity Profiler calculates an average speed of sound through the water column of interest for a designated draft value of the boat (draft is the vertical distance that the boat penetrates the water surface). The draft of the boat was previously determined to average 1.2 ft. The velocity profiler probe is placed in the water to moisten and acclimate the probe. The probe is then raised to the water surface where the depth is zeroed. The probe is lowered on a cable to just below the maximum depth set for the water column, and then raised to the surface. The unit displays an average speed of sound for a given water depth and draft, which is entered into the depth sounder. The depth value on the depth sounder was then checked manually with a measuring tape to ensure that the depth sounder was properly calibrated and operating correctly. During the survey of Lake Graham, the speed of sound in the water column varied from 4850 to 4856 feet per second. Based on the measured speed of sound for various depths, and the average speed of sound calculated for the entire water column, the depth sounder is accurate to within ± 0.2 feet, plus an estimated error of ± 0.3 feet due to the plane of the boat for a total accuracy of ±0.5 feet for any instantaneous reading. These errors tend to be minimized over the entire survey, since some are positive and some are negative readings. Further information on these calculations is presented in Appendix A.

During the survey, the onboard GPS receiver was set to a horizontal mask of 10° and a PDOP (Position Dilution of Precision) limit of 7 to maximize the accuracy of horizontal positions. An internal alarm sounds if the PDOP rises above seven to advise the field crew that the horizontal position has degraded to an unacceptable level. The lake's initialization file used by the Hypack data collection program was setup to convert the collected DGPS positions on the fly to state plane coordinates. Both sets of coordinates were then stored in the survey data file.

Field Survey

Data were collected at Lake Graham during the period of April 14 - 15, 1998. Weather conditions were excellent with moderately cool temperatures and mild winds. Approximately 32,203 data points were collected over the 94 miles traveled along the 96 survey lines run (pre-planned, random, and parallel). These points were stored digitally on the boat's computer in 102 data files. Data were not collected in areas of shallow water (depths less than 3.0 feet) or with significant obstructions unless these areas represented a large amount of water. Figure 2 shows the actual location of all data collection points.

TWDB staff visually observed that the terrain around the lake was generally rolling hills with residential development concentrated mostly along the West Bank of Salt Creek. Minimal amounts of navigational hazards such as standing trees, brush, submerged trees and stumps were noted till reaching an island about four miles upstream of the dam on the Salt Creek side. From this point, upstream to the Highway 380 bridges, navigation became more hazardous with numerous areas of standing trees, brush, submerged trees and stumps. The boat was able to pass through a 12-foot opening in the old Highway 380 bridge and then pass under the new Highway 380 bridge. Sediment deposits and aquatic vegetation were observed one-half a mile prior to the bridges and upstream in the headwaters of Salt Creek. In the Flint Creek arm, navigational hazards were minimal upstream to the Highway 380 bridge and the old Highway 380 bridge. There was an outlet tower located on the East End of Eddleman Dam containing the intake pumps for the City of Graham. The survey crew collected extensive data around this structure. The old Highway 380 bridge blocked the survey vessel from traveling further upstream. The crew did note numerous areas of sediment and aquatic vegetation around the bridges.

Data collection in the headwaters was discontinued when the boat could no longer maneuver due to shallow water and extensive vegetation. The collected data were stored in individual data files for each pre-plotted range line or random data collection event. These files were downloaded to diskettes at the end of each day for future processing.

Data Processing

The collected data were downloaded from diskettes onto the TWDB's computer network. Tape backups were made for future reference as needed. To process the data, the EDIT routine in the Hypack Program was run on each raw data file. Data points such as depth spikes or data with missing depth or positional information were deleted from the file. The depth information collected every 0.1 seconds was averaged to get one reading for each second of data collection. A correction for the lake elevation at the time of data collection was also applied to each file during the EDIT routine. During the survey, the water surface held steady at 1074.5 feet. After all changes had been made to the raw data file, the edited file was saved with a different extension. The edited files were combined into a single X,Y,Z data file, representative of the lake, to be used with the GIS software to develop a model of the lake's bottom surface.

The resulting data file was imported into the UNIX operating system used to run Environmental System Research Institute's (ESRI) Arc/Info GIS software and converted to a MASS points file. The MASS points and the boundary file were then used to create a Digital Terrain Model (DTM) of the reservoir's bottom surface using Arc/Info's TIN software module. The module builds an irregular triangulated network from the data points and the boundary file. This software uses a method known as Delauney's criteria for triangulation. A triangle is formed between three non-uniformly spaced points, including all points along the boundary. If there is another point within the triangle, additional triangles are created until all points lie on the vertex of a triangle. All of the data points are preserved for use in determining the solution of the model by using this method. The generated network of three-dimensional triangular planes represents the actual bottom surface. Once the triangulated irregular network (TIN) is formed, the software then calculates elevations along the triangle surface plane by solving the equations for elevation along each leg of the triangle. Information for the entire reservoir area can be determined from the triangulated irregular network created using this method of interpolation.

If data points were collected outside the boundary file, the boundary was modified to include the data points. The boundary file in areas of significant sedimentation was also downsized as deemed necessary based on the data points and the observations of the field crew. The resulting boundary shape was used to develop each of the map presentations of the lake in this report.

There were some areas where volume and area values could not be calculated by interpolation because of a lack of information within the reservoir. "Flat triangles" were drawn at these locations. Arc/Info does not use flat triangle areas in the volume or contouring features of the model. Approximately 2,286 additional points were manually added to allow for interpolation and contouring of the entire lake surface at elevation 1075.0. Volumes and areas were calculated from the TIN for the entire reservoir at one-tenth of a foot intervals. From elevation 1071.0 to elevation 1075.0, the surface areas and volumes of the lake were mathematically estimated. This was done by first distributing uniformly across each elevation increment; the surface areas digitized from USGS topographic maps. Volumes were then calculated in a 0.1 foot step method by adding to the existing volume, 0.1 of the existing area, and 0.5 of the difference between the existing area the area for the value being calculated. The computed area of lake at elevation 1075.0 was 2,444 surface acres. The computed area was 106 surface acres less than originally calculated in 1945. The computed reservoir volume table is presented in Appendix B and the area table in Appendix C. An elevation-area-volume graph is presented in Appendix D.

Other presentations developed from the model include a shaded relief map and a shaded depth range map. To develop these maps, the TIN was converted to a lattice using the TINLATTICE command and then to a polygon coverage using the LATTICEPOLY command. Using the POLYSHADE command, colors were assigned to the range of elevations represented by the polygons that varied from navy to yellow. The lower elevation was assigned the color of navy, and the 1075.0 lake elevation was assigned the color of yellow. Different color shades were assigned to the intermediate depths. Figure 3 presents the resulting depth shaded representation of the lake. Figure 4 presents a similar version of the same map, using bands of color for selected depth intervals. The color increases in intensity from the shallow contour bands to the deep-water bands.

Linear filtration algorithms were then applied to the DTM smooth cartographic contours versus using the sharp-engineered contours. The resulting contour map of the bottom surface at two-foot intervals is presented in Figure 5.

RESULTS

Results from the 1998 TWDB survey indicate Lake Graham encompasses 2,444 surface acres and contains a volume of 45,302 acre-feet at the conservation pool elevation of 1075.0 feet. The shoreline at this elevation was calculated to be 38 miles. The deepest point of the lake, elevation 1025.9 or 49.1 feet of depth, was located approximately 1,824 feet northwest from the center of Graham Dam. The dead storage volume, or the amount of water below the lowest outlet in the dam, was calculated to be 42 acre-feet based on the low flow outlet invert elevation of 1031.3 feet. The conservation storage capacity, or the amount of water between the spillway and the lowest outlet, is therefore calculated to be 45,260 acre-feet.

SUMMARY

Lake Graham was formed in 1950. Initial storage calculations estimated the volume at the conservation pool elevation of 1075.0 feet to be 53,680 acre-feet with a surface area of 2,550 acres.

During the period of April 14 - 15, 1998, a hydrographic survey of Lake Graham was performed by the Texas Water Development Board's Hydrographic Survey Program. The 1998 survey used technological advances such as differential global positioning system and geographical information system technology to build a model of the reservoir's bathemetry. These advances allowed a survey to be performed quickly and to collect significantly more data of the bathemetry of Lake Graham than previous survey methods. Results indicate that the lake's capacity at the conservation pool elevation of 1075.0 feet was 45,302 acre-feet and the area was 2,444 acres.

The estimated reduction in storage capacity at the conservation pool elevation of 1075.0 feet since 1952 was 8,378 acre-feet or 232.72 acre-feet per year. The average annual deposition rate of sediment in the conservation pool of the reservoir can be estimated at 1.053 acre-feet per square mile of drainage area. *(Please note that this is just a mathematical estimate based on the difference between the original design and the current survey. Limited knowledge on actual sedimentation can be determined from one field survey.)*

It is difficult to compare the original design information and the TWDB performed survey because little is know about the original design method, the amount of data collected, and the method used to process the collected data. However, the TWDB considers the 1998 survey to be a significant improvement over previous survey procedures and recommends that the same methodology be used in five to ten years or after major flood events to monitor changes to the lake's storage capacity.

CALCULATION OF DEPTH SOUNDER ACCURACY

This methodology was extracted from the Innerspace Technology, Inc. Operation Manual for the Model 443 Velocity Profiler.

For the following examples, $t = (D - d)/V$

where: t_D = travel time of the sound pulse, in seconds (at depth = D)
D = depth, in feet
d = draft = 1.2 feet
V = speed of sound, in feet per second

To calculate the error of a measurement based on differences in the actual versus average speed of sound, the same equation is used, in this format:

$$D = [t(V)]+d$$

For the water column from 2 to 30 feet: V = 4832 fps

$t_{30} = (30-1.2)/4832$
$= 0.00596$ sec.

For the water column from 2 to 45 feet: V = 4808 fps

$t_{45} = (45-1.2)/4808$
$= 0.00911$ sec.

For a measurement at 20 feet (within the 2 to 30 foot column with V = 4832 fps):

$D_{20} = [((20-1.2)/4832)(4808)]+1.2$
$= 19.9'$ (-0.1')

For a measurement at 30 feet (within the 2 to 30 foot column with V = 4832 fps):

$D_{30} = [((30-1.2)/4832)(4808)]+1.2$
$= 29.9'$ (-0.1')

For a measurement at 50 feet (within the 2 to 60 foot column with V = 4799 fps):

$$D_{50} = [((50-1.2)/4799)(4808)]+1.2$$
$$= 50.1' \quad (+0.1')$$

For the water column from 2 to 60 feet: $V = 4799$ fps Assumed $V_{80} = 4785$ fps

$$t_{60} = (60-1.2)/4799$$
$$= 0.01225 \text{ sec.}$$

For a measurement at 10 feet (within the 2 to 30 foot column with $V = 4832$ fps):

$$D_{10} = [((10-1.2)/4832)(4799)]+1.2$$
$$= 9.9' \quad (-0.1')$$

For a measurement at 30 feet (within the 2 to 30 foot column with $V = 4832$ fps):

$$D_{30} = [((30-1.2)/4832)(4799)]+1.2$$
$$= 29.8' \quad (-0.2')$$

For a measurement at 45 feet (within the 2 to 45 foot column with $V = 4808$ fps):

$$D_{45} = [((45-1.2)/4808)(4799)]+1.2$$
$$= 44.9' \quad (-0.1')$$

For a measurement at 80 feet (outside the 2 to 60 foot column, assumed $V = 4785$ fps):

$$D_{80} = [((80-1.2)/4785)(4799)]+1.2$$
$$= 80.2' \quad (+0.2')$$

TEXAS WATER DEVELOPMENT BOARD   Jun 16 1998
RESERVOIR VOLUME TABLE

Lake Graham   April 1998 Survey

VOLUME IN ACRE-FEET   ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1,027										
1,028	1	1	1	2	2	2	3	3	4	4
1,029	5	6	6	7	8	9	10	11	12	13
1,030	14	15	17	18	20	22	24	26	28	30
1,031	33	36	39	42	45	48	52	56	60	65
1,032	70	75	80	85	91	96	102	108	115	121
1,033	128	135	142	149	156	164	171	179	187	195
1,034	204	212	221	230	238	248	257	266	276	286
1,035	296	306	316	327	338	349	360	371	383	395
1,036	407	420	432	445	458	471	485	498	512	527
1,037	541	556	571	586	601	617	633	650	666	683
1,038	700	718	735	754	772	791	810	829	849	868
1,039	888	909	930	951	972	994	1016	1038	1061	1084
1,040	1108	1132	1157	1181	1207	1232	1258	1285	1312	1339
1,041	1366	1394	1423	1452	1481	1511	1541	1572	1603	1635
1,042	1667	1700	1733	1766	1800	1835	1869	1905	1940	1977
1,043	2013	2050	2088	2126	2164	2203	2243	2283	2323	2364
1,044	2405	2447	2490	2533	2576	2620	2665	2709	2755	2801
1,045	2847	2894	2941	2989	3038	3086	3136	3186	3236	3288
1,046	3339	3391	3444	3498	3552	3606	3662	3718	3775	3833
1,047	3891	3950	4010	4071	4132	4194	4257	4320	4383	4447
1,048	4512	4577	4643	4709	4776	4843	4911	4980	5049	5119
1,049	5189	5260	5331	5402	5475	5547	5620	5694	5768	5843
1,050	5918	5994	6070	6147	6225	6303	6382	6461	6541	6622
1,051	6703	6785	6868	6952	7036	7120	7206	7291	7378	7465
1,052	7553	7642	7731	7821	7911	8002	8094	8186	8279	8372
1,053	8467	8561	8657	8753	8850	8947	9045	9144	9244	9344
1,054	9445	9547	9649	9752	9856	9961	10066	10172	10278	10386
1,055	10493	10602	10711	10821	10931	11042	11154	11267	11380	11494
1,056	11608	11723	11839	11955	12072	12190	12308	12427	12547	12667
1,057	12787	12909	13031	13154	13277	13401	13526	13651	13777	13903
1,058	14030	14158	14286	14415	14544	14674	14805	14936	15068	15200
1,059	15333	15466	15600	15735	15870	16005	16141	16278	16415	16553
1,060	16691	16830	16969	17109	17250	17391	17533	17675	17818	17961
1,061	18106	18250	18395	18541	18688	18835	18982	19130	19279	19428
1,062	19578	19729	19880	20032	20184	20337	20491	20645	20800	20955
1,063	21111	21268	21425	21584	21743	21902	22063	22224	22385	22548
1,064	22711	22875	23039	23205	23371	23537	23705	23873	24042	24211
1,065	24381	24551	24723	24895	25067	25241	25414	25589	25764	25940
1,066	26117	26294	26472	26651	26831	27011	27192	27374	27557	27740
1,067	27924	28109	28295	28481	28668	28856	29045	29234	29425	29616
1,068	29807	30000	30194	30388	30583	30779	30976	31173	31372	31571
1,069	31771	31971	32173	32375	32579	32783	32987	33193	33400	33607
1,070	33815	34025	34235	34447	34659	34872	35086	35301	35516	35732
1,071	35952	36172	36393	36615	36837	37061	37284	37509	37734	37960
1,072	38187	38414	38642	38870	39100	39330	39560	39792	40024	40257
1,073	40490	40724	40959	41194	41431	41667	41905	42143	42382	42622
1,074	42862	43103	43345	43587	43830	44074	44318	44563	44809	45055
1,075	45302									

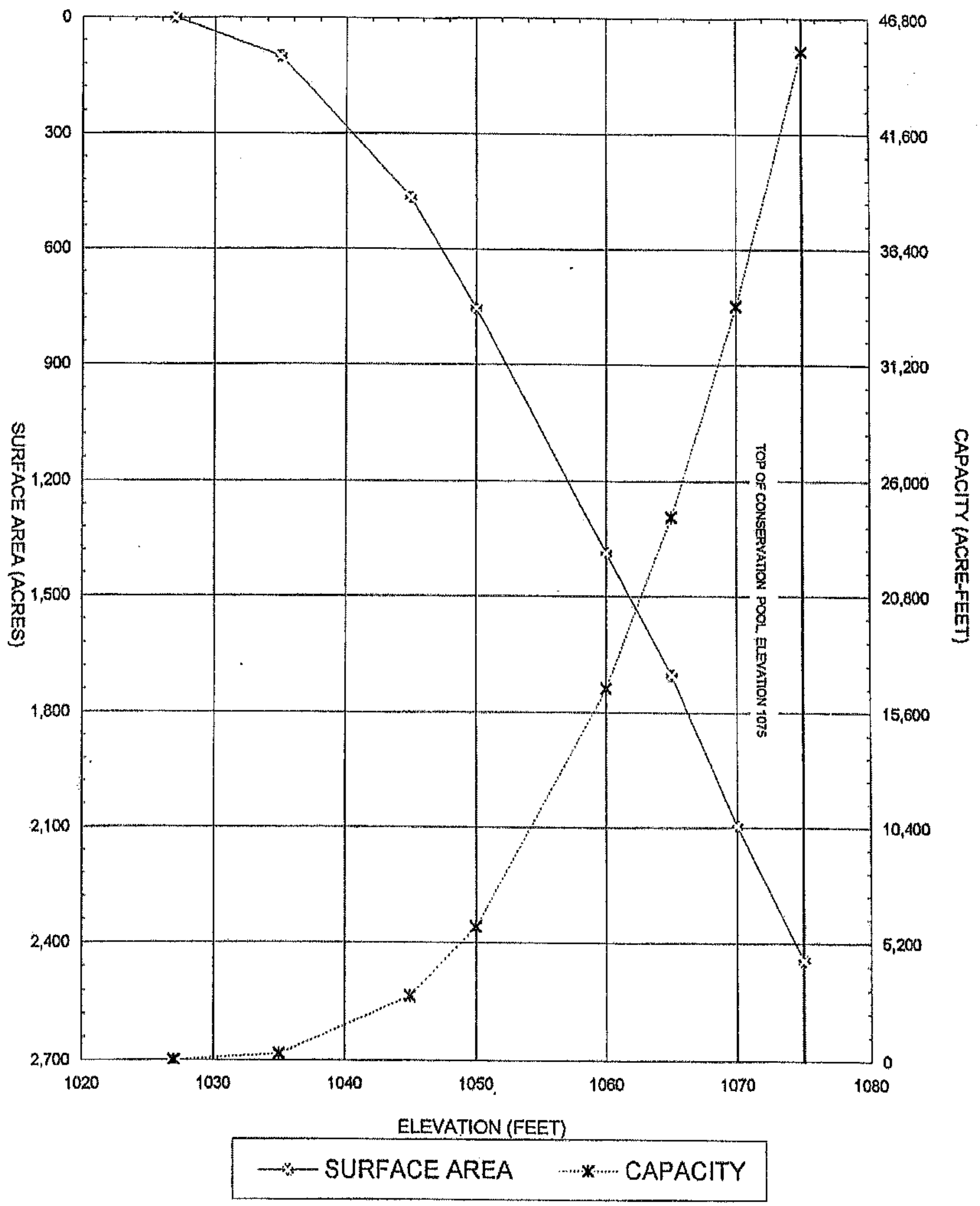
TEXAS WATER DEVELOPMENT BOARD
RESERVOIR AREA TABLE

Jun 16 1998

Lake Graham April 1998 Survey

AREA IN ACRES — ELEVATION INCREMENT IS ONE TENTH FOOT

ELEV. FEET	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
1,027							1	1	1	2
1,028	2	3	3	3	4	4	5	5	6	6
1,029	7	7	7	8	8	9	9	10	11	11
1,030	13	14	15	16	17	19	20	21	23	25
1,031	26	28	29	31	34	37	39	41	44	47
1,032	49	50	53	55	57	58	60	62	64	66
1,033	67	69	71	73	74	76	77	79	81	82
1,034	84	85	87	89	90	92	94	95	97	99
1,035	101	103	105	107	109	112	114	116	118	120
1,036	123	125	127	129	131	134	136	138	141	143
1,037	146	148	151	154	156	159	162	164	167	170
1,038	173	176	180	183	186	189	191	194	197	200
1,039	203	206	209	212	215	219	222	226	230	235
1,040	239	243	247	251	254	258	262	266	270	274
1,041	278	282	287	292	296	301	305	310	314	319
1,042	324	328	333	338	342	346	351	355	359	364
1,043	368	373	377	382	387	392	397	402	407	412
1,044	417	422	427	432	437	442	447	452	457	461
1,045	466	471	476	481	486	491	497	503	509	514
1,046	520	525	531	537	544	551	558	566	574	581
1,047	589	596	603	610	616	622	627	632	638	643
1,048	649	654	660	666	672	678	684	689	694	699
1,049	704	709	714	719	724	729	734	739	744	750
1,050	755	760	766	772	778	784	790	797	805	811
1,051	817	824	830	837	844	850	857	863	869	876
1,052	882	888	894	901	907	913	920	926	932	939
1,053	945	951	957	964	971	979	986	993	1000	1006
1,054	1013	1020	1027	1034	1041	1048	1055	1062	1069	1075
1,055	1082	1088	1095	1102	1108	1115	1121	1128	1134	1141
1,056	1147	1154	1160	1167	1173	1179	1186	1192	1199	1205
1,057	1211	1218	1224	1230	1236	1243	1249	1255	1261	1267
1,058	1273	1279	1285	1291	1298	1304	1309	1315	1320	1325
1,059	1331	1336	1342	1347	1352	1358	1363	1369	1374	1380
1,060	1386	1391	1397	1403	1409	1415	1420	1426	1432	1438
1,061	1444	1450	1456	1461	1467	1473	1478	1484	1490	1496
1,062	1503	1509	1515	1521	1527	1533	1539	1544	1550	1556
1,063	1565	1572	1579	1586	1593	1600	1607	1614	1621	1628
1,064	1636	1642	1649	1656	1663	1670	1677	1684	1690	1697
1,065	1703	1709	1716	1722	1729	1736	1742	1749	1756	1763
1,066	1770	1778	1785	1792	1800	1807	1815	1823	1830	1838
1,067	1845	1853	1860	1867	1875	1883	1891	1898	1906	1914
1,068	1924	1931	1939	1947	1955	1963	1971	1979	1987	1995
1,069	2003	2011	2020	2028	2036	2044	2052	2061	2069	2077
1,070	2095	2103	2111	2119	2127	2135	2142	2149	2156	2163
1,071	2170	2177	2184	2190	2197	2204	2211	2218	2225	2232
1,072	2238	2245	2252	2259	2266	2273	2279	2286	2293	2300
1,073	2307	2314	2321	2327	2334	2341	2348	2355	2362	2369
1,074	2375	2382	2389	2396	2403	2410	2416	2423	2430	2437
1,075	2444									



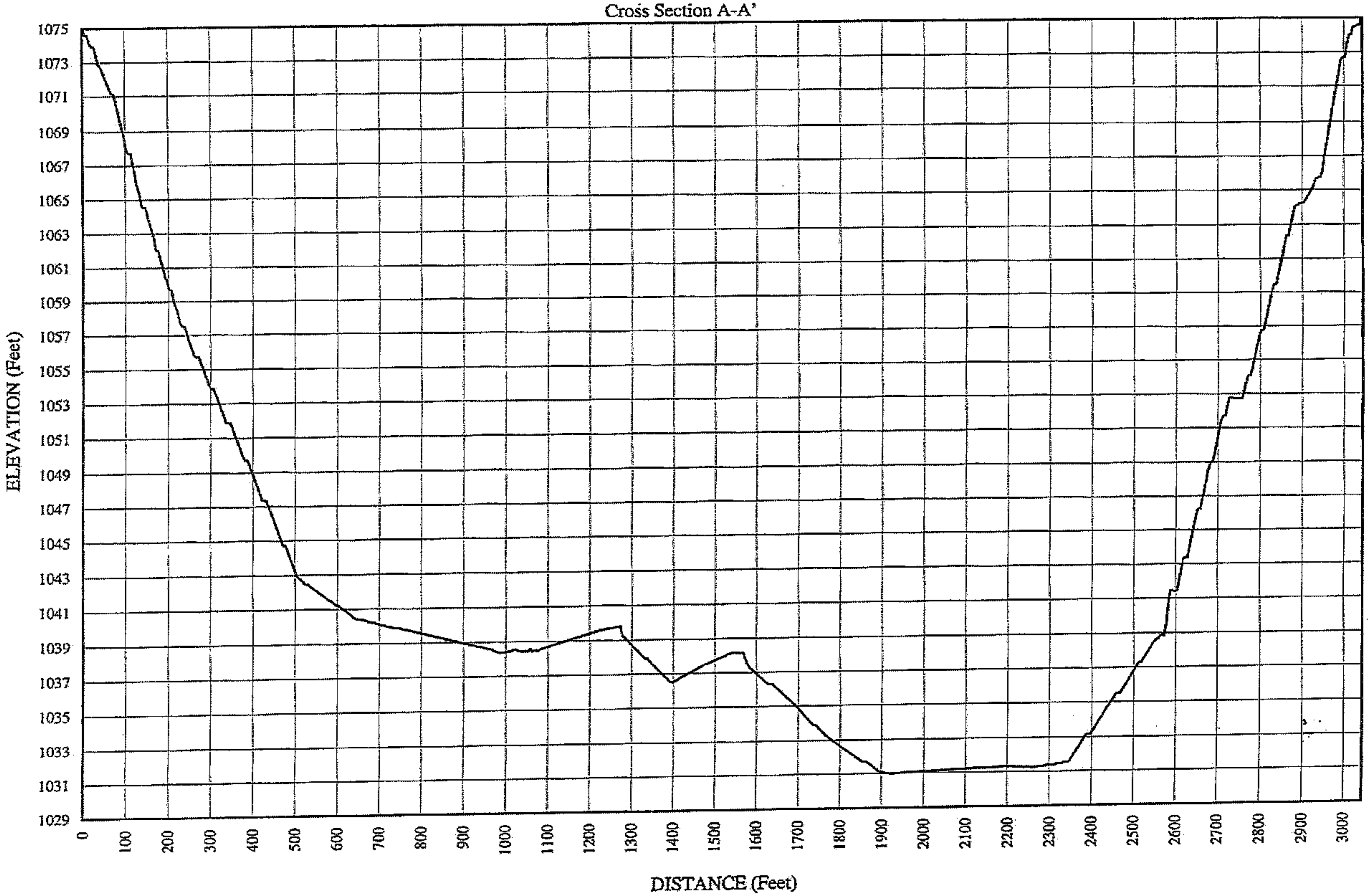
LAKE GRAHAM

April 1998 Survey

Prepared by: TWDB June 1998

LAKE GRAHAM

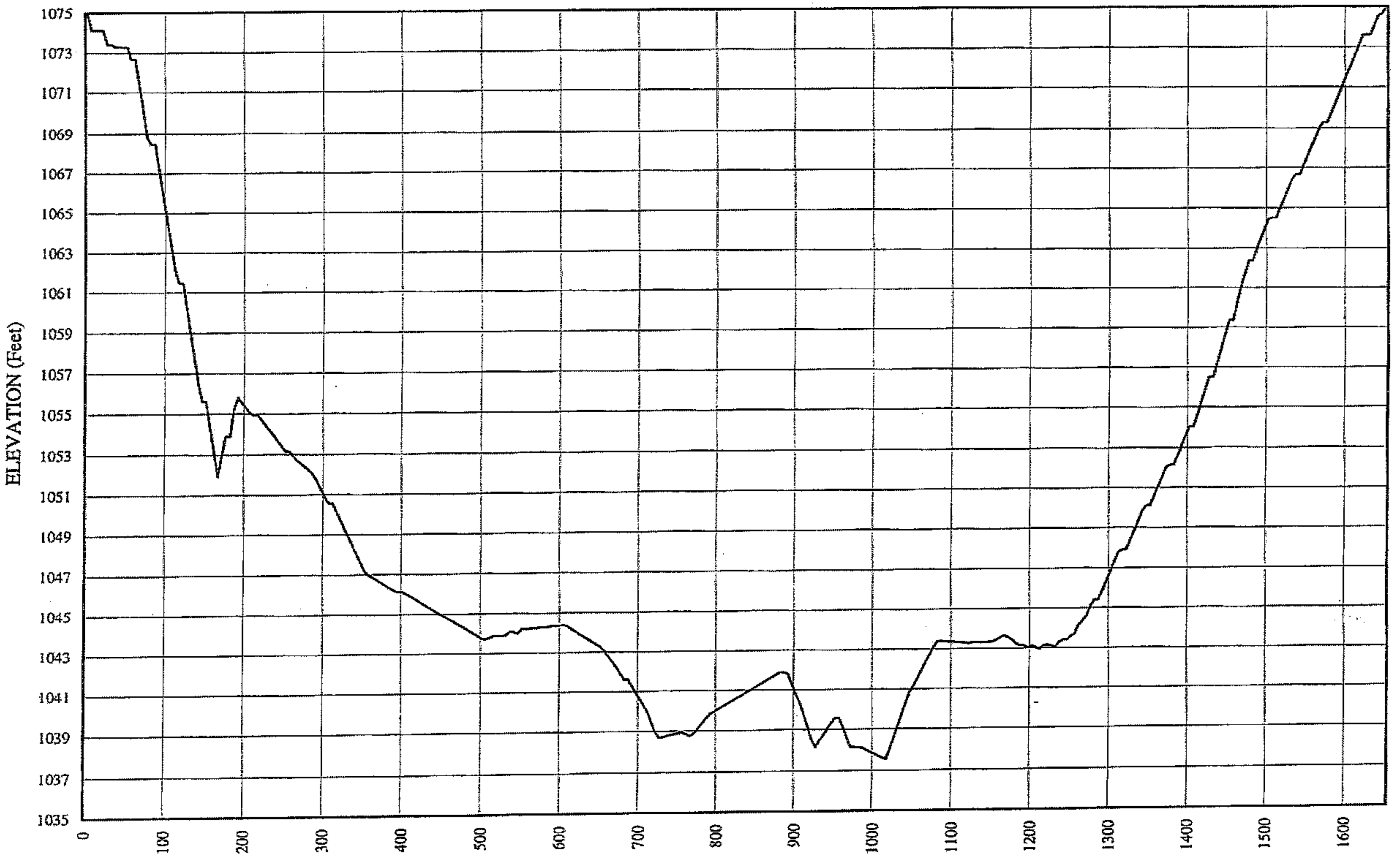
Cross Section A-A'



PREPARED BY: TWDB JUNE 1998

LAKE GRAHAM

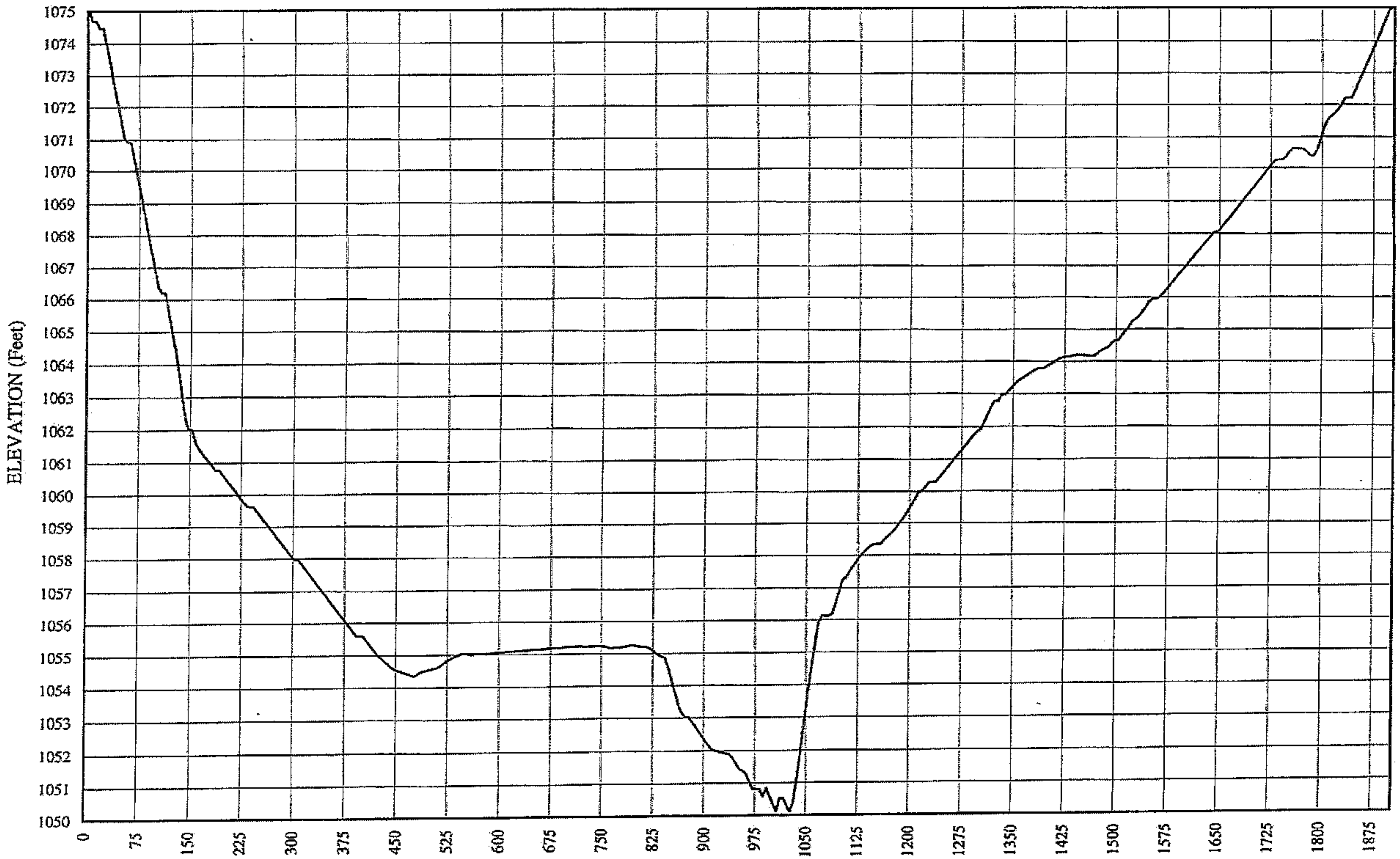
Cross Section B-B'



PREPARED BY: TWDB JUNE 1998

LAKE GRAHAM

Cross Section C-C'

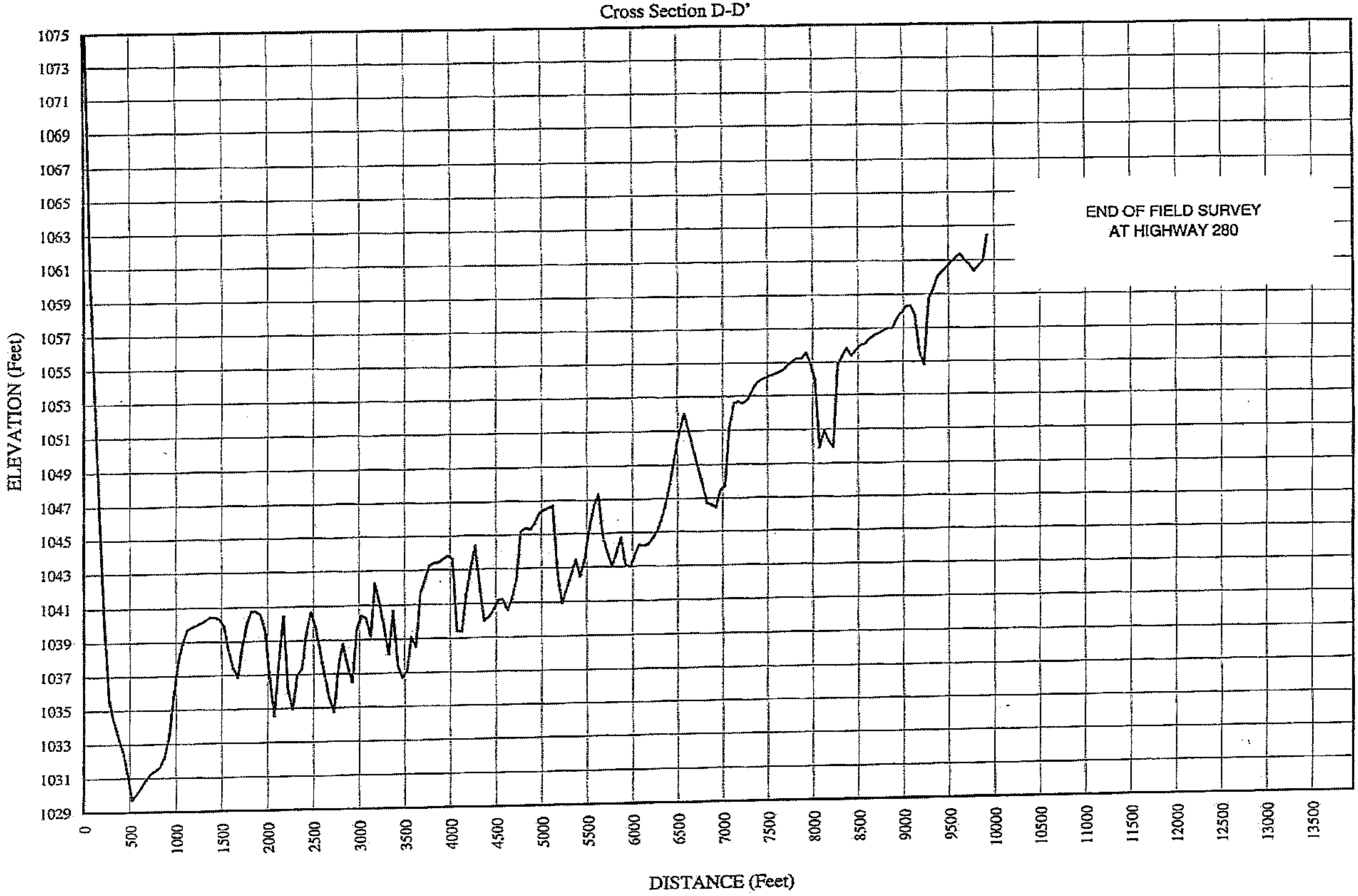


DISTANCE (Feet)

PREPARED BY: TWDB JUNE 1998

LAKE GRAHAM

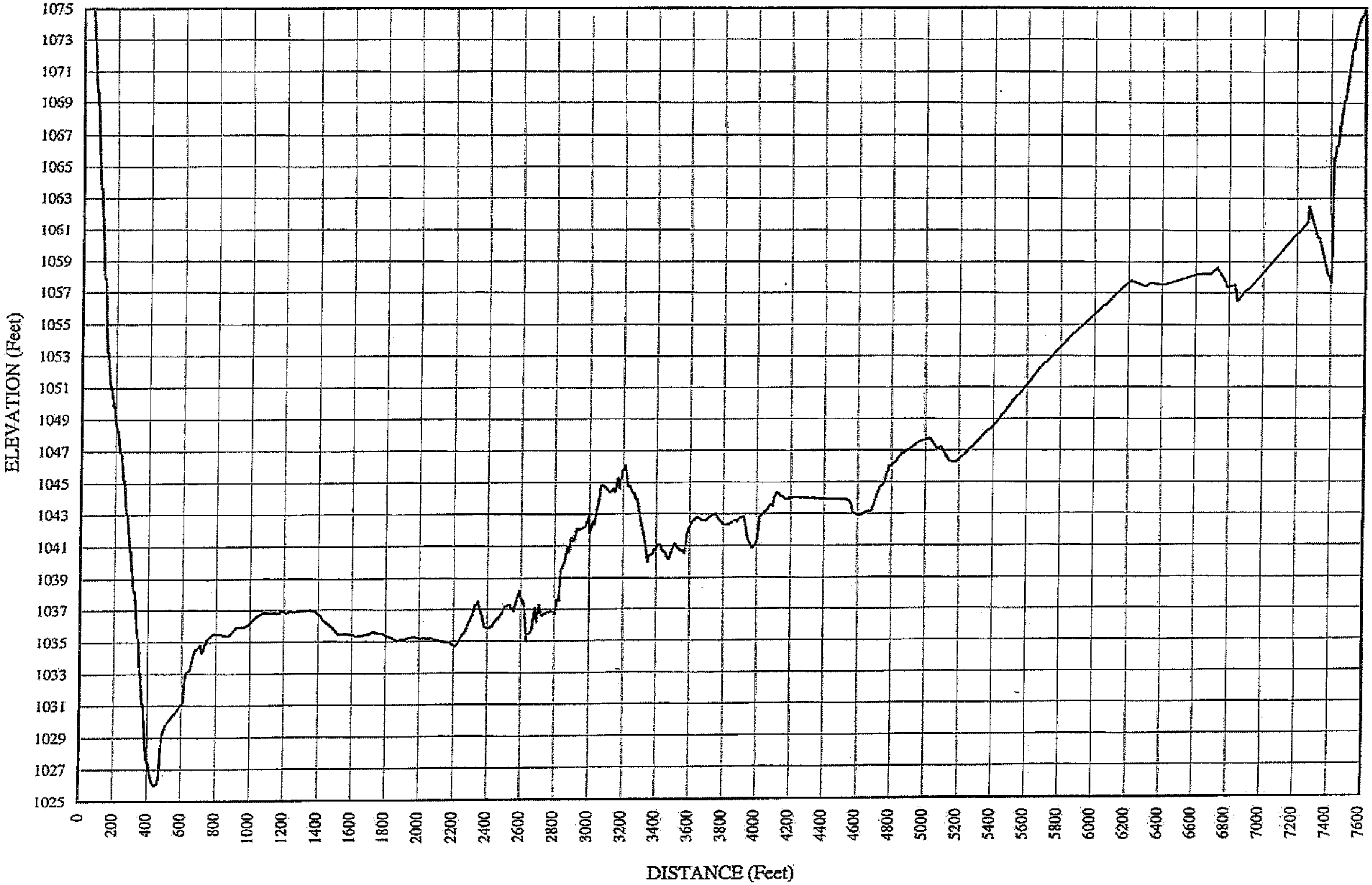
Cross Section D-D'



PREPARED BY: TWDB JUNE 1998

LAKE GRAHAM

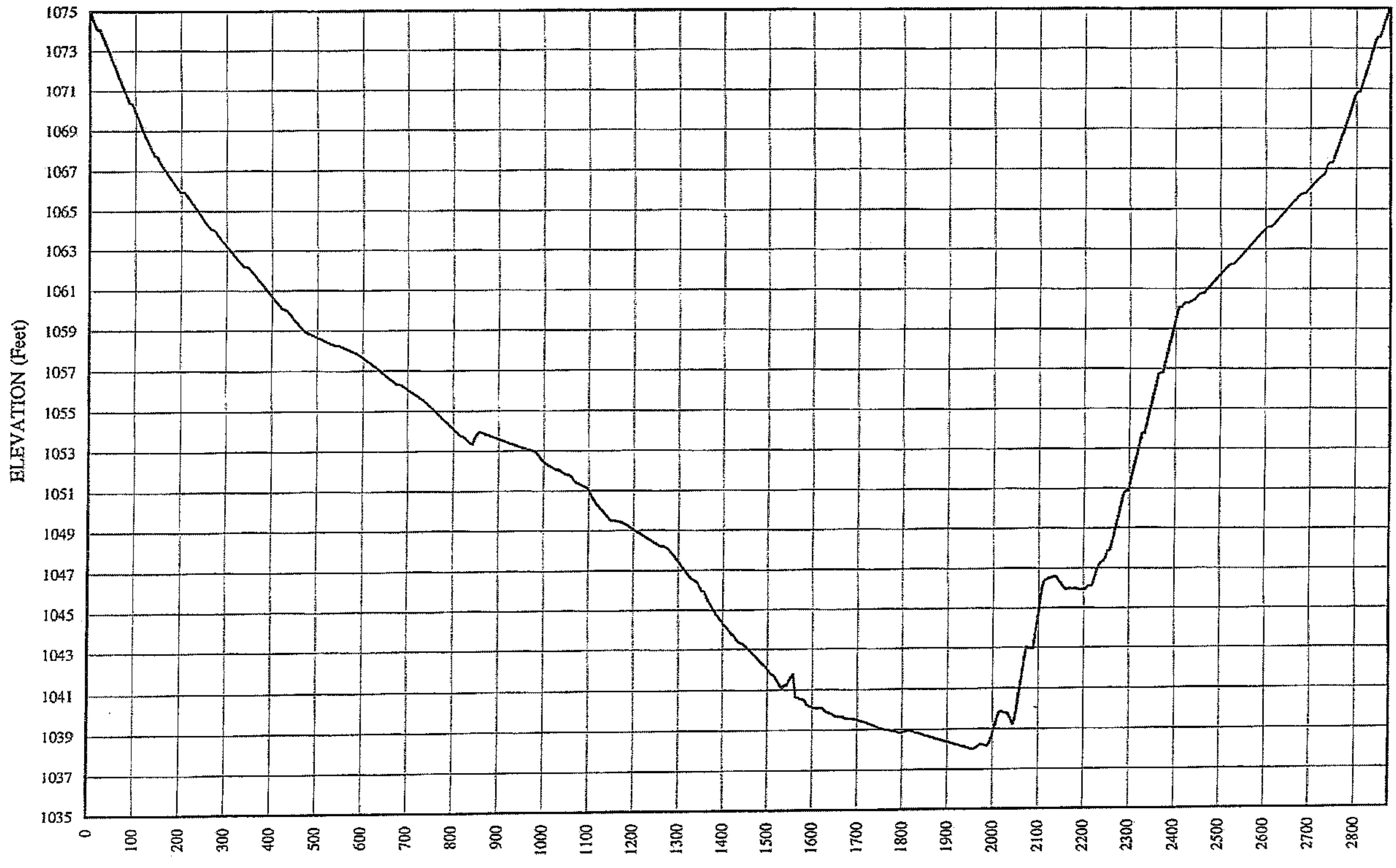
Cross Section E-E'



PREPARED BY: TWDB JUNE 1998

LAKE GRAHAM

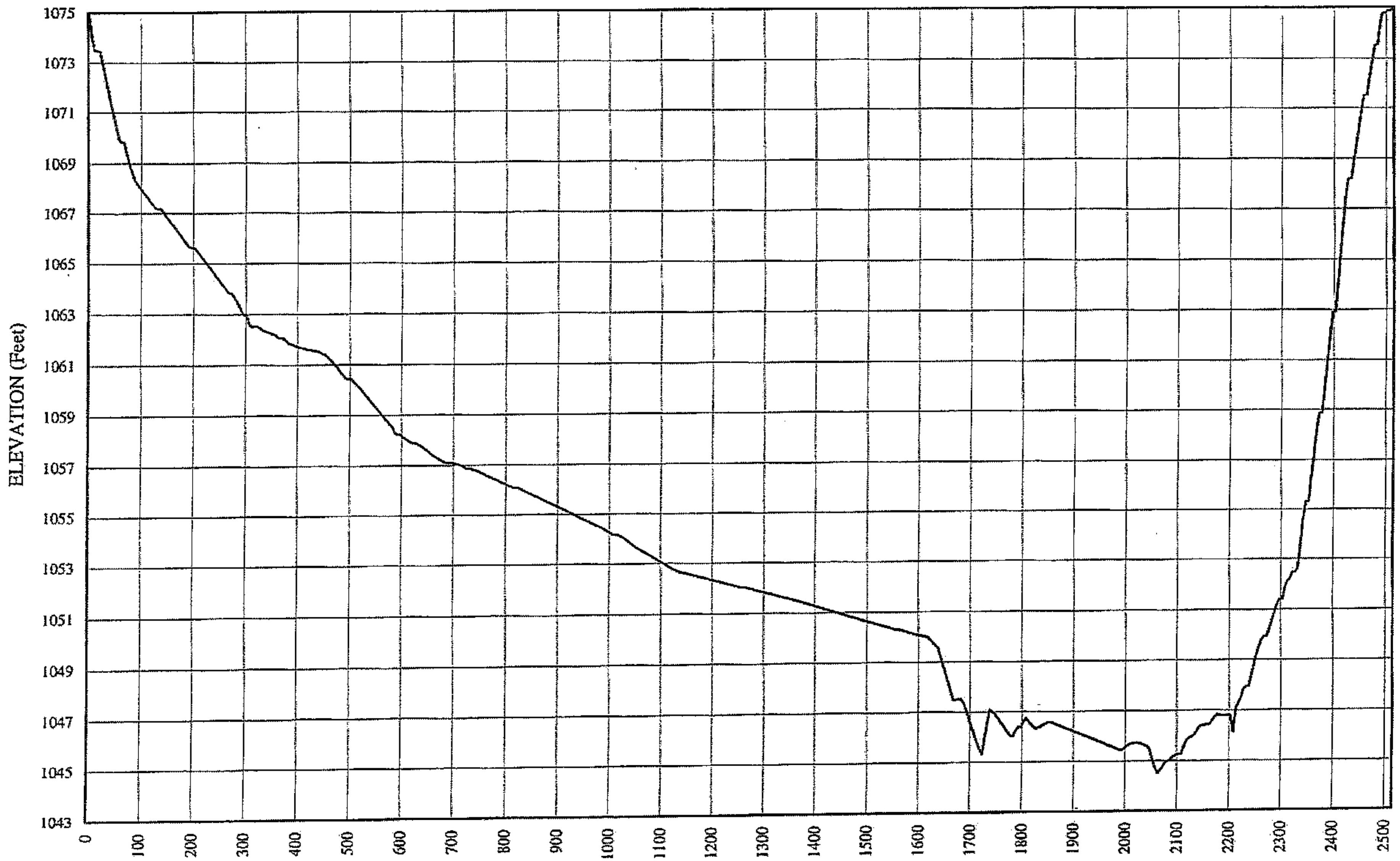
Cross Section F-F'



PREPARED BY: TWDB JUNE 1998

LAKE GRAHAM

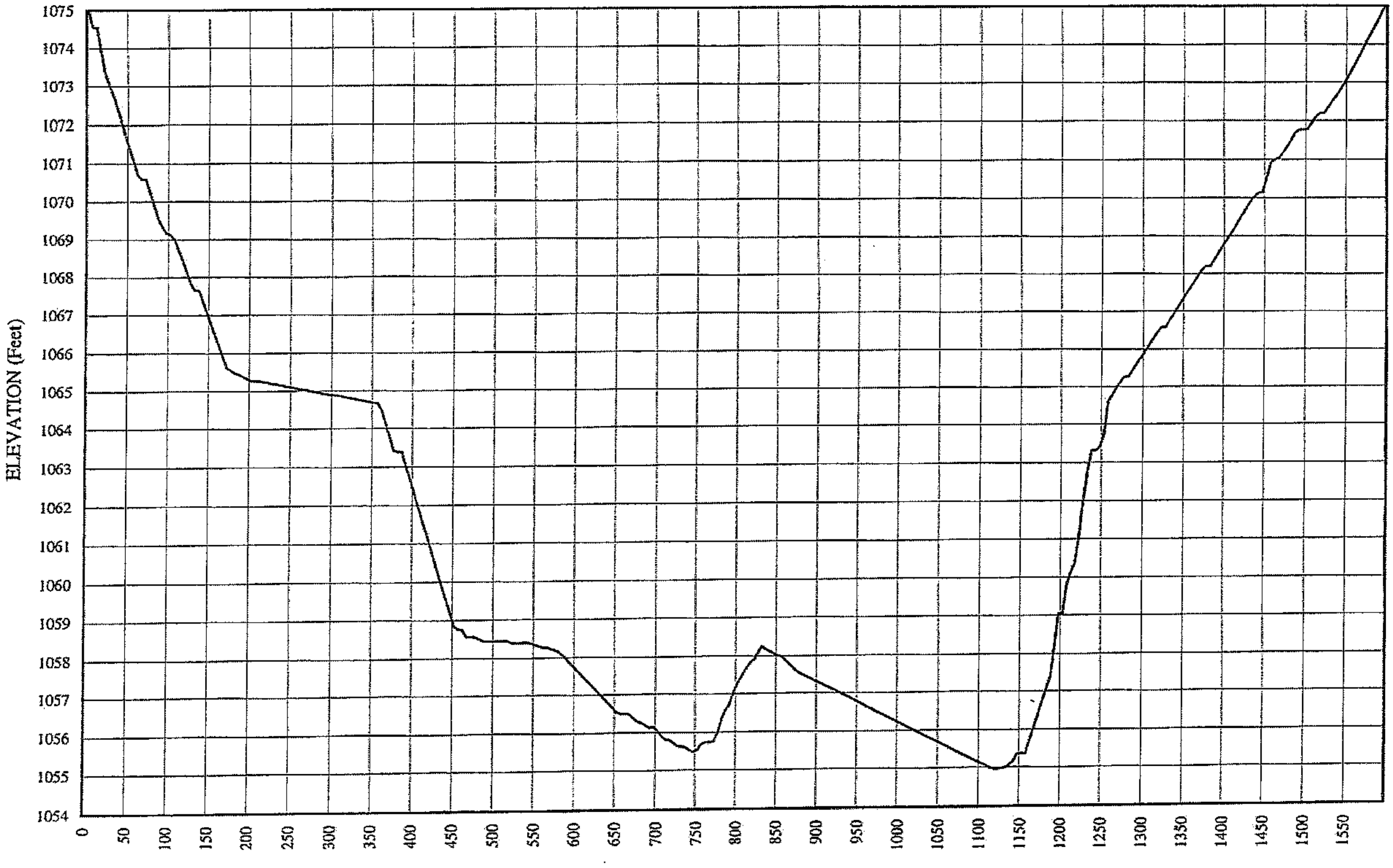
Cross Section G-G'



PREPARED BY: TWDB JUNE 1998

LAKE GRAHAM

Cross Section H-H'



PREPARED BY: TWDB JUNE 1998

LAKE GRAHAM

Cross Section I-I'

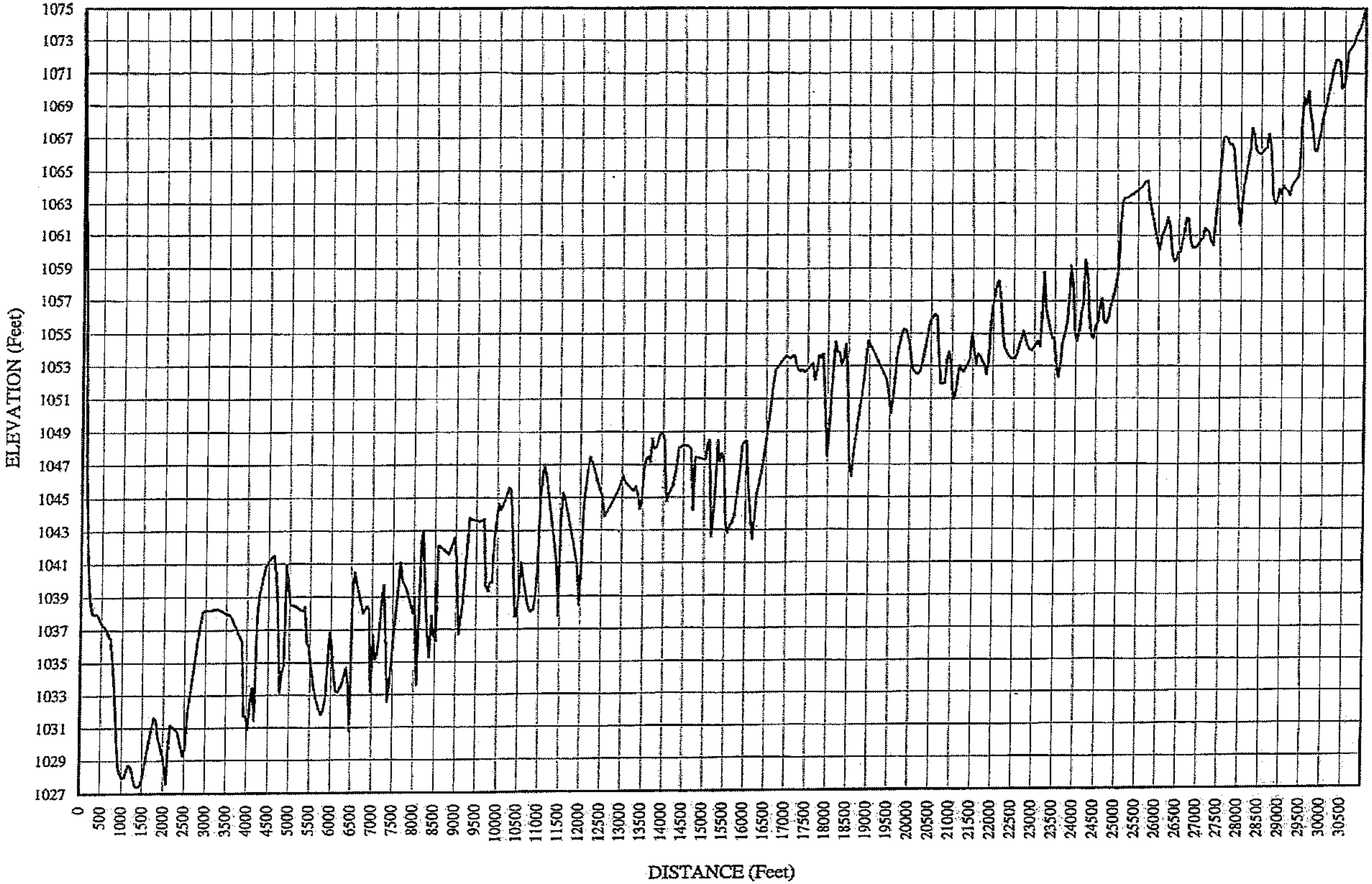


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FIGURE 1
LAKE GRAHAM
Site Location Map

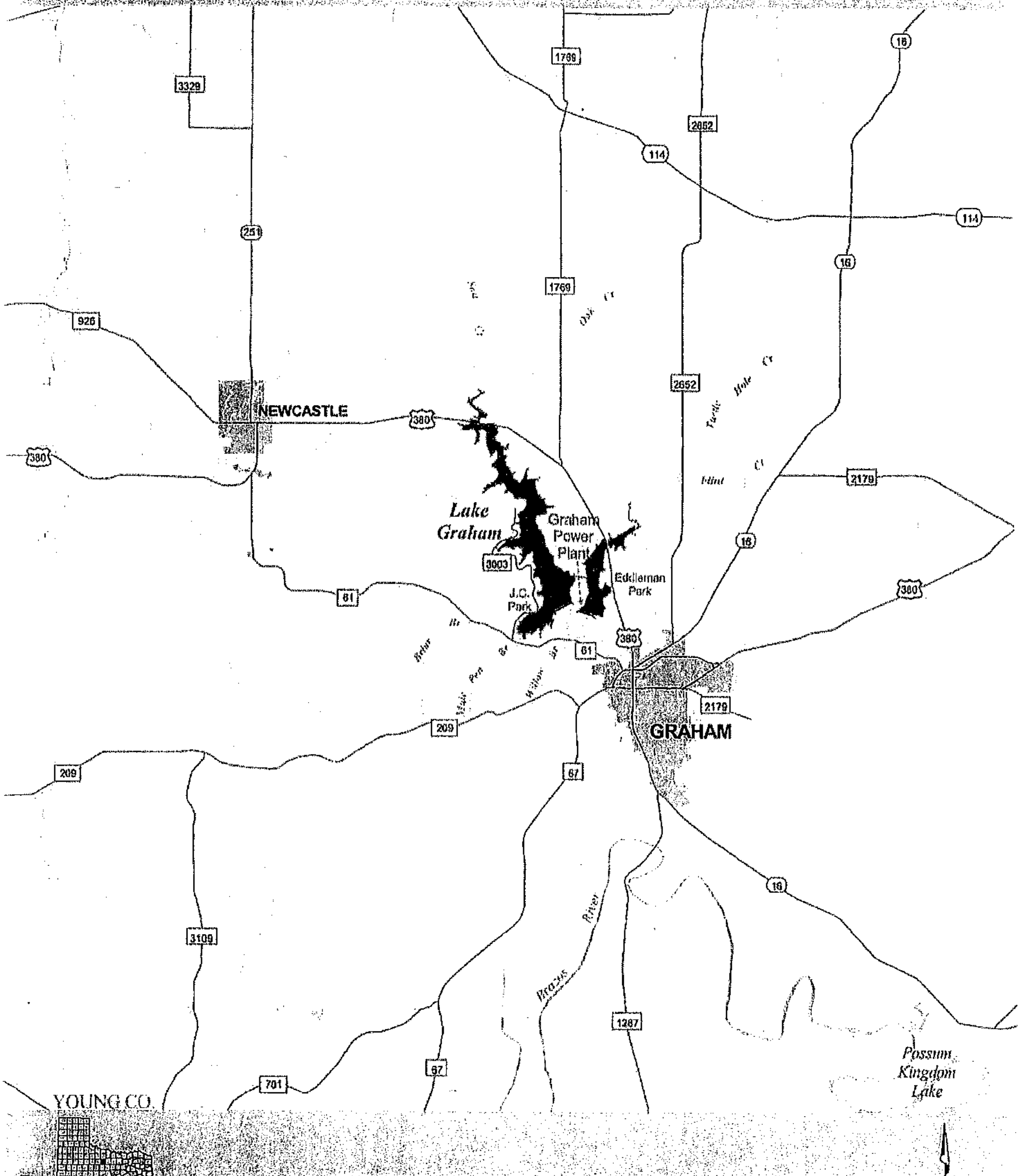

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FIGURE 2

LAKE GRAHAM

Location of Survey Data

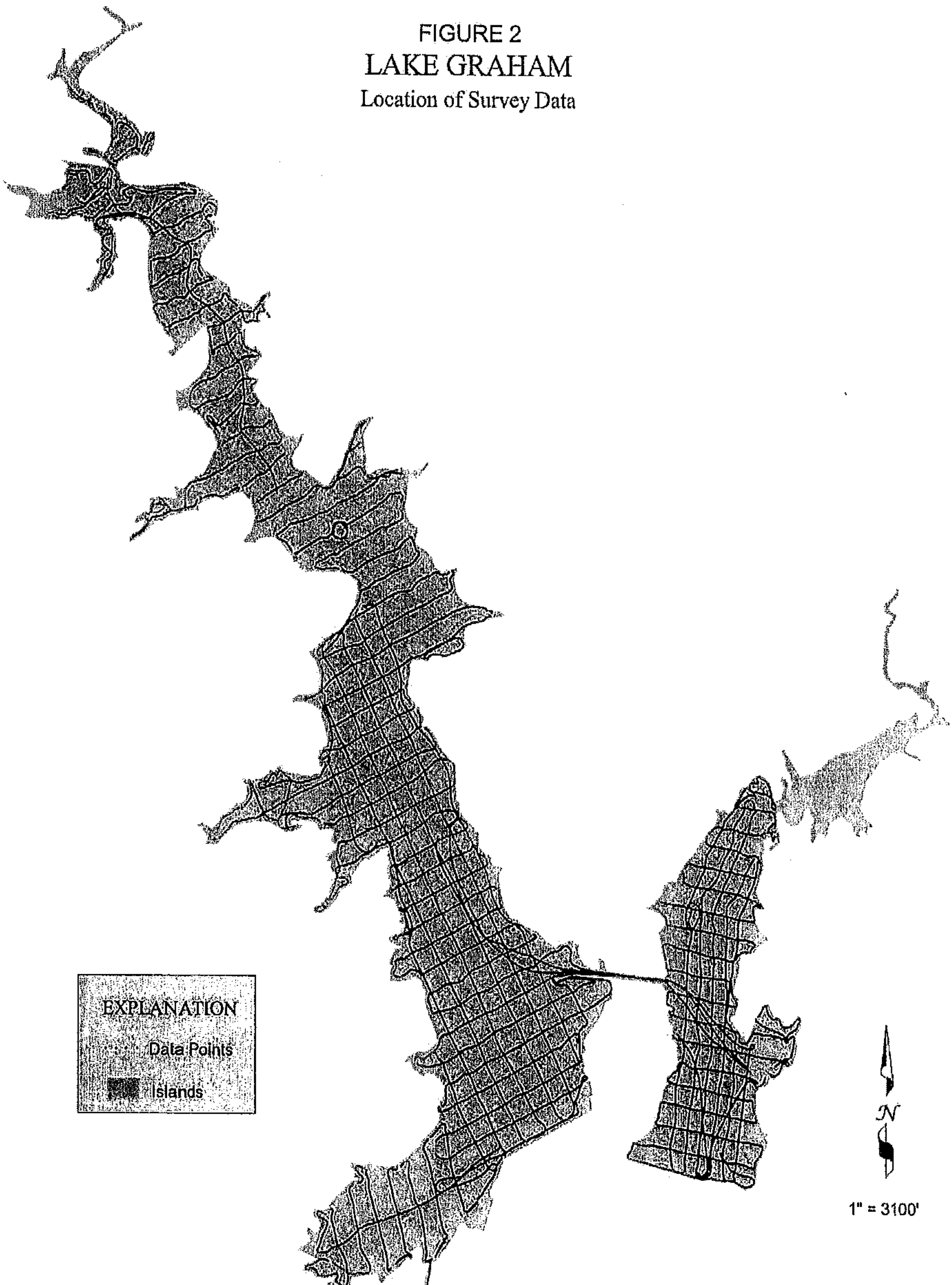

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FIGURE 3

LAKE GRAHAM

Shaded Relief

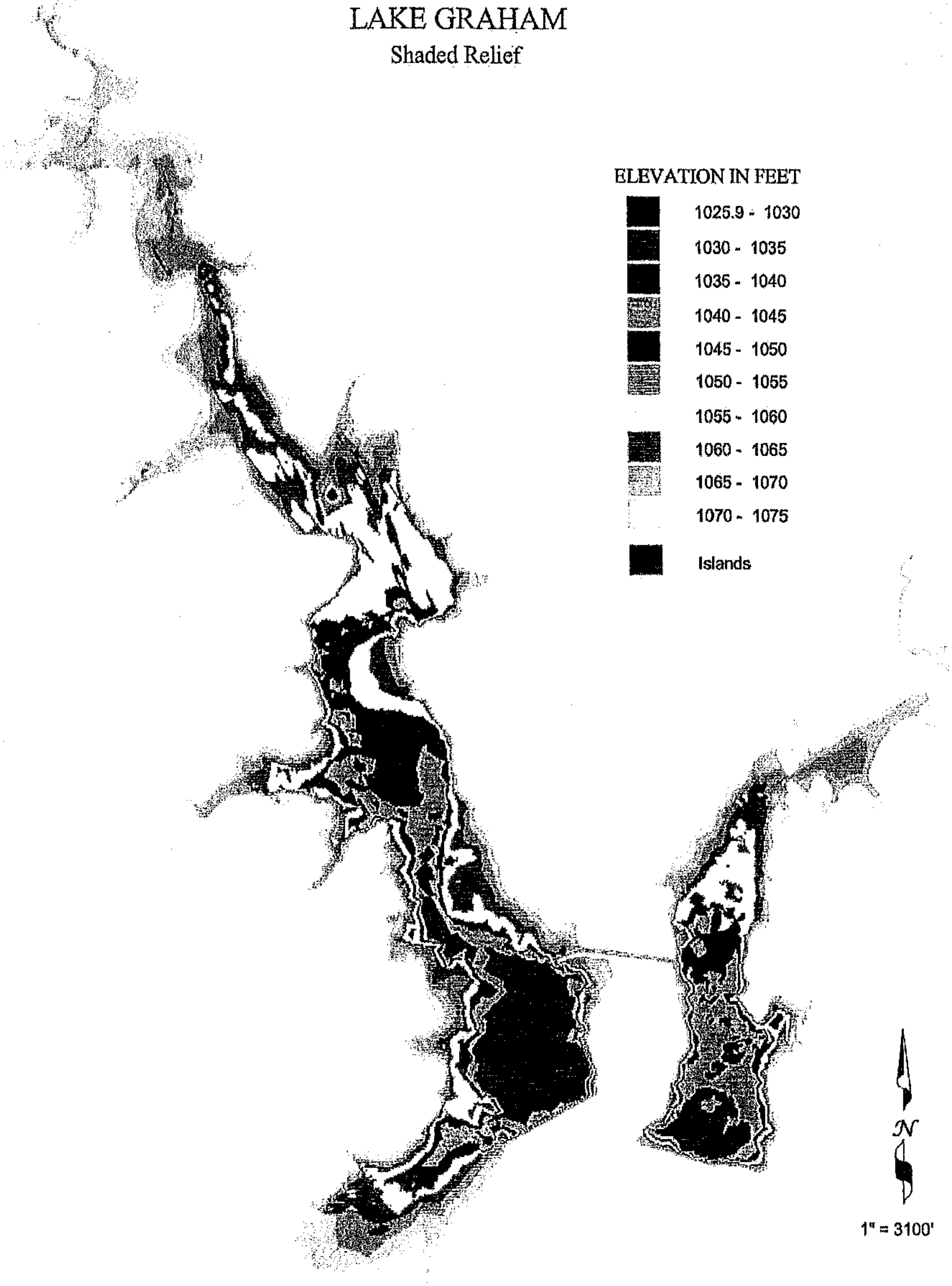

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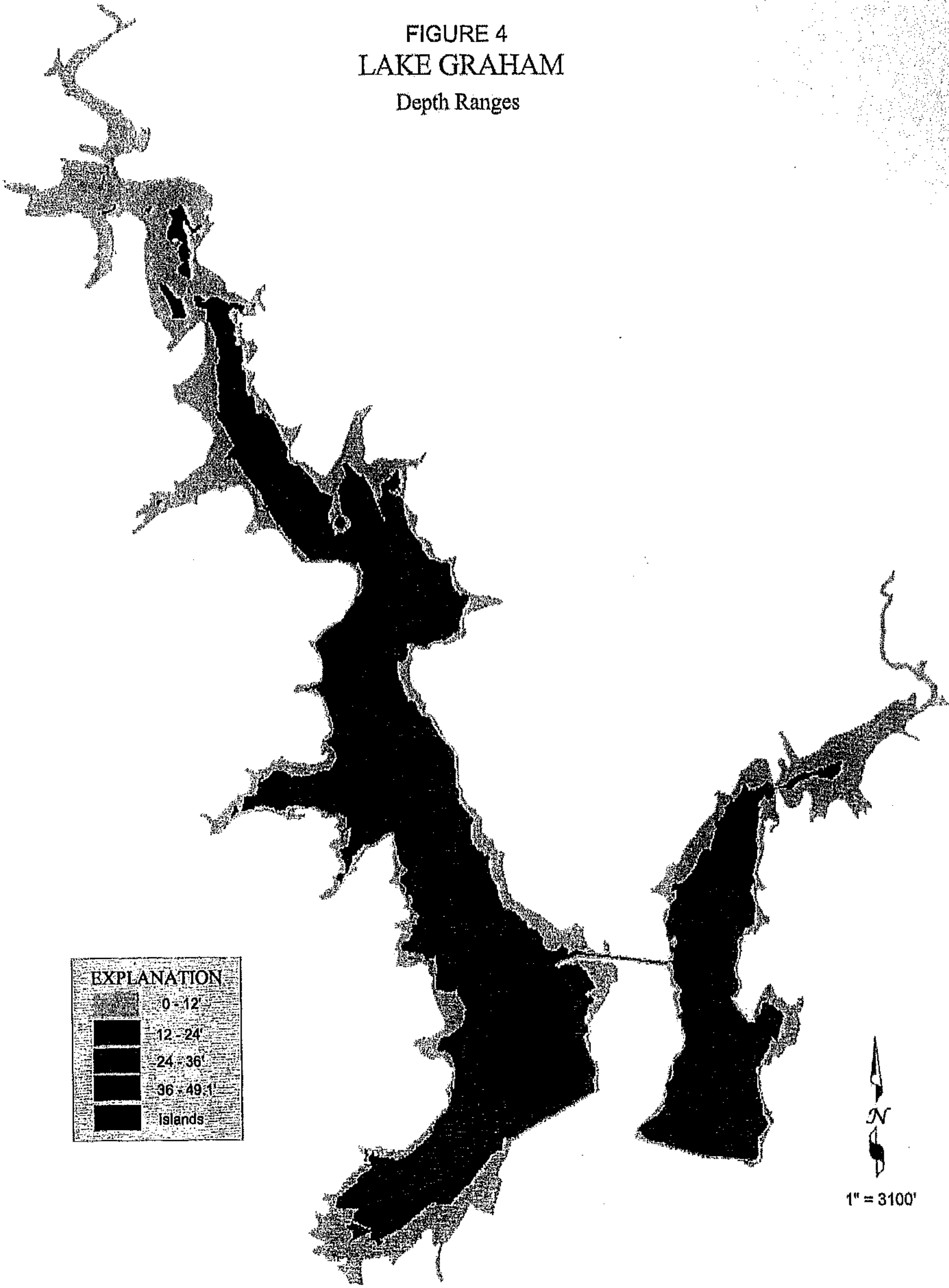
FIGURE 4
LAKE GRAHAM
Depth Ranges



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B LAKE GRAHAM BIOLOGICAL INFORMATION

FREESE AND NICHOLS

Innovative approaches
Practical results
Outstanding service

GRAHAM STEAM ELECTRIC STATION

316(b) BIOLOGICAL INFORMATION

Prepared for:

EPRI

May 2018

FINAL

Prepared by:

FREESE AND NICHOLS, INC.
4055 International Plaza, Suite 200
Fort Worth, Texas 76109
817-735-7300

TABLE OF CONTENTS

Table of Tables

1.0 INTRODUCTION

Graham Steam Electric Station (GRSES) is located on the eastern shore of Lake Graham in Young County, Texas. Lake Graham consists of two impoundments that are connected by a canal. Eddleman Dam was built on Flint Creek in 1928 and Graham Dam was built on Salt Creek in 1958 (TWDB, 2018). Both streams are tributaries of the Brazos River. The combination of the two impoundments encompasses 2,444 acres and a volume of 45,302 acre-feet at conservation pool elevation (TWDB, 2018). The manmade reservoir is stocked and managed, and therefore meets the basis to waive 40 CFR 122.21(r) requirements. Fisheries data are available through the Texas Parks and Wildlife Department (TPWD) Inland Fisheries performance reports. Data from the TPWD 2013 fishery survey were used to describe fish species that occur in Graham Reservoir (TPWD, 2014).

2.0 SPECIES NEAR GRAHAM STEAM ELECTRIC STATION COOLING WATER INTAKE STRUCTURE

Survey data suggest the most important sport fishes in Graham Reservoir include Largemouth Bass (*Micropterus salmoides*), Channel Catfish (*Ictalurus punctatus*), White Bass (*Morone chrysops*), and Crappie (*Pomoxis* spp.). Important forage fishes include shad (*Dorosoma* spp.) and sunfish (*Lepomis* spp.) [TPWD, 2014]. Table 1 provides a list of the most common species that expected to occur near the GRSES cooling-water intake structure (CWIS).

Gizzard Shad (*D. cepedianum*), Threadfin Shad (*D. petenense*), and sunfish are considered forage species and are the most common taxa by number in most lakes. Shad are pelagic with pelagic early life stages that would likely occur near the CWIS. Shad begin spawning in the spring, with rising temperatures (Baglin and Kilambi, 1968; Bodola, 1966). Threadfin Shad may spawn from spring through fall (Carlander, 1969). Eggs are broadcast in open water or over substrates. After hatching, shad are generally pelagic, but can be found throughout the reservoir. The latest fisheries survey exhibited average catch rates for Gizzard Shad, and size structure continued to show a trend toward smaller prey size fish (TPWD, 2014).

Sunfish, including Bluegill (*Lepomis macrochirus*), Redear Sunfish (*L. microlophus*), and Longear Sunfish (*L. megalotis*) are among the most common sunfish species in the area. Sunfish are generally associated with littoral habitats and may occur near the CWIS. Peak spawning of most sunfish is in the spring or early summer, although spawning may occur from March through September (Thomas et al., 2007). Sunfish spawn in nests located in littoral habitats where they offer parental protection of eggs and larvae. In 2014, Bluegill numbers presented at record lows, and Redear Sunfish abundance was also down compared with previous surveys (TPWD, 2014).

Crappie and Largemouth Bass are predators common to reservoirs in the region. These species generally occupy littoral habitats but can also utilize offshore structures. Crappie and Largemouth Bass have similar spawning habits. Their spawning is generally limited to the spring, when most spawning occurs in March and April (Schloemer, 1947; Lee, 1980). Both species spawn in nests in littoral habitats where they offer parental protection of eggs and larvae. Crappie and Largemouth Bass are listed as game fish by TPWD. Creel survey data shows that crappie and Largemouth Bass were the first and second-most sought after species in Graham Reservoir respectively. 2014 data suggests the Largemouth Bass population is below the historical average, while White Crappie (*Pomoxis annularis*) abundance and population remain good. Black Crappie only accounted for 10% of the total crappie sampled, and continue to be present in low abundance after the species was first sampled in 2005 (TPWD, 2014).

Table 1: Fish Species of Likely Occurrence in Graham Reservoir [a]

Common Name	Scientific Name	Entrainment Probability [b]	Impingement Probability [c]
PELAGIC			
Gizzard Shad	*Dorosoma cepedianum*	H	H
Threadfin Shad	*Dorosoma petenense*	H	H
BANK/STRUCTURE			
Crappie	*Pomoxis* spp.	L	L
Largemouth Bass	*Micropterus salmoides*	L	L
White Bass	*Morone chrysops*	L	L
Sunfish	*Lepomis* spp.	M	L
BENTHIC			
Blue Catfish	*Ictalurus furcatus*	L	L
Channel Catfish	*Ictalurus punctatus*	L	L

Source: Hendrickson and Cohen (2015).

H = High likelihood; M = Moderate likelihood; L = Low likelihood

[a] Species of likely occurrence based on fishery survey of Graham Reservoir (TPWD, 2014)

[b] Entrainment Probability refers to early life stages, i.e., eggs, larvae, and post-larvae passing through standard 3/8-inch mesh screen

[c] Impingement Probability refers to juvenile/adult life stages of fish impinged on standard 3/8-inch mesh screen

White Bass are another popular sport fish in Lake Graham. Adults are generally found among offshore pelagic environments. The movement of the species is dependent on water temperature, pursuit of prey, and spawning activity. Spawning typically occurs late February to late April with 12–20 degrees Celsius water temperatures; however, warmer cooling water effluent can accelerate spawning (Webb and Moss, 1968). White Bass often move upstream into creeks to spawn in shallow water. Demersal and adhesive, eggs sink and attach to submerged structure like plants, logs, gravel or rocks (Balon, 1981). White Bass are non-guarders, and adults return to deeper water once spawning is complete (Riggs, 1955). Both White Bass and Palmetto Bass were present in TPWD surveys, with White Bass presenting an all-time high gill net catch rate and increasing abundance of Palmetto Bass due to stocking in 2013 (TPWD, 2014). Palmetto Bass are a hybrid species created by crossing female Striped Bass (Morone *saxatilis*) and male White Bass; the resulting fish are sterile and require repeated stocking to maintain the population.

Channel Catfish and Blue Catfish (*I. furcatus*) are common littoral and bottom-dwelling species in the region. They can be found throughout the reservoir, but are generally associated with structure. Both species spawn during the late spring through early summer (Burgess, 1989) and deposit eggs in cavities, such as undercut banks and brush piles. The males guard the eggs and fry, and both species are popular among recreational anglers. Fisheries surveys showed stable populations of Channel Catfish and Blue Catfish, with the latter presenting expanded numbers since 2002 (TPWD, 2014). The mostly piscivorous Flathead Catfish (*Pylodictis olivaris*) is also present in the reservoir, but in lower numbers.

3.0 SPECIES AND LIFE STAGES SUSCEPTIBLE TO IMPINGEMENT AND ENTRAINMENT

The species most susceptible to impingement and entrainment in Graham Reservoir include Threadfin Shad, Gizzard Shad, and sunfish. These species have life histories that could interact with the CWIS.

Gizzard and Threadfin shad have high fecundity rates, and spawning is often synchronous where large numbers of eggs are broadcast over wide areas. Although most eggs are broadcast over littoral substrates, the larvae are pelagic and succumb to the currents of water. Peak entrainment occurs in the spring, although shad spawning can occur through the fall. The influence of cooling water effluent can create two separate spawning events in the same year. Thus, the primary period of reproduction with the highest larval recruitment would be both during the spring and fall. Impingement of healthy shad is generally uncommon; however, Threadfin Shad can be intolerant of cold temperatures, where they can become lethargic and impinge at CWIS. Shad can also be sensitive to changes in water quality (e.g., low dissolved oxygen), which may trigger impingement.

Sunfish (Lepomis spp.), Largemouth Bass, and crappie share similar spawning habits. Young fish, including larvae and sub-adults, are generally associated with littoral cover, such as aquatic vegetation, rocks, and flooded timber. Since these species deposit demersal eggs in nests among shallow, littoral habitats, entrainment of eggs is unlikely. Once hatched, the males generally provide some parental protection, helping to prevent the drift of larvae and possible entrainment. However, if habitat is suitable near CWIS, some entrainment of fry can occur.

Similar to larvae, juvenile sunfish, Largemouth Bass, and crappie generally reside in littoral habitats with cover. However, as the fish age, their mobility increases, which may increase the chance of interacting with CWIS. Depending on the amount of cover near the CWIS, some impingement of these species can occur.

As indicated in the latest TPWD (2014) report, White Bass densities can be widely variable. White Bass migrate upstream into reservoir tributaries to spawn. Therefore, abundance of juvenile life stages and year-class strength can be related to spring stream flows, which can be highly variable in west Texas.

Since White Bass generally spawn in upstream tributaries and release demersal, adhesive eggs, the probability of egg entrainment is expected to be low. Newly-hatched larvae can be carried with the currents of water into the pelagic zone of the reservoir, where they generally spend the rest of their life. At Lake Graham, the primary upstream spawning areas are far the CWIS and the probability of larval entrainment would be low. As juvenile White Bass move among pelagic areas, it is possible that some impingement could occur. However, White Bass are strong swimmers and impingent of healthy White Bass is expected to be low.

The location of catfish spawning sites in cavities within littoral habitats makes this species much less susceptible to impingement or entrainment at any life stage. Eggs are bound in adhesive masses and incubated inside cavities, away from flows associated with CWIS. Once hatched, the males generally guard the fry until their swimming ability increases. If a spawning cavity is near the CWIS, entrainment of fry could be possible, but generally uncommon. Juvenile Blue Catfish can be pelagic and impingement of this life stage can be possible.

4.0 SPECIES OF REGULATORY INTEREST

Commercial fishing is not allowed on Graham Reservoir, therefore there are no commercially important species in the reservoir. Gamefish include Largemouth Bass, White Crappie, Black Crappie, and White Bass. The species federally listed as threatened or endangered for Young County are birds and two minnow species (Table 2). There are no aquatic species federally listed as threatened or endangered that occur in the reservoir, however two endangered minnow species occur in the nearby Brazos River (U.S. Fish and Wildlife Service [USFWS], 2018). The following sections describe for each of the federally protected species their expected likelihood of interacting with the GRSES CWIS.

Table 2. Federally Listed Species in Graham Reservoir Area

Common Name	Scientific Name	Federal Status*	Potential Habitat in Lake Area	Affected by Normal Operations
BIRDS				
Red Knot	*Calidris canutus rufa*	T	Yes	No
Piping Plover	*Charadrius melodus*	T	Yes	No
Golden-cheeked Warbler	*Setophaga chrysoparia*	E	No	No
Whooping Crane	*Grus americana*	E	Yes	No
Interior Least Tern	*Sternula antillarum*	E	Yes	No
FISH				
Sharpnose Shiner	*Notropis oxyrhynchus*	E	No	No
Smalleye Shiner	*Notropis buccula*	E	No	No

Source: USFWS (2018).
* T = Threatened; E = Endangered

4.1 RED KNOT

The red knot (*Calidris canutus rufa*) is a medium-sized, stocky, short-necked sandpiper with a short, straight bill. The *rufa* subspecies, one of three subspecies occurring in North America, has one of the longest distance migrations known, travelling between its breeding grounds in the central Canadian Arctic to wintering areas that are primarily in South America (USFWS, 2014a). During migration and winter in Texas, red knots may be found feeding in small groups on sandy, shell-lined beaches, and to a lesser degree, on flats of bays and lagoons (Oberholser, 1974). It is an uncommon to common migrant along the coast, and rare inland, primarily in the eastern half of the state. Red knots are very rare summer visitors and are rare and local winter residents on the coast (Lockwood and Freeman, 2004). The wintering population in Texas, with the largest numbers occurring on the Bolivar flats, was once of the order of

3,000 during 1985 through 1996, but has recently declined (USFWS, 2007). Recent eBird (2018a) data show a sighting of twenty-three red knots approximately 75 miles southeast of Graham Reservoir at Benbrook Lake in May of 2016. There are no recorded sightings of red knot at Graham Reservoir and the likelihood of this species occurring is low due to the lack of available habitat. No critical habitat has been designated for this species.

4.2 PIPING PLOVER

The piping plover (*Charadrius melodus*) is a small shorebird that inhabits coastal beaches and tidal flats (Elliott-Smith and Haig, 2004). Approximately 35 percent of the known global population of piping plovers winter along the Texas Gulf coast, where they reside 60 to 70 percent of the year (Campbell, 2003). The piping plover population that winters in Texas breeds on the northern Great Plains and around the Great Lakes. The species is a rare to uncommon migrant and winter resident in coastal areas of south Texas (Lockwood and Freeman, 2004). No potential habitat occurs within the aquatic environment of Graham Reservoir; however, potential stopover habitat exists on exposed islands/bars and along the shoreline. The species would almost exclusively use lake shoreline habitat during migration periods for a few days at a time before continuing their journey. eBird (2018b) data shows piping plover sightings at Graham Reservoir in March 2015 on the south end of the lake (eBird 2018b), with birds likely using the lake for a stopover during migration. While the species was spotted in the area previously, the chance of seeing it again is still low due to its rarity and the lack of exposed sandy shoreline at Graham Reservoir. Critical habitat has been designated for this species; however, it does not exist at any inland Texas locations.

4.3 GOLDEN-CHEEKED WARBLER

The golden-cheeked warbler (*Setophaga chrysoparia*) is federally listed as endangered and migrants reside in habitats consisting mainly of dense, mature ashe juniper mixed with various oak species. This woodland habitat typically grows on limestone hills and canyons of central Texas. Golden-cheeked warblers are summer residents, generally restricting their range to their preferred breeding habitat (Lockwood and Freeman, 2004). eBird (2018c) data confirm golden-cheeked warbler activity approximately 20 miles south of Graham Reservoir at Possum Kingdom State Park. Due to the lack of suitable, unfragmented habitat, the golden-cheeked warbler is not likely to occur near Graham Reservoir.

4.4 WHOOPING CRANE

The whooping crane (*Grus americana*) is the tallest bird in North America and is recognized for its distinctive call and white plumage. The species was federally listed as endangered on March 11, 1967 (32 *Federal Register* 4001, USFWS, 1967). Threats to whooping cranes include habitat loss, powerline collision, illegal hunting, and general human disturbances (Canadian Wildlife Service and USFWS, 2007). Currently, there are several populations of whooping cranes, including migratory and non-migratory experimental populations in Louisiana and Florida. The Texas migratory population breeds and nests in Wood Buffalo National Park in Alberta, Canada during the summer and flies south to Aransas National Wildlife Refuge (NWR) near Rockport, Texas, on the Texas Gulf coast (USFWS, 2017). Whooping cranes have been spotted approximately 48 miles away at Lake Amon G Carter near Bowie, Texas in December 2014 (eBird, 2018d). Sightings near large bodies of water, agriculture fields, and near wetlands are not uncommon during migratory season within the flight path. Graham Reservoir is in the potential flight path for migrating whooping cranes and the birds could use the reservoir as a temporary stopover location before continuing to the coast. However, the birds would likely stay in the area briefly to rest or avoid bad weather before continuing their journey. Critical habitat has been designated for this species; however, it does not exist at any inland Texas locations.

4.5 INTERIOR LEAST TERN

Two breeding populations, one coastal and the other inland, are considered separate subspecies of the least tern (*Sternula antillarum*). It is the interior population of the least tern that is listed as an endangered species (USFWS, 2014b). Any nesting birds at least 50 miles or greater from the coastline are considered interior least terns. In Texas, the interior least tern is known to breed north along the Red River, along the Canadian River in the Texas Panhandle, and among northeast Texas reservoirs (Lockwood and Freeman, 2004). Least terns are the smallest member of the gull and tern family at around 8 to 9 inches long. They nest on barren to sparsely vegetated sandbars along rivers, sand/gravel pits, reservoir shorelines, and occasionally on gravel rooftops. Recent eBird (2018e) data show multiple sightings from Lake Bridgeport most recently in August 2017.The likelihood of this species occurring at Lake Graham is moderate, depending on reservoir elevation. The interior least turn could possibly use the reservoir shoreline when it is below normal pool elevation where there are large amounts of exposed shoreline. No critical habitat has been designated for this species.

4.6 SHARPNOSE SHINER

The Sharpnose Shiner (*Notropis oxyrhynchus*) is an endangered minnow species endemic to the Brazos River drainage that has also naturally occurred in the Wichita and Colorado rivers (Thomas et al., 2007). Currently, the Sharpnose Shiner's range is restricted to the upper Brazos river and its major tributaries, a reduction of over 70 percent of its historical range. The species needs wide, shallow, and flowing waters less than 1.6 feet deep with sandy substrates in the arid prairie region of Texas (Moss and Mayes, 1993). The fish are tolerant of high temperature, high salinity, high turbidity, and low dissolved oxygen, but low flows on consecutive years often results in continual population decline. Due to a lack of suitable habitat, and intolerance of impoundments, the Sharpnose Shiner does not occur in Graham Reservoir. Critical habitat has been designated for the species, but it does not occur within Graham Reservoir or any upstream tributaries.

4.7 SMALLEYE SHINER

The Smalleye Shiner (*Notropis buccula*) is an endangered minnow species endemic to the Brazos River and its tributaries (Thomas et al., 2007). The species is currently restricted to the upper Brazos River, however its historical range has been reduced by 50 percent. The species needs wide, shallow, and flowing waters less than 1.6 feet deep with sandy substrates in the arid prairie region of Texas (Moss and Mayes, 1993). The fish are tolerant of high temperature, high salinity, high turbidity, and low dissolved oxygen, but low flows on consecutive years often results in continual population decline. Due to a lack of suitable habitat, and intolerance of impoundments, the Smalleye Shiner does not occur in Graham Reservoir. Critical habitat has been designated for the species, but it does not occur within Graham Reservoir.

4.8 SPECIES CONCLUSIONS

While protected species have potential to occur within the Graham Reservoir area, there is no nexus between any of the federally listed bird or fish species and the GRSES cooling water intake structure. The Sharpnose Shiner and Smalleye Shiner potentially may occur downstream of Graham Reservoir in the Brazos River, which is less than four miles away. Salt Creek and Flint Creek are both tributaries to the Brazos River, but are not considered critical habitat for the minnow species. Therefore, there is no significant risk to either federally protected species or their designated critical habitat. No critical habitat for any federally listed species occurs within or in the area of Graham Reservoir or any upstream tributaries.

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C APPROVAL OF LAKE GRAHAM AS A CCRS

Luminant

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August 17, 2015

Executive Director
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Attn: Lynda Clayton (MC-150)

Re: 316(b) – Request for Designation as a Closed-Cycle Recirculating System
Lake Graham Reservoir
Certificate of Adjudication # 12-3458

Dear Ms. Clayton,

Luminant Power requests the Director's determination of Lake Graham Reservoir as a closed-cycle recirculating system as defined in 40 CFR 125.92(c)(2). As discussed in the last paragraph of Section V(B)(1)(b) of the preamble of the *National Pollutant Discharge Elimination System – Final Regulations To Establish Requirements for Cooling Water Intake Structures at Existing Facilities and Amend Requirements at Phase I Facilities,* issued August 15, 2014 in the Federal Register Vol. 79, No. 158, (at page 48327), the Lake Graham Reservoir was lawfully built in waters of the U.S. in part for the purpose of providing cooling water for the Graham Steam Electric Station (GRSES). The GRSES was built by Texas Electric Service Company, one of the predecessor companies of Luminant Power. Luminant Power is the owner and operator of GRSES.

The Lake Graham reservoir was authorized in 1954, and it is located in Young County. The reservoir was constructed, and is owned & operated by the City of Graham. A letter from the City of Graham confirming the reservoir history and purpose to support GRSES is attached, as well as a copy of their Certificate of Adjudication.

The Lake Graham reservoir cooling system is designed to minimized make-up flows by recirculation of the water used for cooling within the reservoir. Water in the reservoir is used for non-contact cooling, discharged to Lake Eddleman reservoir, and then returned back to Lake Graham reservoir via the connecting canal. This method and route are to allow waste heat to be dissipated to the atmosphere before it is again reused. Also, because it is a reservoir system, this system essentially eliminates blowdown and completely eliminates drift (both of which are losses associated with cooling towers).

If you have any other questions, or require any additional information, please contact Mr. Gary Spicer at 214-875-8299.

Sincerely,

David P. Duncan

David P. Duncan

Bryan W. Shaw, Ph.D., P.E., *Chairman*
Toby Baker, *Commissioner*
Richard A. Hyde, P.E., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

September 2, 2015

RECEIVED
SEP - 9 2015
BY:

Mr. David P. Duncan, Director, Environmental Generation
Environmental Services
Luminant Power
1601 Bryan Street
Dallas Texas 75201

Re: Request for approval of determination of closed-cycle recirculating system relevant to the Clean Water Act 316(b) requirements for Luminant Power Lake Graham Reservoir

Dear Mr. Duncan:

This letter is in response to your letter dated August 17, 2015 requesting approval of a designation of a closed-cycle recirculating system (CCRS) as stipulated in 40 Code of Federal Regulations (CFR) §125.92(c) for Lake Graham Reservoir.

The documentation submitted with the request includes the following:

(1) cover letter including information on Lake Graham Reservoir;

(2) the Certificate of Adjudication for water rights issued by the TCEQ to the City of Graham with the most recent Amendment granted on November 18, 1982 indicating that the reservoir was built for industrial cooling water purposes;

(3) A letter dated March 16, 2015 from the City of Graham indicating that one of the original reasons for construction of the Lake Graham Reservoir was to provide industrial cooling water for a power plant with an accompanying contract between the City of Graham and Texas Electric Services Company (predecessor of Luminant Energy) to substantiate the letter; and,

(4) a statement in the cover letter indicating that the reservoir cooling system is designed to minimize make-up flows and, because it is a reservoir system, essentially eliminates blowdown and drift as required in 40 CFR §125.92(c).

Based upon the information provided and in accordance with 40 CFR §125.92(c), Lake Graham Reservoir is approved for designation as a CCRS relevant to compliance with the Federal Clean Water Act 316(b) regulation.

Please be advised that, at this time, the approval of a designation for a CCRS for Lake Graham Reservoir only indicates that this CCRS system meets Best Technology Available (BTA) for impingement as identified in 40 CFR §125.92. BTA for entrainment will be addressed at a later time.

Additionally, approval of Lake Graham Reservoir as a CCRS does not address information requirements to be submitted with a wastewater discharge permit application outlined in 40 CFR §122.21(r). Based upon Lake Graham Reservoir being approved as a CCRS, you may request, under separate letter, some, or all, of the application information requirements in 40 CFR §122.21(r) be waived.

If you have any questions or comments regarding the contents of this letter please contact me at 512-239-4591 or via email at Lynda.Clayton@tceq.texas.gov.

Sincerely,

Lynda Clayton, Team Leader
Water Quality Assessment Team
Water Quality Division
Texas Commission on Environmental Quality

LC/ml

cc: ✓ Mr. Gary Spicer, Environmental Services, Luminant Power, 1601 Bryan Street Dallas Texas 75201

D EVALUATION OF FINE-MESH SCREENS

ALDEN

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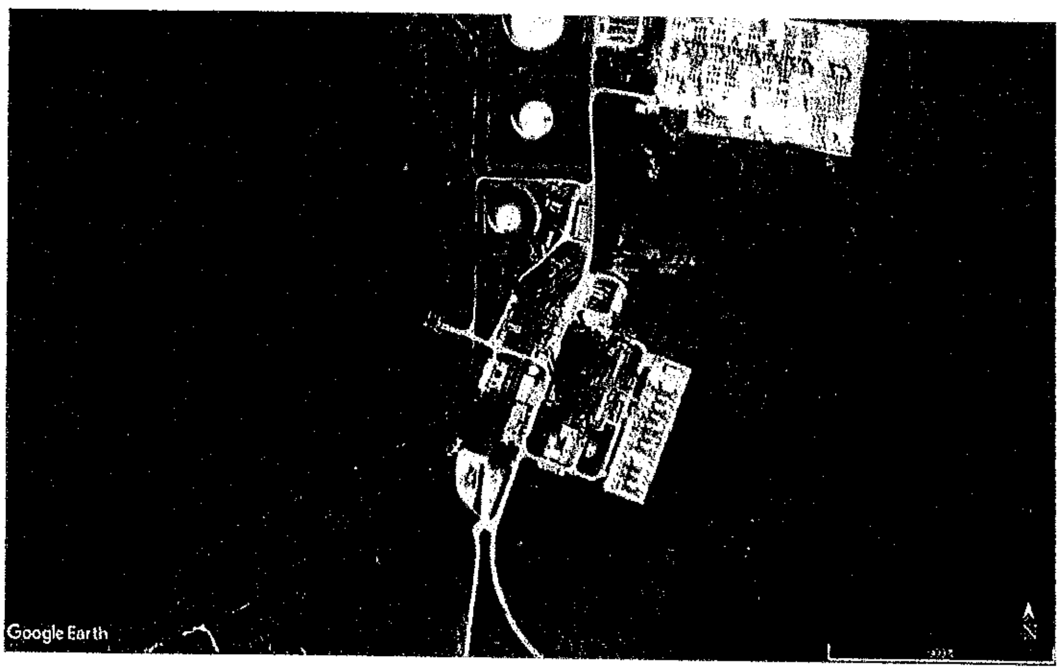
Appraisal Level Design and Costs Estimate for Fine-mesh Ristroph and Cylindrical Wedgewire Screens to meet 316(b) for the Graham Power Plant

DRAFT

Prepared for:

Luminant

April 2018



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1 INTRODUCTION

Texas Commission on Environmental Quality (TCEQ) has agreed that the Graham Power Plant (GRSES) withdraws from a cooling lake and has closed-cycle recirculating system. TECQ has also agreed to waive the 122.21(r) information, since the facility withdraws from lakes or reservoirs with stocked and managed fisheries. To make a BTA determination on entrainment a brief description and appraisal level cost estimate of options to further reduce entrainment were developed in this study. Two fine-mesh intake technologies; fine-mesh traveling water screens with fish friendly features, and narrow-slot cylindrical wedgewire screens were evaluated. Both 0.5mm and 2.0 mm openings were evaluated for each technology.

2 CWIS DESCRIPTION

The GRSES cooling water intake structure (CWIS) is located along the eastern design shoreline, facing the main body of Graham Lake. The CWIS has four bays (two for each unit), each with a trash rack, traveling water screen and vertical, mixed flow circulating water pump. The trash rack at the front of each bay prevents large debris from reaching the traveling water screens. The traveling water screens are located about 13 ft downstream of the trash racks. The two screens for Unit 1 are 8 ft wide and the two screens for Unit 2 are 10 ft wide. All four of the screens are equipped with 3/8 in. square mesh. The circulating water pumps are located downstream of the traveling water screens. The two circulating water pumps used for Unit 1 have a rated capacity of 184.9 cfs (83,000 gpm), and the two circulation pumps used for Unit 2 have a rated capacity of 206 cfs (92,500 gpm). When all four circulating water pumps are operating, the flow to the facility is 782 cfs (351,000 gpm).

3 CONCEPTUAL DESIGN TO RETROFIT THE EXISTING INTAKE WITH FINE-MESH MODIFIED TRAVELING WATER SCREENS AND A FISH RETURN SYSTEM

Fine-mesh traveling water screens (TWS) modified with fish protection features (also known as modified-Ristroph or Ristroph-type screens) are one of the most commonly used technologies for reducing entrainment mortality at CWIS. The screens include all of the BTA features identified in the §125.92(s) for coarse-mesh screens including fish-lifting buckets, low-pressure spray washes, and continuous rotation. A drawing showing some of the fish protection features of a typical Ristroph-type screen is shown on Figure 3-1. The use of fine-mesh with modified traveling water screens does not impact impingement survival of larger organisms and the screens could be used under § 125.94(c)(5) to for best technology available (BTA) requirements for reducing impingement mortality.

Several types of fine-mesh TWS with fish protection features are available: through-flow traveling screens (similar to the existing screens); dual-flow screens (like standard screens only rotated 90 degrees to the flow); and rotary-disk screens (both the ascending and descending sides of the screen face upstream). All of these TWS options are compatible with 0.5-mm and 2.0-mm fine-mesh. The feasibility and cost differential of installing fine-mesh fish modified traveling screens with any of these available screen types or either mesh size is indistinguishable at this level of design and costing.

Fine-mesh TWS can either be installed in the existing intakes or in expanded intakes to lower the approach and through-screen velocity. At low water levels (El. 1,045 ft) the velocity approaching the Unit 1 screens ranged from 0.8 fps to 1.0 fps depending on the number of circulating water pumps operating. Under the same low water conditions the velocity approaching the Unit 2 screens was calculated to be approximately 0.8 fps regardless of the number of circulating water pumps operating. Screen approach velocities up to 1.5 ft/sec have shown no or minor effect on post-collection survival of the larger (> 12 mm) larvae tested during an EPRI sponsored fine-mesh modified traveling water screens laboratory study (EPRI 2010). This is consistent with the findings of EPRI sponsored coarse-mesh modified traveling water screens laboratory studies (EPRI 2006; Black 2007) that reported approach velocities did not appear to affect post-impingement survival of juvenile and adult fish, ≥50 mm, over a range of 1-3 ft/sec tested. Post-collection survival of smaller (< 12 mm) entrainable fish was generally poor (~30%), regardless of the screen approach velocity. Therefore, it is our best professional judgement (BPJ) that fine-mesh modified traveling water screens installed in the existing screen bays are the most technically feasible fine-mesh modified traveling screen option for GRSES.

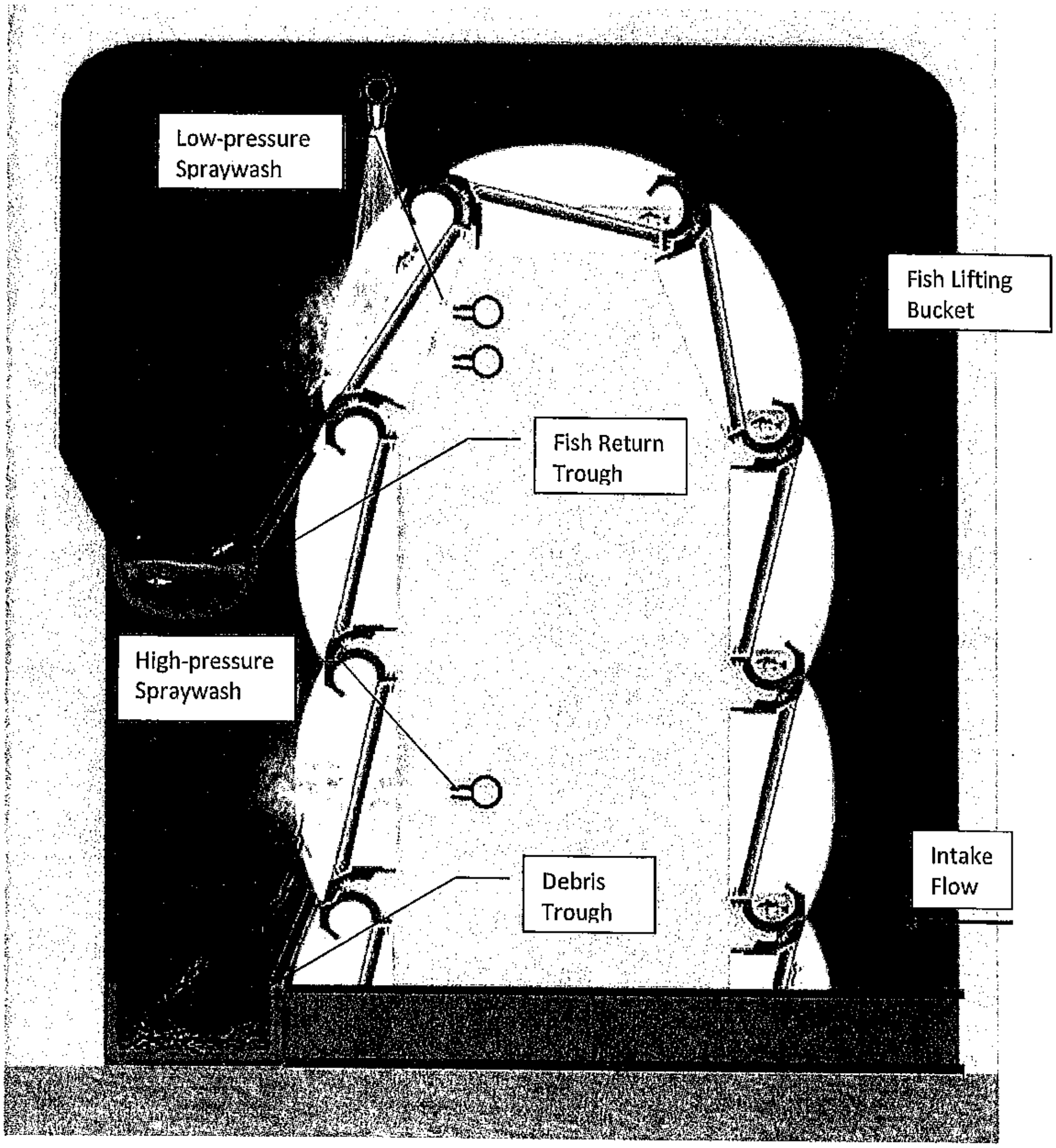

Figure 3-1: Typical Fish-Friendly Features of a Modified Traveling Water Screen

3.1 Design and Operation

The new fine-mesh modified traveling water screens will be installed in the existing screen bays, replacing the existing traveling water screens. Each screen basket will incorporate a fish bucket to hold collected organisms in about 2 inches of water while they are lifted to the fish recovery system. A low-pressure spray will be used to gently remove the fish from the fish holding buckets into a fish sluice and a conventional high-pressure wash will then remove remaining debris into a debris sluice. High pressure spray wash water for the existing screens is withdrawn from the warm water discharge. The existing spraywash system is not expected to be sufficient to meet the spraywash needs of the new screens and a new, larger spraywash pump was assumed for each unit.

Fish and debris removed by the low-pressure spray washes will flow into a fish trough located above the debris trough. The fish troughs from all four screens will combine with the debris troughs downstream of the last screen. The combined fish and debris trough will flow east around the power plant and into the Eddleman portion of Graham Lake, as shown in Figure 3-2. This discharge location was selected to minimize potential re-impingement.

Operation and maintenance activities associated with the new screens are similar to those required for the existing traveling water screens. The level of effort necessary will increase as a result of increased operation of the screens. The O&M procedures are expected to be very similar regardless of mesh size. The screens will be rotated and cleaned continuously whenever a unit's circulating water pumps are operating as required by the Rule for modified traveling screens to reduce impingement duration of impingeable and entrainable life stages. Fine-mesh screens use small diameter wires that are more prone to damage from debris and fouled spray wash nozzles and require additional effort to inspect and maintain, including the replacement of approximately 20% of the fine-mesh material annually. Repairs and replacement of other screen components including major overhauls of the screens is estimated at 10% of the capital cost of the new screens per year. The fish return line will be inspected and cleaned daily to prevent any debris plugging and to remove bio-growth.

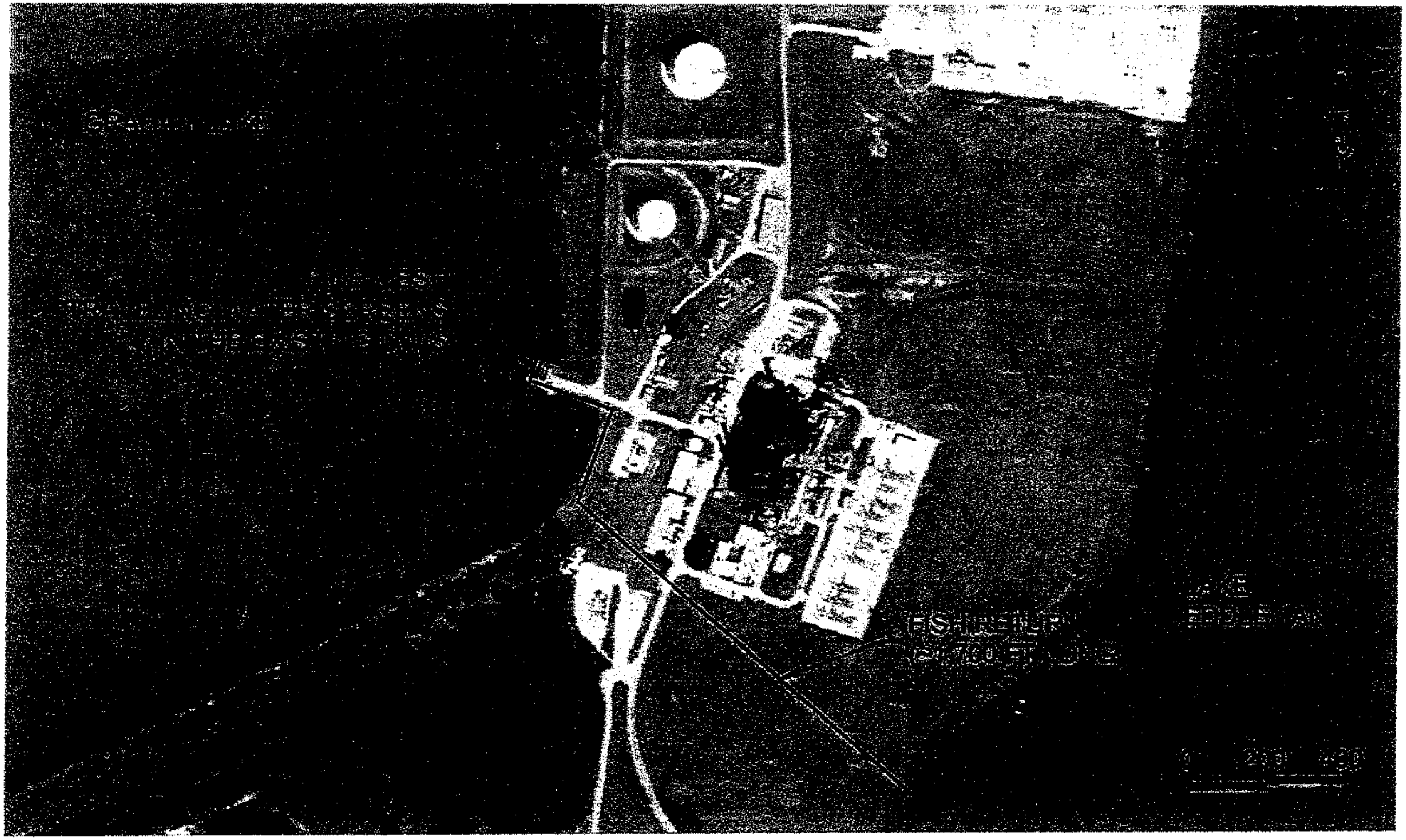

Figure 3-2: Conceptual Design for New Fine-mesh Screens with a New Fish Return – Plan

3.2 Uncertainty and Additional Studies

Debris Handling and Clogging Study – There is limited data on the ability to maintain fine-mesh screens in Texas cooling lakes. A pilot study should be conducted to determine if fine-mesh screens can be installed under the debris and biofouling conditions in Graham Lake. This study, including the costs to modify an existing screen with fine-mesh material is expected to cost approximately $150,000 for a 1 year fine-mesh deployment.

Study to Evaluate Screen Impact on Cooling Water Pump Performance – Head loss across the traveling water screens will increase due to the reduced open area associated with fine-mesh screens. The increase in head loss across the fine-mesh screens will vary based on the water levels and selected mesh size. While Alden does not expect any pump maintenance or operational issues, a pump intake model should be conducted prior to adding fine-mesh screens to the CWIS. This model will investigate potential adverse impacts to the pump performance. The study is expected to cost approximately $50,000 and is included in the overall cost estimate for this option.

Fish Return Discharge Studies – The fish return design presented in this evaluation is conceptual in nature. A detailed engineering analysis including a hydraulic study of the return over the range of expected flows will be needed to refine the design of the fish return. These studies are expected to cost approximately $70,000 and are included in the overall cost for this option.

4 CONCEPTUAL DESIGN OF NARROW–SLOT CYLINDRICAL WEDGEWIRE SCREENS

Narrow-slot wedgewire screens are exclusion devices that act as a passive barrier to reduce impingement of juvenile and adult fish and the entrainment of eggs and larval fish into a CWIS. Two narrow-slot sizes, 0.5 mm and 2.0 mm were evaluated in this study. Wedgewire screen designs developed in this assessment use an average through-slot velocity of 0.43 ft/sec. This low design through-screen velocity,(e.g. ≤0.5 ft/sec), allows cylindrical wedgewire screens to automatically meet Compliance Alternative 2 at § 125.94(c)(2) of the Rule for impingement BTA.

The efficacy of wedgewire screens with entrainable sized organisms is dictated primarily by the slot (opening) size and the sizes of the organisms present near the screens. Fish behavior near the screens also plays a role in the overall effectiveness of the screens and larvae longer than about 6 to 8 mm have been shown to possess sufficient swimming capabilities to completely avoid entrainment despite being able to fit physically fit through the slot openings (Otto et al 1981). In addition, local flow conditions that include the through-slot velocity and ambient currents (also referred to as the channel or approach velocity) can affect screen performance. Entrainment has been positively correlated with through-slot velocity and inversely related to ambient velocity (Hanson et al. 1978; Heuer and Tomljanovich 1978; EPRI 2003). Too be most effective, a combination of low through-slot velocity and ambient cross-currents in the water body should be present to carry debris and organisms with limited motility past the screens. Overtime, this will lead to an accumulation of debris around the screens that will need to be manually removed.

Ambient currents within a cooling lake, such as Graham Lake are expected to be primarily a result of the circulating water flow. Wind and thermal differences are also expected to affect localized lake currents. In the absence of ambient currents to move eggs and larvae past the screens the biological effectiveness of narrow-slot wedgewire screens will be lower than what would be expected in a riverine or other environment with greater ambient currents. The lack of ambient currents will also limit the effectiveness of any cleaning system because there will be no currents to transport debris away from the screens.

4.1 Design and Operation

Both potential wedgewire screen arrays at GRSES were designed with 6-ft diameter Tee-shaped screens, with an average through-slot velocity of 0.43 ft/sec. Each screen includes two 6-ft long screening sections on either end of a center non-screening section with an overall length of approximately 22 ft, as shown on Figure 4-1.

The difference between the two slot sizes is the number of screens and size of header. The total number of screens necessary for each slot size is provided in Table 4-1.

Both options will use screens mounted to intake pipes located connected to a bulkhead wall constructed in front of the existing CWIS. Automated gates build into the bulkhead wall will act as emergency bypass gates in the event the wedgewire screens cannot be maintained in a clean condition. The traveling water screens will remain in place and operational to screen the intake flow if the wedgewire screens need to be bypassed.

The header pipes would be 7 ft in diameter and aligned and anchored to the lake bottom using large concrete anchors. These header pipes would extend out into the deep water section of the lake to move them to a less biologically productive area. An automatic cleaning system, either brush cleaned or air-backwash would be used to clean the screens. A boat barrier would be needed around the deployment area to prevent damage to either the screens or boats using the lake. The layout of the 0.5 mm slot option is provided on Figure 4-2 and the 2.0 mm slot option on Figure 4-3.

The new screens will be equipped with an automated system to remove any debris and biofouling from the screen face. Two automatic cleaning systems are available an air-backwash and a cleaning system. A pilot study is recommended to select the most appropriate cleaning system and cleaning frequency for GRSES. Alden anticipates that screens with 0.5 mm slot openings will require more frequent cleaning than screens 2.0 mm slot openings. In addition to regular cleanings, bi-annual diver inspections to remove large debris and identify damage or sediment buildup around the screens will also be necessary. The emergency bypass gates, built into the bulkhead wall will be tested at least once a month and the remaining traveling water screens rotated for approximately 10 minutes per day to ensure they remain operational. Visual inspections of the screen deployment area and brush cleaning control system should be conducted daily. Replacing wear items and repairing any damaged screens is estimated to cost 5% of the capital cost of the new screens and cleaning system annually. Maintenance requirements for the existing circulating water pumps will not change.

Table 4-1: Number of 72 inch Diameter Wedgewire Tee-screens needed to Screen the GRSES Flow

Slot-size	Total Number of Screens
0.5 mm	40
2.0 mm	16

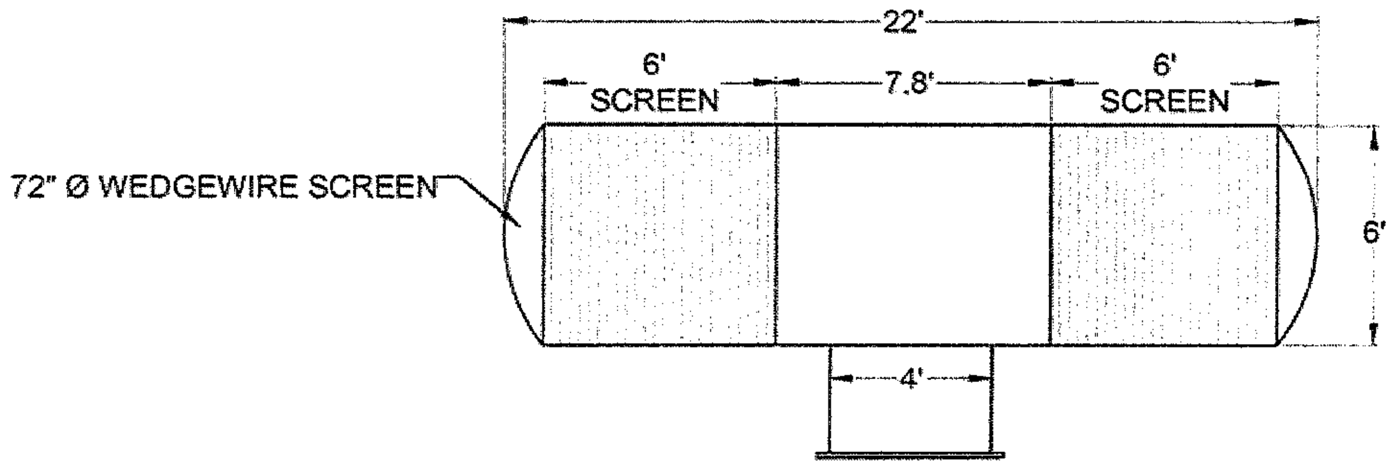

Figure 4-1: Typical 6.0-ft Diameter Narrow-slot Wedgewire Tee Screen

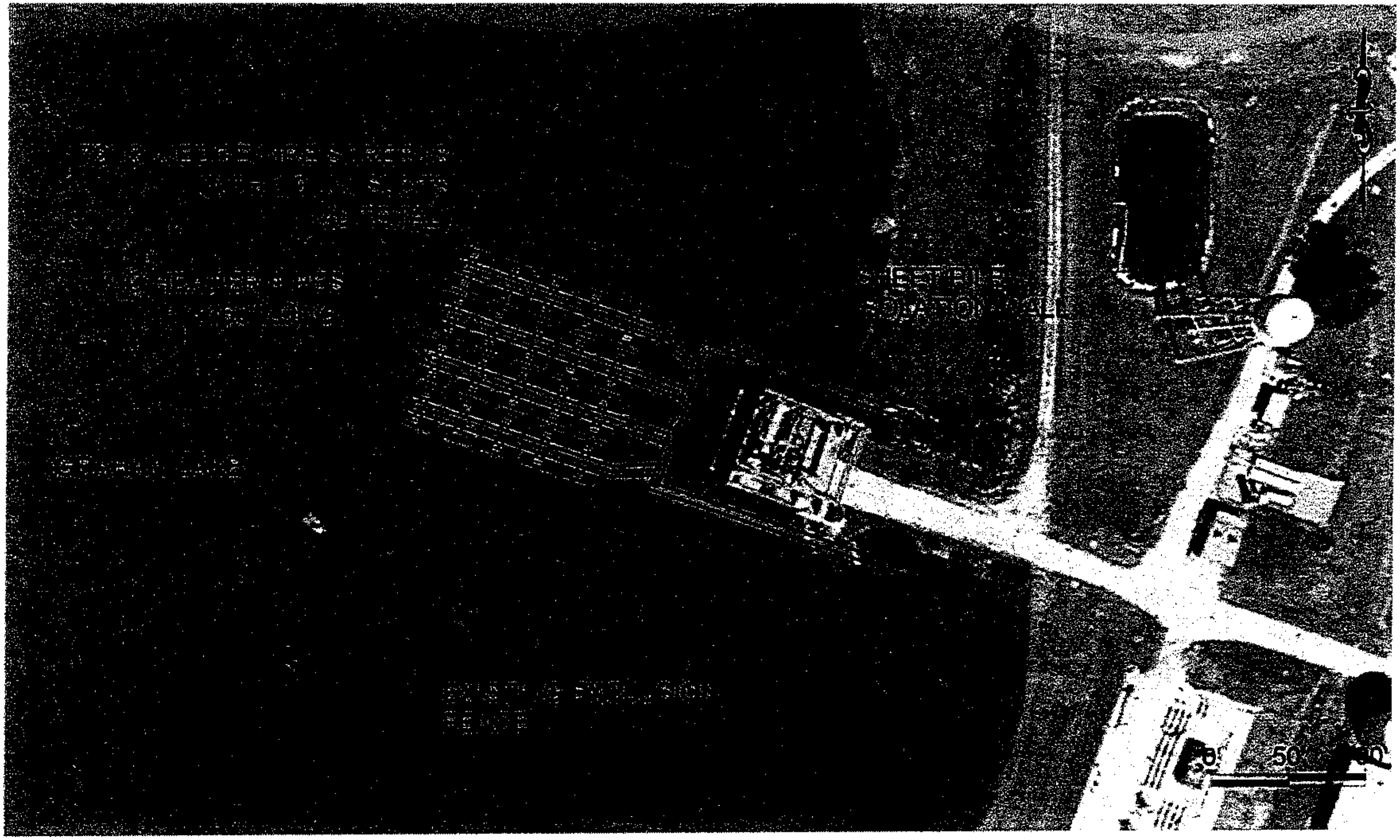

Figure 4-2: Conceptual 0.5 mm Slot Wedgewire Screen Design – Plan

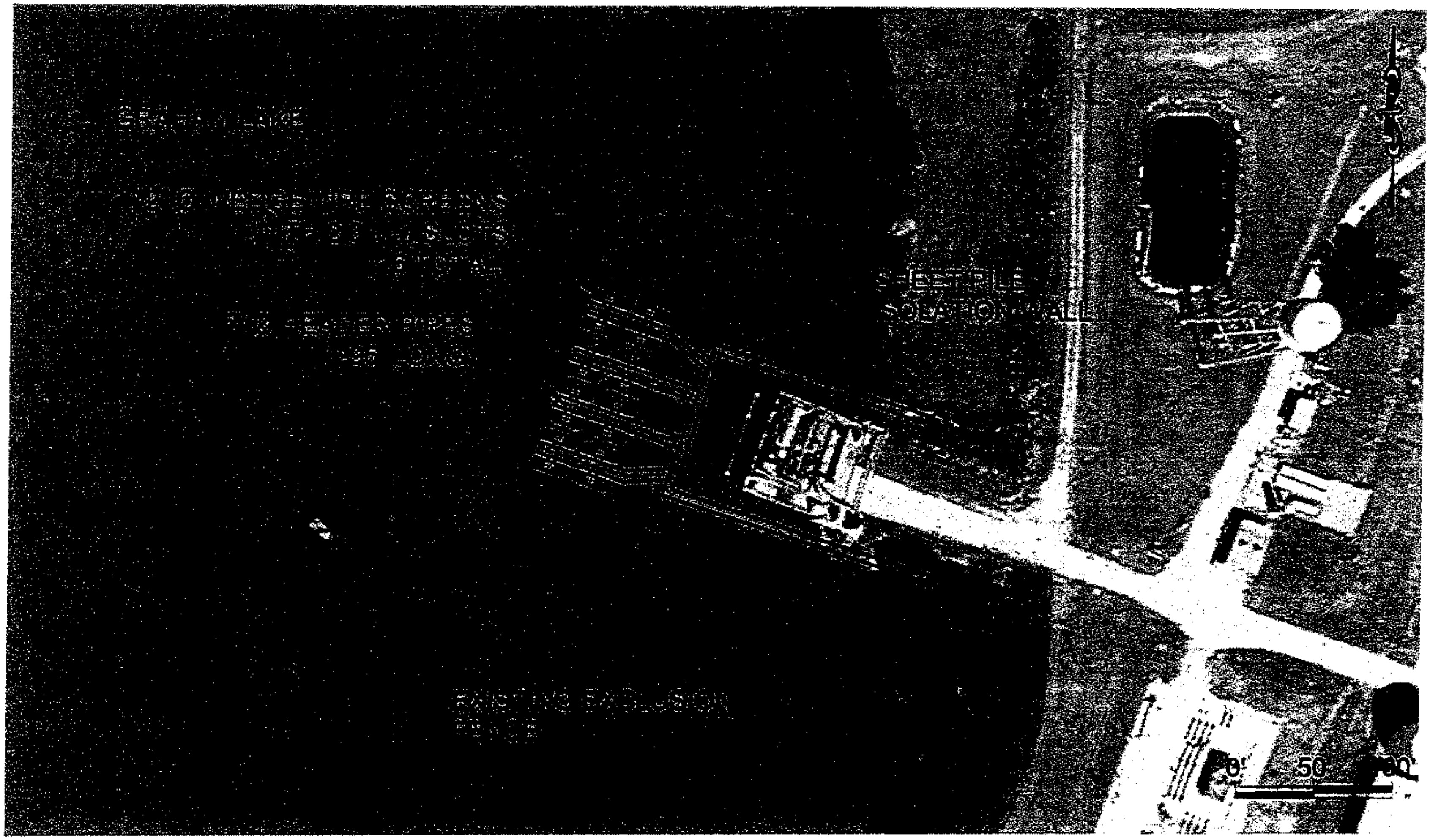

Figure 4-3: Conceptual 2.0 mm Slot Wedgewire Screen Design – Plan

4.2 Uncertainty and Required Additional Studies

Submerged cylindrical wedgewire screens are commonly used to screen riverine intakes where there is a sweeping current past the screens. Alden is aware of only one generating facility that uses narrow-slot cylindrical wedgewire screens with once-through cooling. The facility uses brush cleaned screens with 0.75 mm slots in a deep water lake. As a result, prior to making a BTA determination for any of the wedgewire screen options at GRSES, it would be necessary to conduct studies to confirm the operational feasibility of these screens.

Biofouling and Debris Control Studies - A pilot study to approximate the rate of debris loading and biofouling at the proposed deployment location will be required to ensure that the screens can be maintained under the debris loading and biofouling conditions in Graham Lake. The results of this study will confirm the technical feasibility of the proposed screens and increase the accuracy of the O&M cost estimate. This study is expected to cost an estimated $250,000 and has been included in the total project costs.

Study to Evaluate Screen Impact on Cooling Water Pump Performance – Both cylindrical wedgewire configurations will result in approximately a 2 ft reduction in water level at the pumps with clean screens. However, this may adversely affect pump performance. This is especially true if debris plugging or biofouling becomes an issue. A hydraulic model study (physical or numeric model) is required to investigate potential adverse impacts to the pump performance. The study will also be used to verify and optimize the flow distribution through the screens and determine cleaning frequency. This study is expected to cost approximately $50,000 and is included in the overall cost estimate for this option.

5 ENGINEERING COST ESTIMATES

Costs, based on the conceptual designs, were estimated using Alden's cost database. These costs were adjusted for identifiable differences in project sizes and operations. Due to their generalized nature, these appraisal-level order of magnitude cost estimates are intended to identify the relative cost differences between selected alternatives and provide budgetary cost estimates for fine-mesh screen options at GRSES. These costs are consistent an Association for the Advancement of Cost Engineering (AACE) Class 5 estimates (AACE 2005). The accuracy for order-of-magnitude costs is typically -30% to +50%.

Pre-construction permitting and study costs are also included when necessary. Permitting costs have been taken as 2% of the materials and labor cost for each alternative. Costs for additional laboratory or field studies that may be required, such as hydraulic modelling studies, and biological or engineering evaluations of prototype fish protection systems were estimated using historical study cost estimates developed by Alden for other projects and are considered indirect costs.

Ongoing costs to operate the fine-mesh screens are based on Alden's experience estimating detailed operational and maintenance efforts (O&M) adjusted for identifiable differences in project sizes and operations. Labor costs were assumed at $40 per man-hour. The power cost to operate each technology was assumed to be $36.08/MWh. This value represents the average cost to operate and maintain an investor owned fossil plant in 2016 (EIA 2017). Costs for regular repairs and major overhauls of the fine-mesh screens are included as part of the overall O&M estimate.

Facility compliance costs were developed for the fine-mesh traveling water screen and narrow-slot wedgewire screen options. The facility compliance costs are the costs that Luminant would incur at GRSES for each of the alternatives. These costs are presented as the net present value (NPV) and equivalent annual costs (EAC), based an assumed remaining life expectancy of 30 years (2018-2047). NPV is provided to convert all the present and future costs to a base year, assumed to be 2018. This was done to estimate the present cost of each alternative over its lifespan. EAC is the annual costs of owning, operating and maintaining each option over the life of the technology. This cost can be used as part of a benefits cost analysis by comparing them to the expected annual benefits provided by each alternative.

The costs used for the NPV and EAC analysis are based on incremental changes from current CWIS design and operations. Constant dollars, as recommended by EPA for developing cost estimates during feasibility studies (EPA 2000), were used this present value analysis. Constant dollars assume the cost of goods and services remain the same over time and are not affected by inflation or deflation. These constant dollars were then adjusted with discount rates of 3% and 7% to account for the time value of the money. The use of these discount rates is consistent with the social discount rates required as part of the social cost analysis required by EPA under the § 316(b) Rule. Taxes and depreciation were not considered in this analysis.

The costs for the three fine-mesh screen options evaluated at GRSES are summarized in Table 5-1. The compliance costs are presented in Table 5-2

Table 5-1: Order of Magnitude Costs for Fine-mesh Screens at GRSES

Alternative	Capital Costs (2018 $)	Permitting and Pre-construction Study Costs (2018 $)	Annual O&M (2018 $)
Fine-Mesh Ristroph Screens in Existing Intake	$10,529,000	$390,000	$515,000
Narrow-slot Wedgewire Screens with 0.5 mm Slots	$30,409,000	$648,000	$569,000
Narrow-slot Wedgewire Screens with 2.0 mm Slots	$18,941,000	$516,000	$221,000

Table 5-2: Incremental NPV and Annualized Compliance Cost Estimate for Fine-mesh Screens at GRSES

Technology	Fine-Mesh Ristroph Screens in Existing Intake	Narrow-slot Wedgewire Screens with 0.5 mm Slots	Narrow-slot Wedgewire Screens with 2.0 mm Slots
Net Present Value (2018 $) (7% Discount rate)[1,2]	$13,503,000	$33,123,000	$19,340,000
Net Present Value (2018 $) (3% Discount rate)[1,2]	$16,807,000	$39,122,000	$22,172,000
Equivalent Annual Cost (2018 $) (7% Discount rate)[1,2]	$1,088,000	$2,669,000	$1,559,000
Equivalent Annual Cost (2018 $) (3% Discount rate)[1,2]	$1,354,000	$3,153,000	$1,787,000

1. Incremental costs are the difference in costs from current traveling water screen operations.
2. Costs assume a remaining life expectancy of 30 years (2018-2047).

6 REFERENCES

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Attachment M

Design and Engineering Calculations of CWIS

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

40 CFR 122.21 Impacted by 316(b) of Clean Water Act

Graham Steam Electric Station

Cooling Water Intake

Graham Steam Electric Station (GRSES) is located on the eastern shore of Lake Graham in Young County, Texas. Lake Graham, as it is now known, is a combination of two man-made reservoirs: Edelman created in 1932 and Salt Creek created in 1959. It is owned and operated by the City of Graham and was supported and partially funded by TXU. The USGS Site Map shows the intake orientation on the reservoir. At the conservation pool level of 1075.0 ft. msl, the reservoir has a surface area of 3,228 acres and a maximum depth of 45.0 ft.

GRSES is a two-unit natural gas fired facility rated at 615 MW (total) utilizing a once-through cooling water system. The 2004 capacity factor for GRSES (both units) was about 9.0%.

GRSES has one cooling water intake structure (CWIS), situated along the eastern design shoreline facing the main body of the reservoir. The CWIS has four bays, two for Unit 1 and two for Unit 2. Each of the four operating bays is equipped with one vertical, mixed flow circulating water pump, located downstream of the traveling water screens.

The two circulating water pumps used for Unit 1 have a rated capacity of 180 cfs (81,000 gpm), and the two circulating water pumps used for Unit 2 have a rated capacity of 206 cfs (92,500 gpm) when both circulating pumps per unit are operating at the conservation pool level. When all four circulating water pumps are operating, the flow to the facility is 772 cfs (347,000 gpm). There is a trash rack at the front of each intake which prevents large debris from reaching the traveling water screens. The traveling water screens are located about 13 ft downstream of the trash racks. Each Unit 1 CWIS bay is 9'-2" wide and fitted with a screen that is 8 ft. wide with 3/8 in. square mesh. Each Unit 2 CWIS bay is 11'-2" wide and fitted with a screen that is 10 ft. wide with 3/8 in. square mesh.

Velocities within the CWIS bays were calculated at the conservation pool water level (El. 1075.0 ft) and at low water level (El. 1045.0 ft). Calculations were made both at the maximum design flow capacity for each unit's bays which is when one circulating water pump is out of service and when both circulating water pumps are operating under normal conditions.

	Low Level	Conservation Level
Unit 1		
One circulating pump in operation:	1.0 fps	0.47 fps
Two circulating pumps in operation:	0.81 fps	0.40 fps
Unit 2		
One circulating pump in operation:	0.83 fps	0.44 fps
Two circulating pumps in operation:	0.79 fps	0.37 fps

The through-screen velocity was not calculated since the exact porosity of the traveling water screens is not known; however, the through-screen velocity can be estimated at approximately twice the screen approach velocity.

Intake Structure Velocity Calculations

For

Luminant Power
Graham Station Units 1 and 2

September, 2008

By

Palco Engineering & Construction Services, Inc.
211 East Beltline Rd., Suite 103
DeSoto, TX 75115

STATE OF TEXAS
CAROL ANN ALSTON
65830
LICENSED
PROFESSIONAL ENGINEER

Sept 19, 2008

PALCO Engineering & Construction Services
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VELOCITY CALCULATIONS FOR GRAHAM UNIT 1

Graham Intake Structure contains two (2) intake bays for Unit 1. The design low lake water level is elevation 1045'. The conservation or normal operating water level is 1075'. The design high lake water level is elevation 1088'.

Normal operating condition is when both circulating pumps are in service. Calculations follow for both cases when one or two circulating water pumps are in operation at normal operating and low lake levels.

Bay 1 contains:
- 1 Circulating Water Pump (ref. Curve N-1484):
  - Flow rates when one circ water pump is operating:
    - 97,000 gpm @ Normal Water Level (NWL) [point A]
    - 83,000 gpm @ Low Water Level (LWL) [point B]
  - Flow rates when both bay circ water pumps are operating:
    - 81,000 gpm @ Normal Water Level (NWL) [point C]
    - 66,000 gpm @ Low Water Level (LWL) [point D]
- 1 Screen Wash Pump (ref. Curve 8QFO-4) 300 gpm
- 1 Lake Makeup Water Pump (ref. Curve 5400-1542R) 175 gpm

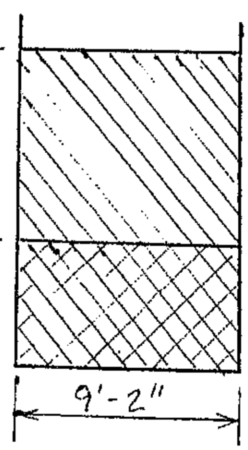
Bay 2 contains:
- 1 Circulating Water Pump (ref. Curve N-1484):
  - Flow rates when one circ water pump is operating:
    - 97,000 gpm @ Normal Water Level (NWL) [point A]
    - 83,000 gpm @ Low Water Level (LWL) [point B]
  - Flow rates when both bay circ water pumps are operating:
    - 81,000 gpm @ Normal Water Level (NWL) [point C]
    - 66,000 gpm @ Low Water Level (LWL) [point D]
- 1 Screen Wash Pump (ref. Curve 8QFO-4) 300 gpm

Each Bay has the same dimensions and thus the same cross-section flow area (ref. Dwg. G-152676 for dimensions and water levels):

@ Normal Water Level EL 1075.00'

@ Low Water Level EL 1045.00'

Bay Bottom EL 1025.00'



$Area_{NWL}$ = (1075.0'-1025.0')x(9.17')
= 458.5 ft^2

$Area_{LWL}$ = (1045.0'-1025.0')x(9.17')
= 183.4 ft^2

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$$\text{Velocity} = \frac{\text{Flow Rate}}{\text{Flow Area}}$$

Maximum velocity flow conditions occur in Bay 1 when a single Circulating Water Pump is in operation with the Screen Wash and Makeup Water Pumps also in use:

Velocity @ Low Water Level and one circulating water pump in operation:

$$V_{LWL} = \frac{(83{,}000+300+175)\ \text{gal}}{\text{min}} \cdot \frac{1}{183.4\ \text{ft}^2} \cdot \frac{\text{ft}^3}{7.48\ \text{gal}} \cdot \frac{\text{min}}{60\text{s}} = 1.0\ \text{ft/s}$$

Velocity @ Normal Water Level and one circulating water pump in operation:

$$V_{NWL} = \frac{(97{,}000+300+175)\ \text{gal}}{\text{min}} \cdot \frac{1}{458.5\ \text{ft}^2} \cdot \frac{\text{ft}^3}{7.48\ \text{gal}} \cdot \frac{\text{min}}{60\text{s}} = 0.47\ \text{ft/s}$$

The usual operating condition is when both circulating water pumps are in service and the velocities under those conditions are:

$$\text{Velocity at Low Water Level } (V_{LWL}) = \frac{(66{,}000+300+175)\ \text{gal}}{\text{min}} \cdot \frac{1}{183.4\ \text{ft}^2} \cdot \frac{\text{ft}^3}{7.48\ \text{gal}} \cdot \frac{\text{min}}{60\text{s}} = 0.81\ \text{ft/s}$$

$$\text{Velocity @ Normal Water Level } (V_{NWL}) = \frac{(81{,}000+300+175)\ \text{gal}}{\text{min}} \cdot \frac{1}{458.5\ \text{ft}^2} \cdot \frac{\text{ft}^3}{7.48\ \text{gal}} \cdot \frac{\text{min}}{60\text{s}} = 0.40\ \text{ft/s}$$

Thus, it is expected that the worst case screen approach velocity will be 1.0 ft/s when one circulating water pump is out of service and the lake level is at low water level. Under normal operating conditions and at normal lake levels, the approach velocity is expected to be 0.4 ft/s.

Through-screen velocity was not calculated since the exact porosity of the screens is unknown; however, it can be approximated as twice the approach velocity.

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VELOCITY CALCULATIONS FOR GRAHAM UNIT 2

Graham Intake Structure contains two (2) intake bays for Unit 2. The design low lake water level is elevation 1045'. The conservation or normal operating water level is 1075'. The design high lake water level is elevation 1088'.

Normal operating condition is when both circulating pumps are in service. Calculations follow for both cases when one or two circulating water pumps are in operation at normal operating water and low water levels.

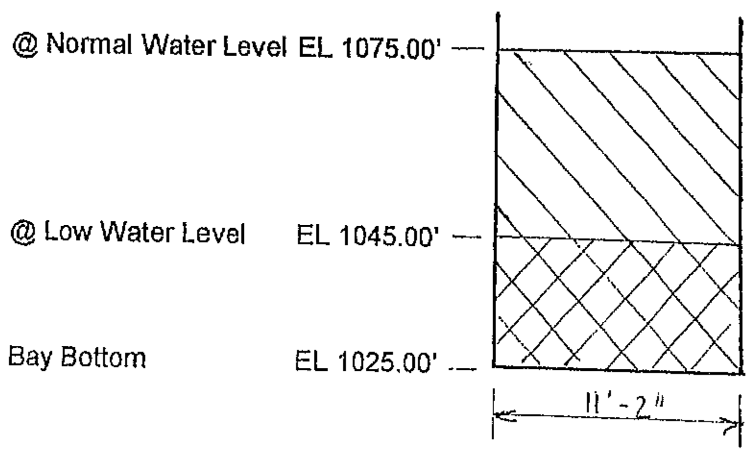
Bay 1 contains:

- 1 Circulating Water Pump (ref. Curve G2-1003-SC):
  - Flow rates when one circ water pump is operating:
    - 110,000 gpm @ Normal Water Level (NWL) [point A]
    - 83,000 gpm @ Low Water Level (LWL) [point B]
  - Flow rates when both bay circ water pumps are operating:
    - 92,500 gpm @ Normal Water Level (NWL) [point C]
    - 79,000 gpm @ Low Water Level (LWL) [point D]
- 1 Lake Makeup Water Pump (ref. Curve 5400-1542R) 175 gpm

Bay 2 contains:

- 1 Circulating Water Pump (ref. Curve G2-1003-SC):
  - Flow rates when one circ water pump is operating:
    - 110,000 gpm @ Normal Water Level (NWL) [point A]
    - 83,000 gpm @ Low Water Level (LWL) [point B]
  - Flow rates when both bay circ water pumps are operating:
    - 92,500 gpm @ Normal Water Level (NWL) [point C]
    - 79,000 gpm @ Low Water Level (LWL) [point D]

Each Bay has the same dimensions and thus the same cross-section flow area (ref. Dwg. G-152676 for dimensions and water levels):



$$Area_{NWL} = (1075.0' - 1025.0') \times (11.17') = 558.5\ ft^2$$

$$Area_{LWL} = (1045.0' - 1025.0') \times (11.17') = 223.4\ ft^2$$

PALCO Engineering & Construction Services
A Division of PALCO Enterprises, Inc.
211 East Beltline Rd., Ste. 103 ♦ DeSoto, TX 75115
Office: 972-223-7676 ♦ Fax: 972-223-7677

$$\text{Velocity} = \frac{\text{Flow Rate}}{\text{Flow Area}}$$

<u>Maximum velocity</u> flow conditions occur in Bay 1 when a single Circulating Water Pump is in operation with the Makeup Water Pump also in use:

Velocity @ Low Water Level and one circulating water pump in operation:

$$V_{LWL} = \frac{(83{,}000+175)\text{ gal}}{\text{min}} \left| \frac{}{223.4\text{ ft}^2} \right| \frac{\text{ft}^3}{7.48\text{ gal}} \left| \frac{\text{min}}{60\text{s}} \right. = 0.83\text{ ft/s}$$

Velocity @ Normal Water Level and one circulating water pump in operation:

$$V_{NWL} = \frac{(110{,}000+175)\text{ gal}}{\text{min}} \left| \frac{}{558.5\text{ ft}^2} \right| \frac{\text{ft}^3}{7.48\text{ gal}} \left| \frac{\text{min}}{60\text{s}} \right. = 0.44\text{ ft/s}$$

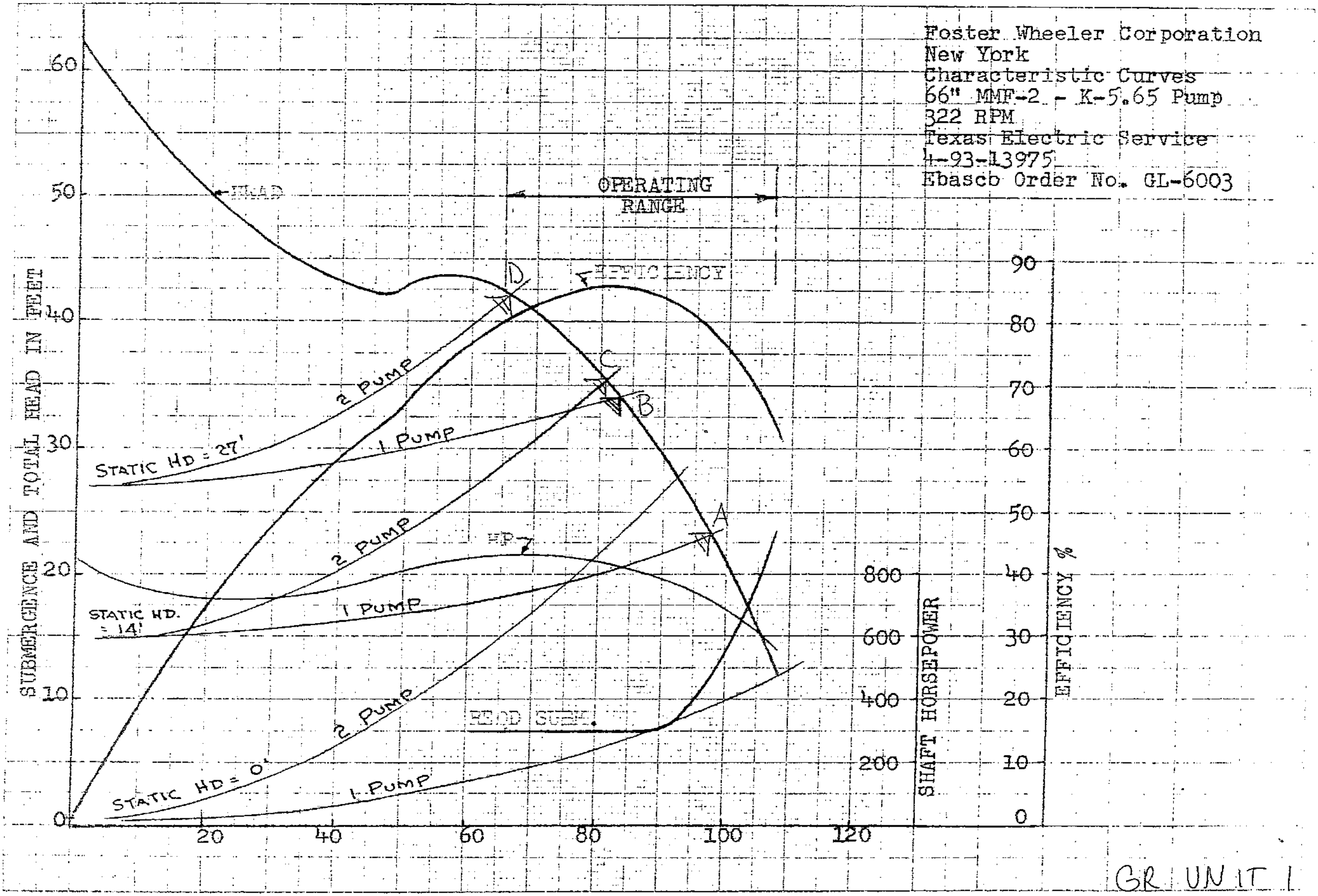
The <u>usual operating condition</u> is when both circulating water pumps are in service and the velocities under those conditions are:

$$\text{Velocity at Low Water Level } (V_{LWL}) = \frac{(79{,}000+175)\text{ gal}}{\text{min}} \left| \frac{}{223.4\text{ ft}^2} \right| \frac{\text{ft}^3}{7.48\text{ gal}} \left| \frac{\text{min}}{60\text{s}} \right. = 0.79\text{ ft/s}$$

$$\text{Velocity @ Normal Water Level } (V_{NWL}) = \frac{(92{,}500+175)\text{ gal}}{\text{min}} \left| \frac{}{558.5\text{ ft}^2} \right| \frac{\text{ft}^3}{7.48\text{ gal}} \left| \frac{\text{min}}{60\text{s}} \right. = 0.37\text{ ft/s}$$

Thus, it is expected that the worst case screen approach velocity will be 0.83 ft/s when one circulating water pump is out of service and the lake level is at low water level. Under normal operating conditions and at normal lake levels, the approach velocity is expected to be 0.37 ft/s.

Through-screen velocity was not calculated since the exact porosity of the screens is unknown; however, it can be approximated as twice the approach velocity.



GR UNIT 1

N-1484-C

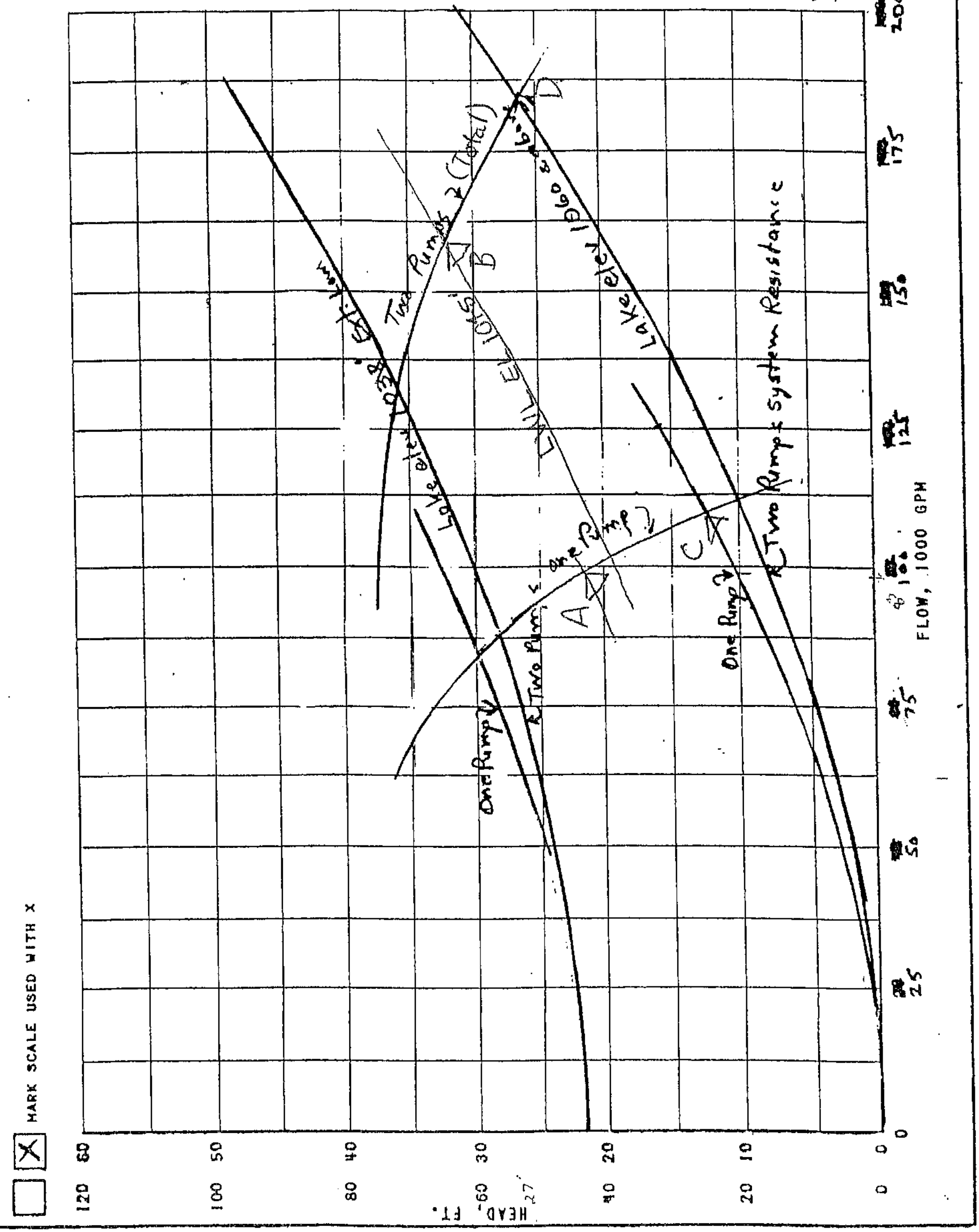
Specification Ebasco 48-6:
Surface Condenser and Accessories

Purchaser's
Identification:
TES G2-1003-SC

CIRCULATING WATER PUMPS
SYSTEM HEAD CURVES

Figure 4

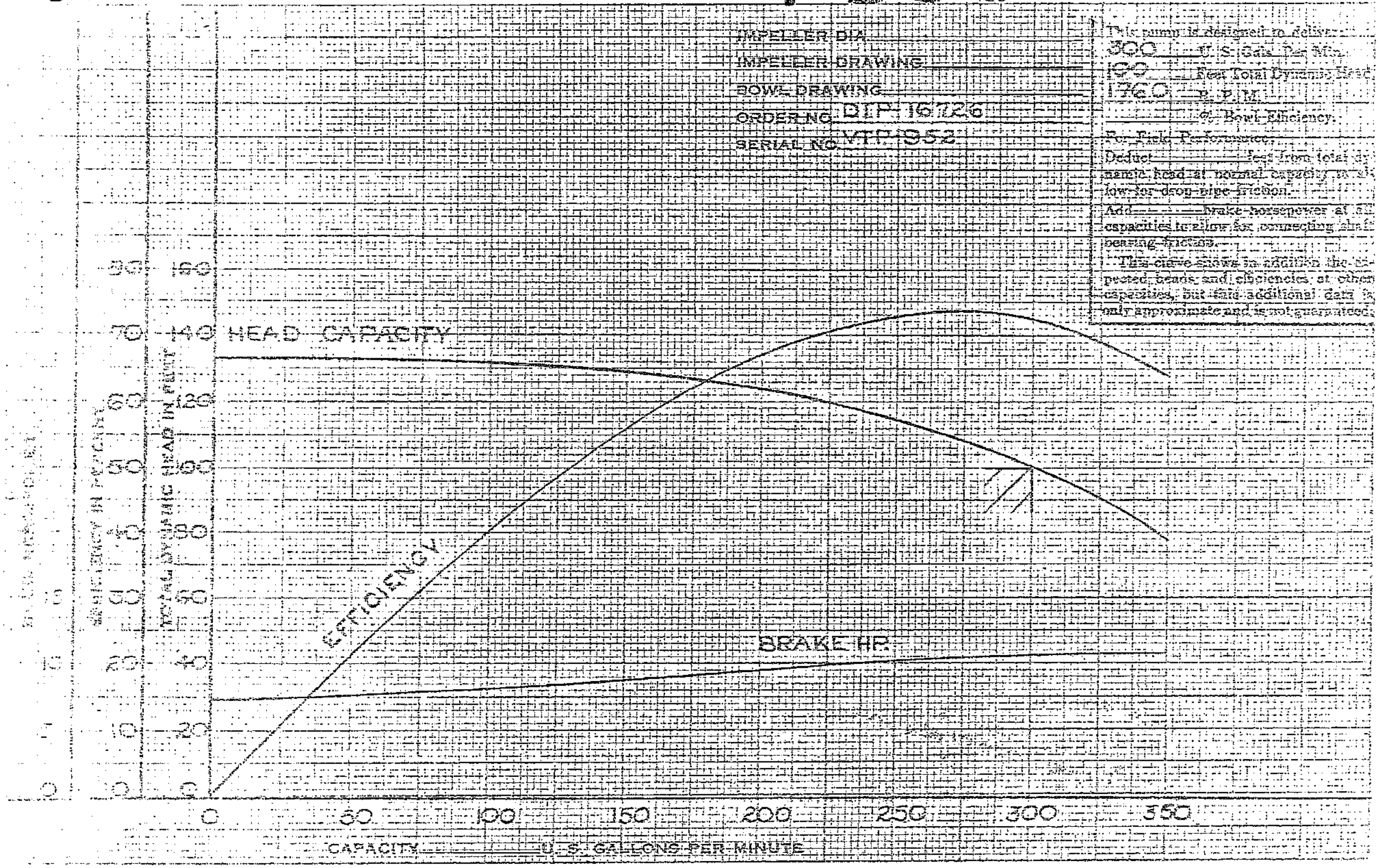
Date of Spec
Nov. 16, 1965, Rev. 2/8/66
(Last Page)



#2 Unit

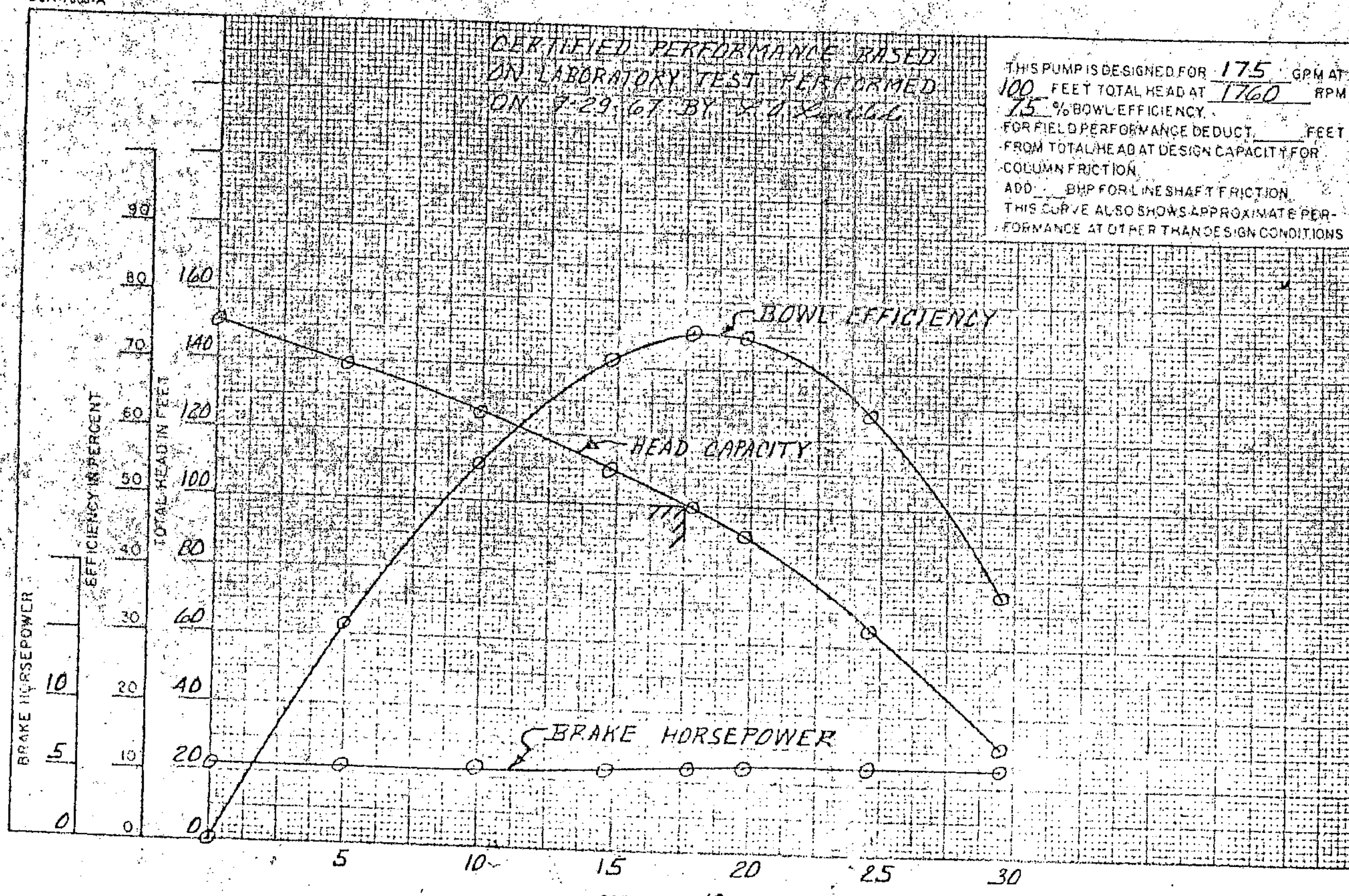
CRSES SCREEN WASH GL-602

7353-821H-0



G. P. M.	PERFORMANCE CURVE FOR 8QFO-4 VERTICAL TURBINE PUMP	IMPELLER SYMBOL QF
G. P. M.	WORTHINGTON CORPORATION DENVER WORKS - DENVER, COLORADO	NUMBER OF STAGES 4
FT.		DRIVER: TYPE MOTOR
PIPE FRICTION FT.		HORSEPOWER 15
ABOVE GROUND FT.		SPEED 1760 R. P. M.
DYNAMIC HEAD FT.	DEN-7931 CURVE NO. DATE 2-11-59 MADE BY [signature]	METHOD OF DRIVE DIRECT

DEN-7868-A



BRONZE IMPELLER	C.I. ENAM BOWL	8M-23 PUMP	WORTHINGTON CORPORATION	7-29-67 DATE	VTP-19847 SERIAL NO
FULL 5 9/16" IMP. DIA	15 H.P. DRIVER	4 NO OF STAGES	VERTICAL PUMP DIVISION	CUST NO	DTP-27716 ORDER NO
2120 W TEST NO	1760	L.A.L.			

5400-1542 R 0 DATE REC 9-12-67

TEXAS ELECTRIC SERVICE CO.
GRAHAM S.E.S. 1968
375 MW EXT UNIT NO. 2

P.O 1010 ITEM

A	DRAWING REVIEW	REVIEWED WITHOUT COMMENTS.	1	✓
		REVIEWED WITH COMMENTS AS NOTED	2	
		NOT APPLICABLE	3	
		NO COMMENTS; NO PRINT RETURNED	4	
		NOT FOR INSTALLATION	5	
B	PROCEED WITH FABRICATION	NO FURTHER REPRODUCIBLE REQUIRED	4	
		RESUBMIT REVISED REPRODUCIBLE — SEE NOTE BELOW IF CHECKED HERE	5	
		RESUBMIT CLOTH OR MYLAR REPRODUCIBLE AS SHIPPED	6	
	DO NOT PROCEED WITH FABRICATION RESUBMIT REVISED REPRODUCIBLE		7	

PRINT INCLUDED NOTE

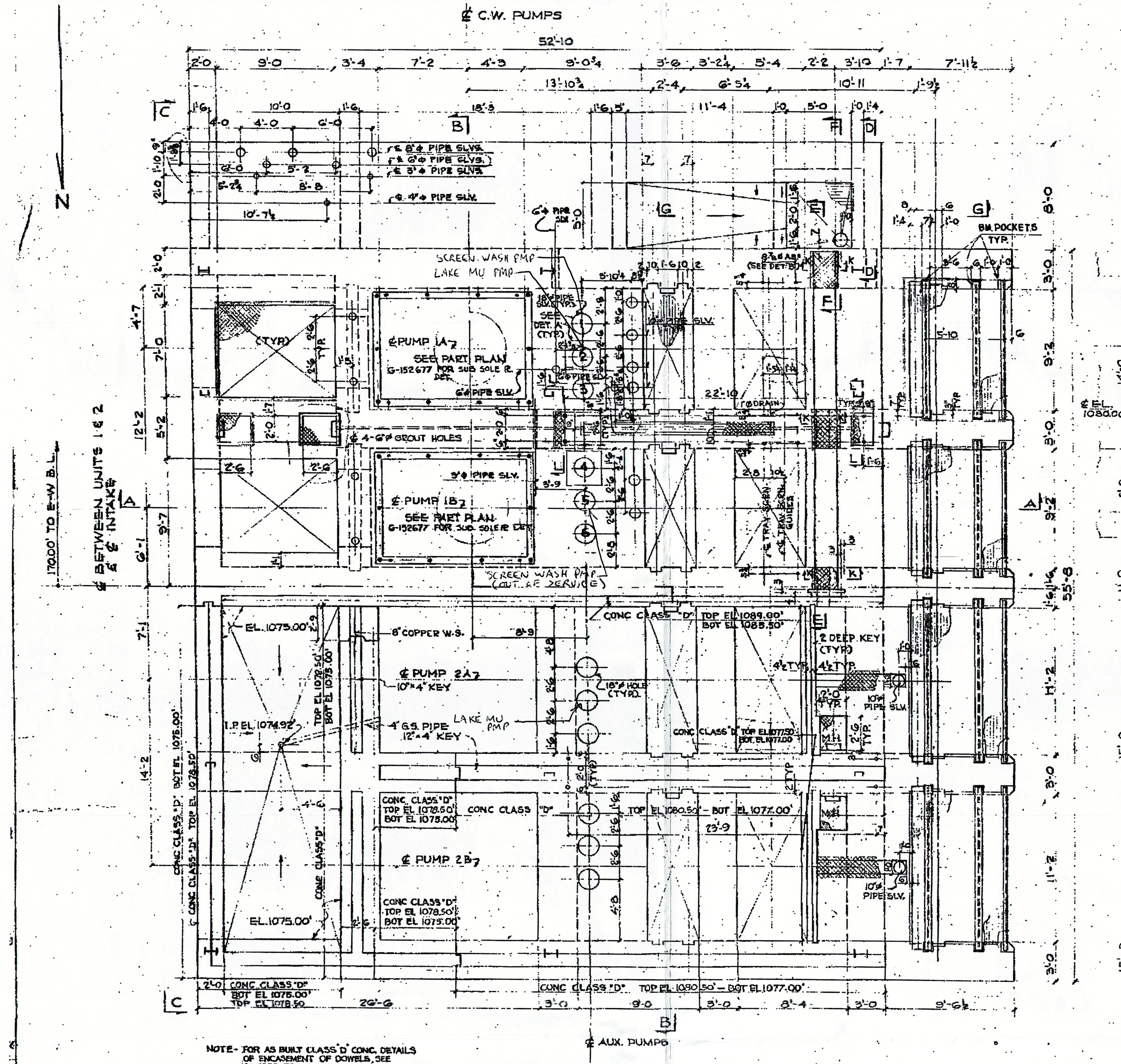
LAKE WATER PUMP PERFORMANCE CURVE

GRAHAM SES

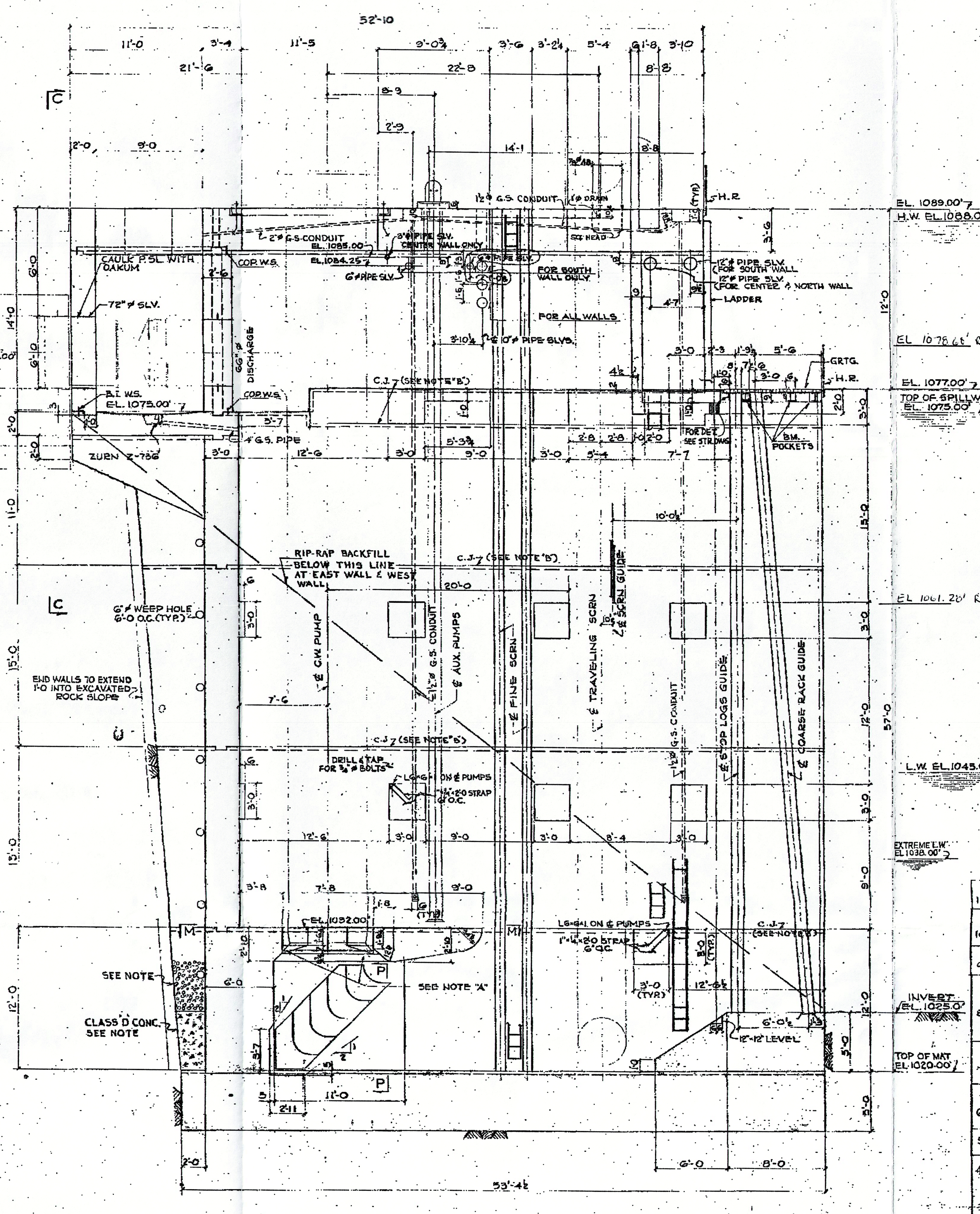
REVIEWED BY	DATE	ORIG DIV	DAYS TO COMMENT
[illegible]	9-29-67	M	30

THE FOREGOING SHALL IN NO WAY RELIEVE CONTRACTOR FROM ENTIRE RESPONSIBILITY FOR ENGINEERING DESIGN WORKMANSHIP MATERIAL AND ALL OTHER LIABILITY UNDER THE CONTRACT

EBASCO SERVICES INCORPORATED
AGENT
2 RECTOR ST NEW YORK N Y 10006



PLAN AT EL. 1089.00', 1077.00' & 1075.00'



SECT. A-A

QUANTITIES (NET BY FIELD UNLESS NOTED)
CONCRETE - CLASS "B" (3000 PSI) [illegible]
CONCRETE - CLASS "D" (ABOVE EL. 1075.0) 28 CU. YD.
FOR REINF. STEEL SEE [illegible]

6"Φ PIPE SLV. x 0'-11⅞ LG. 2 REQ'D.
3"Φ PIPE SLV. x 3'-0 LG. 1 REQ'D
3"Φ PIPE SLV. x 1'-0½ LG. 2 REQ'D
4"Φ PIPE SLV. x 1'-2½ LG. 1 REQ'D
8"Φ PIPE SLV. x 0'-10⅞ LG. 3 REQ'D.
6"Φ PIPE SLV. x 3'-6 LG. 2 REQ'D.
6"Φ PIPE SLV. x 3'-0 LG. 2 REQ'D.
⅞Φ A.B. 2'-0 LG. w HEX NUT (SEE DET. B) 8 REQ'D.
10"Φ PIPE SLEEVES 1'-0 LG. 4 REQ'D.
1"Φ AB (SEE SECT U-U G152677) 8 REQ'D.
PL 18"Φ ¼" 3 REQ'D.
1"Φ G.S. PIPE, 1'-1 LG. 1 REQ'D.
BLACK IRON W.S. 34 LIN. FT.
COPPER W.S. 184 LIN. FT.
1½Φ G.S. PIPE [illegible]
4"Φ G.S. PIPE [illegible]
4" FL. DRAIN, ZURN Z-736 w B.W. VALVE [illegible]
6"Φ PIPE SLEEVE 2'-0 LG. [illegible]
L6x6x1x1'-6 LG. [illegible]
1"x¼"x2'-0 LG. STRAP [illegible]
L6x6x1x2'-0 LG. [illegible]
2"Φ G.S. PIPE [illegible]
10"Φ PIPE SLEEVES 3'-0 LG. 7 [illegible]
10"Φ PIPE SLEEVES 3'-6 LG. 6 [illegible]
12"Φ PIPE SLEEVES 3'-0 LG. 3 [illegible]
18"Φ PIPE SLEEVES 3'-6 LG. 6 [illegible]
PL 30x1½x2'-6 (SEE DET. A) 12 [illegible]
1"Φ INSERTS (SEE DET. A G152678) 24 [illegible]
1½Φ A.B. (SEE SEC. T-T G152677) 20 [illegible]
7"x2" SOLE PL. ASSEMBLY (SEE G152677) 2 [illegible]

NOTE:

CONCRETE TO BE CLASS "B" (3000 PSI) UNLESS NOTED. SEE SPEC [illegible] 14-44. CONC. MAS.

GROUT TO BE DRY PACK, CLASS "D" (1-2 MIX.) SEE SPEC [illegible] FOUNDATIONS & STRUCTURAL [illegible]

ANCHOR BOLTS, PIPE SLEEVES, ELECT. CONDUITS ETC. TO BE IN PLACE BEFORE CONCRETE IS POURED.

FOR LOCATION AND DETAILS OF ANCHOR BOLTS, PLATES, ANCHOR STRAPS, FRAMES ETC. SEE STRUCTURAL DRAWINGS.

ALL WATER STOPS TO BE CONTINUOUS ALL AROUND, AND ALL SPLICES AND CONNECTIONS MADE WATER TIGHT.

ALL SHIMS AND JACK SCREWS TO BE REMOVED BEFORE FINAL TIGHTENING OF ANCHOR BOLTS.

BACK FILL AT REAR OF INTAKE [illegible] TAMPED CRUSHED STONE.

FOR ANCHOR BOLTS FOR "A" FRAMES SEE STR. DWG. G-152766

NOTE "A"
PEAGRAVEL CONC. FOR FILLETS AND VANE POCKETS TO BE PLACED AFTER VANES ARE IN PLACE AND LUGS HAVE BEEN ATTACHED. VANES, SIDE PLATES AND CENTER STRUT TO BE SANDBLASTED AND COATED WITH [illegible] TH. COAT OF "GLASS-FAB" AFT. CONC. IS PLACED.
EXCAVATION AT REAR, SIDES AND FRONT OF INTAKE TO BE BACKFILLED TO EL. 1025.0 WITH CLASS "D" CONC.

NOTE "B"
HORIZONTAL CONSTRUCTION JOINTS TO BE ROUGHENED AND BUTTERED WITH [illegible] MINIMUM LAYER OF NEAT GROUT PRIOR TO PLACING NEXT LIFT.

NOTE "C"
ALL ELECT. LINES & CONDUITS TO BE IN PLACE BEFORE CONC. IS POURED. SEE DWG. G-[illegible] & G152848

REFERENCE DRAWINGS:
LIST OF DRAWINGS [illegible]
INTAKE STRUCTURE SECTS. & DETS. [illegible]
DO DO [illegible]
DO DO [illegible]
DO DO [illegible]
INTAKE STEEL (STRUCT.) [illegible]
INTAKE STRUCT. - CONDUIT, GROUNDING & LIGHTING PLAN [illegible]
INT. STRUCT. - CATH. PROT. SYSTEM [illegible]
MANUFACTURERS DWGS. [illegible]
SUCTION CHANNEL [illegible]
OUTLINE [illegible]
MOTOR DRIVE [illegible]
CONC. ENCASEMENT OF [illegible]

Attachment N

Supplemental Fisheries Data Analysis for Proposal for Information Collection, Clean Water Act, Section 316(b) Phase II Requirements

Luminant Generation Company LLC
Graham Steam Electric Station
TPDES Permit No. WQ0000551000

Document No. 050019
PBS&J Job No. 441482

SUPPLEMENTAL FISHERIES DATA ANALYSIS FOR PROPOSAL FOR INFORMATION COLLECTION, CLEAN WATER ACT, SECTION 316(B) PHASE II REQUIREMENTS

Prepared for:

TXU Power
1601 Bryan Street
Dallas, Texas 75201-3411

Prepared by:

PBS&J
6504 Bridge Point Parkway
Suite 200
Austin, Texas 78730-5091

January 2005

Printed on recycled paper

Contents

Figures

Tables

Acronyms and Abbreviations

ANOVA	analysis of variance
CDS	Comprehensive Demonstration Study
CPUE	catch-per-unit-effort
CWIS	cooling-water intake structure
EPA	U.S. Environmental Protection Agency
FWS	U.S. Fish and Wildlife Service
I&E	Impingement and Entrainment
mgd	million gallons per day
PIC	Proposal for Information Collection
SDR	Shoreline Development Ratio
TCEQ	Texas Commission on Environmental Quality
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TXU	Texas Utilities Generating

1.0 BACKGROUND

The Clean Water Act Section 316(b) pertains to Impingement and Entrainment (I&E) of aquatic life at power-generating facilities that withdraw surface water from waters of the U.S. for cooling purposes. The U.S. Environmental Protection Agency (EPA) developed a three-phased approach for rule implementation. Phase I went into effect on January 17, 2002, and regulates new facilities. Phase II regulates existing facilities that withdraw 50 million gallons of water per day (mgd) or more. These regulations went into effect on September 9, 2004. Phase III rules are currently being developed. In Texas, many power-generating facilities withdraw water from reservoirs and are regulated under the Phase II rules. Facilities located on reservoirs are required to meet a performance standard of 80 to 95% reduction in impingement mortality (40 CFR 125.94(b)(1)). The rules provide options for meeting compliance standards and are listed in 40 CFR 125.94(a).

These new rules have been implemented through the Texas Pollutant Discharge Elimination System (TPDES). Through TPDES, many Texas facilities regulated by Phase II rules will be required to submit a Comprehensive Demonstration Study (CDS) (40 CFR125.95(b)) by January 2008. The purpose of the CDS for facilities located on reservoirs is to characterize impingement mortality, describe the operation of the cooling-water intake structure (CWIS), and confirm that the technologies, operational measures, and/or restoration measures selected are meeting or will meet impingement performance standards. One of the first steps in developing a CDS is to prepare and submit a Proposal for Information Collection (PIC) to the Texas Commission on Environmental Quality (TCEQ). Specific components of the PIC are listed in 40 CFR 125.95 (b)(1).

1.1 PHASE II AND TEXAS UTILITIES

Texas Utilities Generating (TXU) owns and operated 18 facilities in Texas that will be regulated by the Phase II rules. All of these facilities are located on reservoirs, most of which were constructed specifically to provide cooling water for "once-through" circulation. All of the source waters for the facilities are classified as waters of the U.S. and will be subject to the Phase II requirements for lakes and reservoirs. These facilities and associated reservoir names are listed below:

Facility Name	Reservoir Name	Stream Channel	Public Access
Hubbard	Ray Hubbard Reservoir	Mainstem	yes
Stryker	Striker Reservoir	Off-channel	yes
Twin Oak		Off-channel	no
Monticello	Monticello Reservoir	Off-channel	yes
Forest Grove		Off-channel	no
De Cordova	Granbury Reservoir	Mainstem	yes
Big Brown	Fairfield Reservoir	Off-channel	yes
Comanche Peak	Squaw Creek Reservoir	Off-channel	no

Facility Name	Reservoir Name	Stream Channel	Public Access
Lake Creek	Lake Creek Reservoir	Off-channel	no
Morgan Creek	Colorado City Reservoir	Off-channel	yes
Martin Creek	Martin Creek Reservoir	Off-channel	yes
North Lake	North Reservoir	Off-channel	no
Tradinghouse	Tradinghouse Creek Reservoir	Off-channel	yes
Trinidad	Trinidad Reservoir	Off-channel	no
Valley Lake	Valley Lake Reservoir (Brushy Creek)	Off-channel	no
Eagle Mountain	Eagle Mountain Reservoir	Mainstem	yes
Graham	Graham Reservoir	Off-channel	yes
River Crest*	River Crest Reservoir	Off-channel	No

*Announced for retirement and will not be considered for 316(b) compliance.
Mainstem – Impoundment of a major river or stream.
Off-channel – Perched reservoir or impoundment of a small stream.

TXU is currently investigating a feasible and practical approach for bringing each of its facilities into compliance under these new rules. Of particular interest is the development of an approach for characterizing aquatic life and monitoring impingement at such a large set of facilities. With the exception of Comanche Peak (Squaw Creek Reservoir), there are little to no recent impingement monitoring data with which to develop required information. Conducting impingement monitoring (and possibly mortality studies) at all of these facilities would be expensive and would present significant logistical challenges. Under the existing deregulated electric supply market, it is difficult and sometimes impossible to know when or whether a facility will be in operation. Some of the smaller facilities have a very low capacity factor, or are inactive, and others have never been completed, but all maintain TPDES permits. Thus, developing a sampling program for every facility would be impractical. On the other hand, some of TXU's facilities are considered "base-loaded" and operate almost continuously, providing good opportunities to conduct thorough impingement demonstration studies. As discussed in the following sections and in the PIC document, these facilities, however, share many similarities, which offer the opportunity to consolidate some of the required data collection for the purpose of estimating facility impacts. With the range of operational scenarios presented by these facilities, TXU proposes to conduct impingement demonstrations at three of its base-loaded facilities: Big Brown (Fairfield Reservoir), Comanche Peak (Squaw Creek Reservoir), and Monticello (Monticello Reservoir). These three facilities would be considered "representative" facilities in which detailed impingement monitoring would be conducted. Data from these facilities and reservoirs would be extrapolated to represent impingement mortality at the remainder of the facilities given that they share acceptable facility, operational, and biological similarities. The purpose of this document is to evaluate and compare available fisheries and habitat data for each reservoir and to determine whether similarities exist between the representative reservoirs and the remainder of the reservoirs. Reservoirs that share similarities (if any) with the representative reservoirs will be grouped accordingly. Information gained from this evaluation will be used as a supplement to the PIC for the purpose of developing impingement demonstration strategies.

1.2 RESERVOIR FISHERIES

TXU facilities are sited throughout east, north, and central Texas and are located in a variety of ecological regions of Texas, as described by Hubbs (1982). These include the East Texas timber country, blackland prairies, cross timbers/grand prairies, and the plains. According to Hubbs et al. (1991), over 150 fish species occur throughout these regions, collectively. Since only one large natural lake occurs in Texas, most of these species are adapted to lotic (stream) systems. Construction of reservoirs on perennial streams alters fish communities through chemical, biological, and physical changes in these systems (Yeager, 1993). Thus, fish communities in reservoirs largely deviate from communities originally found in the pre-impounded reach. Since most large reservoirs across the state are managed for fishing, the introduction of various species for sport-fish management amplifies these changes. A number of tools exist for measuring the health or integrity of natural stream-fish communities. One example is the widely applied Index of Biological Integrity developed by Karr et al. (1986). Because of the "artificial" nature of reservoirs, few studies have focused on reservoirs in this context, which is an important factor when considering data sources for reservoirs (discussed in more detail in Section 2.0). The artificial nature of reservoirs was, in part, the logic the EPA applied when developing the tiered approach for waterbody sensitivity, whereby lakes and reservoirs were considered the least sensitive of the ecosystems categories (EPA, 2004).

Contrary to the above, reservoirs constructed "off channel" or on small, or in some cases ephemeral streams, provide habitat for fish that did not exist in the pre-impounded area. This is particularly true for many off-channel cooling ponds, such as some of the TXU reservoirs. Construction of these facilities and reservoirs created large areas of aquatic habitats, which, in turn, provided the opportunity for Texas Parks and Wildlife Department (TPWD) to stock and manage fish populations for public fishing opportunities. TXU facilities that are currently closed to the public are closed due to security and/or safety concerns, or in some cases, the facilities (and reservoirs) were never completed.

2.0 DATA SOURCES

TPWD maintains fisheries data for the TXU reservoirs open or previously open to the public. Facilities that are no longer open to the public are not currently surveyed by TPWD. Surveys are generally conducted about once every 3 years. In some cases, surveys were conducted at higher frequencies. With the exception of habitat observations, these surveys are standardized between survey years and across reservoirs and fisheries districts. The surveys include boat electrofishing, gill netting, trap netting, and periodic measurements or observations of fish habitat. Each survey takes place within a period of 1 year and each survey technique is typically employed once per survey period. The data are summarized in performance reports required by the Federal Aid in Fisheries Restoration Act. Most of the performance reports contain data summaries from previous surveys. For this study, all performance reports that represent about the last 15 years of data were requested from TPWD. The table below lists all of the survey years that were provided in the performance reports. If a performance report was not provided, it was concluded that data were not available for that reservoir. References for the performance reports used in this study are in Section 5.0.

Reservoir	Performance Report Year(s)
Colorado City	1985, 1988, 1991,1994, 1995, 1997, 2001
Eagle Mountain	1988, 1989, 1990, 1991, 1992, 1995, 1997, 2000
Graham	1983, 1986, 1990, 1994, 1997, 2001
Granbury	1981, 1988, 1990, 1992, 1995, 1998, 2001
Fairfield	1985, 1987, 1988, 1991, 1993, 1996, 1999, 2000
Forest Grove	ND
Lake Creek	1984
Martin Creek	1985, 1991, 1994, 1999, 2000, 2001
Monticello	1987, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999
North	1988, 1991, 1992, 1995, 1998,
Ray Hubbard	1989, 1991, 1994, 1997, 2000,
Squaw Creek	1981, 1988, 1990, 1994, 1997,
Striker	1975, 1988, 1991, 1992, 1993, 1995, 1997, 1999, 2003
Tradinghouse Creek	1987, 1989, 1991, 1994, 1997, 2000
Trinidad	ND
Twin Oak	ND
Valley	ND

ND = Data not available

In addition, the latest reports containing standing crop (cove rotenone) data were also requested. For some reservoirs, creel (angler) surveys were provided, but surveys were available for only a limited number of reservoirs and, therefore, were not considered for this study. A search of the University of Texas Library and TCEQ archives was conducted to obtain any additional fisheries studies to complement this data set, but none were located.

3.0 DATA HISTORY AND ANALYSIS

Recent data provided for this study allows for some level of spatial and temporal analysis. Multiple data points from the last 15 years or so of data collection were used to develop reasonable statistical analysis. However, there are important factors regarding how these data were collected and the reason other types of data are not available, most of which pertain to the evolution and purposes of fisheries sampling in Texas reservoirs. When evaluating data sets that represent multiple years, or data sets that represent different reservoirs, it is tempting to assume that one data set is directly comparable with the next. This is not necessarily the case due to any number of variables, including constantly changing environmental conditions (i.e., weather, fluctuating water levels, and habitat availability), small sample sizes, stocking, occurrence of invasive species, and sample quality associated with constantly improving sampling techniques. The following section provides a discussion on the later, which is a brief history of fishery sampling in Texas public waters.

3.1 DATA HISTORY

Routine fisheries, water quality, and habitat data have been collected for Texas reservoirs since at least the 1960s. Data collection up to about the mid1980s was quite different than current data collection efforts. During this period, rotenone, seines, and multifilament gill nets were standard sampling tools and a wide suite of water quality parameters were also measured including temperature and dissolved oxygen profiles. Current data collection relies on electrofishing, gill netting, and trap netting. The following paragraphs provide a brief history on each of these sampling techniques.

Cove rotenone – Cove rotenone sampling involved blocking coves of known areas and volumes with block nets and then applying rotenone (fish toxicant) to the sample area. Most of the dead fish eventually floated to the surface and were collected. Data collection included species identification, enumerating, measuring, and weighing the fish. This provided an estimate of standing crop (pounds/acre), numbers of fish per given area, and various population indices. These data were often extrapolated to provide estimates for entire reservoirs or to help assess angler harvest. This technique was quite effective for sampling fish that occur in shallow coves. However, it provided a skewed view of the reservoir standing crop and population composition and structure simply because the fish that occurred in the coves did not necessarily represent fish found in open waters (Nielsen and Johnson, 1985). Due to public concern over killing large numbers of fish and the evolution of alternative, less damaging sampling techniques, the use of cove rotenone surveys ceased by the late 1980s. Because cove rotenone surveys, although quite dated, are some of the only data that provide quantitative assessments of fish populations, the latest (most recent) cove rotenone data were obtained (if available) for each reservoir for this study. With some broad assumptions and validation with recent data, the standing crop estimates might provide one tool for estimating impingement rates.

Seine surveys – Seine surveys of shoreline zones were also a standard tool during this period. Seine hauls were made over a known area to provide quantitative estimates of smaller individuals and species that do not attain larger sizes. Similar to cove rotenone data, seine data can provide useful information about the segment of the population subject to impingement. However, seine surveys were discontinued for most reservoirs by the late 1980s. Due to the age and scarcity of these data, seine data were not considered for this study.

Gill netting – Gill netting is a passive sampling tool that has been applied since monitoring began. However, during the late 1980s, the types of gill nets changed. Formerly, gill nets were constructed from multifilament nylon string. Gill nets used today are monofilament, which is considered more effective at capturing fish. Also, during the early 1990s, gill net lengths were slightly shortened. Gill nets are currently constructed with various sizes of mesh within each net and are used to target a variety of fish sizes. Gill nets generally target larger bottom-dwelling and open-water species, most of which are not prone to impingement due to their large size. However, these data provide useful qualitative information about species composition and relative abundance. Gill net data for this study include only data collected using the current gill net configuration. Catch-per-unit-effort (CPUE) (net-night) refers to the number of fish caught in one gill net over about a 24-hour period.

Trap netting – Trap netting is a passive sampling technique used to target sub-adult and adult crappie (*Pomoxis* spp.). TPWD began using trap nets as a standard sampling tool in the early 1990s. Trap net data prior to the 1990s essentially does not exist. Similar to gill nets, trap nets are set out for about a 24-hour period. CPUE refers to the number of fish caught during one net-night. All of the trap net data for the period of records were obtained for this study.

Electrofishing – Boat electrofishing is an effective tool for sampling shallow, shoreline areas. Electrofishing data are largely qualitative, but provide useful information regarding species composition, relative abundance, and individual-specific indices, and can also demonstrate population trends over time. Electrofishing, in turn, can provide information that might be useful for projecting impingement rates, particularly for the sunfish (*Lepomis* and *Micropterus* spp.).

Boat electrofishing technology has greatly improved over time. TPWD began using boat electrofishing in the mid1980s. During this period, the boats were generally small, generators were low wattage and only supplied alternating current, electrode specifications were widely variable, and frequencies were not adjustable. As such, catch rates were relatively low and varied from fisheries district to fisheries district, depending upon the type of electrofishing boat employed. Electrofishing technology rapidly improved, and by the early 1990s TPWD acquired larger, more efficient boats, which were similar between fisheries districts. As a result, electrofishing catch rates increased and data were more comparable between reservoirs. Prior to the mid to late 1990s, electrofishing sampling was conducted at fixed stations. This meant that the stations were selected by the biologists and the same stations were sampled from one survey period to the next. Each station was surveyed for 15 minutes. Existing electrofishing protocol requires selecting random sampling stations at a higher frequency (number of stations) with a shorter (5-minute) duration. There has been some debate regarding the compatibility of the fixed station and random station data. Most likely, the degree of the impact of changing the sampling protocol probably varies from reservoir to reservoir. The potential spatial and temporal variations should be kept in mind for data evaluation. CPUE for electrofishing is expressed in terms of the number of fish captured during 1 hour of electrofishing. Electrofishing data for the period of record (dating back to the mid 1980s) were obtained for this study.

Habitat – Comprehensive water quality and reservoir profile surveys were conducted up until about the mid 1980s and those data were provided in the earlier performance reports. Existing water quality measurements include surface reading of the basic water quality parameters (temperature, dissolved oxygen, conductivity, and Secchi depth), which are usually taken at each sample station. Approximate conductivities and Secchi depths are listed in Table 1.

Availability (or lack of) of physical habitats play an important role in shaping fish communities (Miller et al., 1987). Variation in habitat might, in part, help to explain variation in fish populations. Physical fish habitats have been documented over the years by TPWD and can be found in most of the performance reports. Habitats can vary widely from year to year due to water level fluctuations, urban development, and the natural and man-induced dynamics of aquatic vegetation coverage. For most of the TXU reservoirs, water levels are maintained within a narrow range of elevations, which helps to reduce the variability induced by changing water levels. Exceptions to this include the reservoirs in the central and western part of the state. TPWD efforts for standardizing habitat data collection have been somewhat hindered due to this variability and the numerous potential combinations of habitat types. Nevertheless, habitats might provide important insight for comparative analysis. The most recent habitat survey for each reservoir was obtained for this study.

3.2 DATA ANALYSIS

Data from the performance reports provided by TPWD were entered into Microsoft Excel spreadsheets. Data fields included reservoir physical characteristics (Table 1), abundance or CPUE of selected species (Table 2), cove rotenone results (Table 3), and habitats surveyed (Table 4). Some winnowing of the fisheries data were required to develop a suite of species that are common across reservoirs and are relevant when assessing impingement. Not all species or sizes of fish are impinged. Since EPA (2004) established ⅜-inch mesh screen as one of the baseline conditions, many smaller species such as silversides (*Menedia* spp.), minnows (*Notropis* and *Cyprinella* spp.), mosquitofish (*Gambusia affinis*), and darters (*Etheostom* and *Percina* spp.) may simply pass through intake screens and do not show up in impingement samples in appreciable numbers. Unlike studies of streams that focus on species diversity, few data are available for non-game species in Texas reservoirs. Survey techniques currently employed by TPWD are biased towards larger species. Some non-game species are collected and reported by TPWD, but their data collection efforts focus on sport fish and the forage species that support sport fish.

Therefore, data on non-game species vary widely and preclude population-level assessments of these species.

Adults of larger species can typically overcome water currents and are usually not impinged. However, catch rates of larger species can provide some insight into potential impingement of juveniles of the same species. In general, the species most prone to impingement in Texas reservoirs are shad (*Dorosoma* spp.) and sunfish (*Lepomis* spp.). These species have high reproductive rates, are generally abundant, and remain of size susceptible to impingement for a large portion of their life.

This study focused on the species most susceptible to impingement and/or common sport fish and forage species. While some of the data were viewed on a species level, the statistical analysis was conducted with groups of like species. This was done to account for spatial variability in species composition of closely related species that occupy comparable niches. These groups are collectively known as the "indicator" species. This grouping generally corresponds to the genus level and are classified as follows:

Species	Grouping
Largemouth bass (*Micropterus salmoides*)	Black bass
Spotted bass (*M. punctulatus*)	Black bass
Gizzard shad (*Dorosoma cepedianum*)	Shad
Threadfin shad (*D. petenense*)	Shad
Bluegill (*Lepomis macrochirus*)	Sunfish
Redear sunfish (*L. microlophus*)	Sunfish
Longear sunfish (*L. megalotus*)	Sunfish
Warmouth (*L. gulosus*)	Sunfish
Green sunfish (*L. cyanellus*)	Sunfish
Orangespotted sunfish (*L. humilis*)	Sunfish
White crappie (*Pomoxis annualris*)	Crappie
Black crappie (*P. nigromaculatus*)	Crappie
Channel catfish (*Ictalurus punctatus*)	Catfish
Blue catfish (*I. furcatus*)	Catfish
White bass (*Morone chrysops*)	Temperate bass
Striped bass (*M. saxatilis*)	Temperate bass
Palmetto bass (*M. chrysops* x *M. saxatilis*)	Temperate bass

3.2.1 Indicator Species Abundance

Temperate bass, crappie, and catfish numbers were low when compared with the number of individuals captured by electrofishing (see Table 2). This is simply due to the sampling techniques employed by TPWD for these species. Temperate bass and catfish are sampled with gill nets and crappie are sampled with trap nets. These sampling tools are passive capture techniques that target larger, sub-adult and adult individuals (Nielson and Johnson, 1986). Numbers of individuals usually decrease with increasing age class. It is common for most of the individuals in a population to occur within the age-0 class (first year of life), which is the segment of the population that is generally missed by these sampling techniques. Conversely, electrofishing is a sampling technique that actively pursues fish of a wide range of sizes. While many smaller age-0 fish can be easily overlooked during electrofishing, larger age-0 fish can be represented in samples, depending on the species. Electrofishing is effective for capturing sunfish, black bass, and shad (when present along the shoreline). Figure 1 illustrates the electrofishing catch rates of these species by reservoir. Electrofishing catch rates are based upon the mean of all sample events. In general, the representative reservoirs represent the high (Monticello Reservoir), mid (Fairfield Reservoir), and lower (Squaw Creek Reservoir) ranges of the abundance of these species. However, the variability in abundance appears to be wide from year to year, as illustrated for selected species in Figure 2. This variability can be the result of the combination of factors, such as reservoir water level changes (available habitat), variability in population sizes, increased electrofishing efficiency over time, and the change from fixed-station sampling to random sampling. Relative abundance of black bass, shad, and sunfish were consistently low in electrofishing samples taken at Squaw Creek Reservoir. This is somewhat surprising because anecdotal information indicate that when the reservoir was open to the public, it was considered one of the state's best bass fishing lakes. TPWD (Floyd Teat, personnel communication) suggests that electrofishing catch rates are low at Squaw Creek Reservoir due to the high conductivity, step shorelines, and exceptionally clear water, which significantly decreased sampling efficiency. Thus, electrofishing samples might not be truly representative of the fish community.

Some additional generalities can be drawn from the data without detailed analysis. Since most of these reservoirs are not located on large rivers or streams, white bass (*Morone chrysops*) are either not present or occur in low numbers in these reservoirs (i.e., cooling ponds). The exceptions to this are lakes Eagle Mountain, Ray Hubbard, and Colorado City, which support appreciable numbers of white bass (Table 2). Eagle Mountain and Ray Hubbard reservoirs are large impoundments of rivers, which tend to maintain viable white bass populations. Striped bass (*M. saxatilis*) are absent or do not occur in large numbers in any of the reservoirs. Striped bass are not native to the areas where these reservoirs are located and only occur where they are stocked. Palmetto bass (*M. chrysops* x *M. saxatilis*), similar to striped bass, occur in a few of the reservoirs, but they only exist due to stocking. Since the reproductive potential of temperate bass for most of these reservoirs is very low to nonexistent, it would make sense to exclude these species as indicators. However, some consideration should be given to the reservoirs that support viable populations of white bass. Similar to the temperate bass, data indicate that crappie (*Pomoxis* spp.) are generally scarce in most of the reservoirs. The exceptions to this are Eagle Mountain, Graham, and Granbury reservoirs where appreciable numbers of crappie have been collected. In general, crappie do not thrive in reservoirs that were constructed as cooling ponds. TPWD attempted to establish crappie fisheries in many cooling ponds in the 1990s by introducing hybrid white (*P. annualris*) x black (*P. nigromaculatus*) crappie. However, their data indicated that the hybrids did not increase the crappie populations. The earlier cove rotenone data (see Table 3) also indicate that crappie populations were historically low for most of the reservoirs. Anecdotal information from TXU staff indicate that anglers do catch crappie in some of the reservoirs, even though TPWD data indicates the populations are low.

Channel catfish (*Ictalurus punctatus*) are abundant in most of the reservoirs. Flathead catfish (*Pylodictis olivaris*) were considered; however, few reports contained data on this species. The data that were present indicated low abundance of this species across reservoirs. Blue catfish (*I. furcatus*) are generally absent from most of the reservoirs (see Table 2) because they are inhabitants of big rivers and are usually not found in small watersheds (Robison and Buchanan, 1992), unless they are stocked. Ray Hubbard is the only reservoir that maintains a large population of blue catfish. Even though channel catfish are abundant, the potential impingement rate of this species is questionable. Informal observations of intake screens at TXU and other facilities indicate that channel catfish impingement is typically low.

One detail that is not represented in the data is the impact that golden algae (*Primnesium parvum*) have had on the fisheries in Colorado City and Granbury reservoirs. It would be difficult to determine quantitative effect on these reservoirs, but it is very possible that the recent sampling data do not represent the post fish-kill environments. However, the magnitude of the fish kills on Colorado City Reservoir was considered higher than the fish kills on Granbury Reservoir. In either situation, the actual numbers of fish susceptible to impingement might be low.

Based on available data, sunfish, shad, and black bass survey results might be the most appropriate data set for comparing reservoirs fish communities in relation to impingement. Compared with the inherent bias of capturing larger fish with gill nets and trap nets, electrofishing data likely represent the portion of the fish community vulnerable to impingement. This does not necessarily mean that the species targeted by gill nets and trap nets are not important to consider, but extrapolating the juveniles of those species would add a level of uncertainty. On the other hand, electrofishing data provide a direct measure of the relative abundance of target species. The catfish, temperate bass, and crappie data were compared between reservoirs, as discussed in the following section. However, these species were not used for developing habitat to fisheries relationships, as discussed in Section 3.2.3.

3.2.2 Analysis of Recent Data

CPUE data (electrofishing, gill netting, and trap netting) for various species were available from about 1986 to 2003 for 12 reservoirs (see Table 2). These data represent multiple years of data collection and the number of data points for the reservoirs ranged from 5 to 11. An analysis was performed to determine whether there is a statistically significant difference between the mean CPUEs of any pair of reservoirs. The analysis was performed for each of the indicator species.

The first step was to check whether the variance increased with the mean. Such condition would affect the validity of the results. The variance was stabilized with either logarithmic transformation or square-root transformation. The data were log-transformed when there was no zero in the data set; otherwise, the square-root transformation was used.

Then, analysis of variance (ANOVA) was performed for the data sets of all the reservoirs for a particular species. The null hypothesis was that the mean CPUEs of all the reservoirs were the same. If the ANOVA result supported the null hypothesis, then no further testing was necessary; otherwise, the next step was to determine which pair of reservoirs had different mean CPUEs. It was concluded that for each species, the null hypothesis was rejected at the 95% confidence level.

The Tukey-Kramer method (Neter et al., 1990) was used for multiple comparisons of pairs of reservoirs. With this method, for each species, the pairs of reservoirs with different mean CPUEs at the 95% confidence level were identified.

Results of this analysis are shown in Table 5. There appears to be broad similarities in the indicator species between reservoirs. These results are in general agreement with the catch rates of black bass, sunfish, and shad illustrated in Figure 1. Fairfield Reservoir, which is considered "average" among the reservoirs, shares the most similarities in the fish community, followed by Monticello Reservoir and Squaw Creek Reservoir. If black bass, sunfish, and shad are used as a measure of similarity, as shown below, there are significant similarities between all of the reservoirs and at least one of the representative reservoirs (see Table 5). Reservoirs that are significantly similar based on two of the three species are denoted with an asterisk.

Fairfield	Monticello	Squaw Creek
Colorado City	Fairfield	North
Martin Creek	Tradinghouse Creek	Colorado City
Monticello	Martin Creek	Granbury
Striker	Eagle Mountain	Striker*
North	Ray Hubbard	Tradinghouse*
Tradinghouse Creek	Graham	Martin Creek*
Graham	Colorado City*	Graham*
Ray Hubbard	Striker*	Ray Hubbard*
Eagle Mountain*	Granbury*	
Granbury*		

3.2.3 Analysis of Older Data

Cove rotenone data were available for most reservoirs (Table 3). The species were grouped similarly to the above. The data were mostly from the mid 1980s and probably do not represent current conditions due to reservoir aging and habitat dynamics, changes in trophic state, and changes in fisheries management. However, these data provide the only estimates of standing crop, which could be one of the most meaningful measures for comparing reservoirs and estimating impingement. In theory, catch rates of electrofishing, gill netting, and trap netting should be positively correlated with standing crop. That is, reservoirs with more target fish should yield larger electrofishing, gill net, and trap net sample sizes. Unfortunately, there is little to no overlap between estimates of standing crop and the sample techniques currently employed to determine whether this is indeed the case. However, the relationships between the latest available cove rotenone data and mean electrofishing CPUE for various species were investigated. As shown on Figure 3, there appears to be no relationship between recent electrofishing catch rates and previous standing crop. Figures 3c and 3d compare total numbers and standing crop with the electrofishing survey closest to that period. In two cases, the electrofishing surveys were conducted during the same year of the cove rotenone survey, but in most cases there were at least 2 years difference between sample events. Assuming enough reservoirs were concurrently sampled using both techniques, a relationship between electrofishing catch rate and standing crop might be expected. However, due to the wide disparities between survey events and the age of the data, it appears that the existing standing crop estimates cannot be confidently applied for comparisons of these reservoirs under current conditions.

3.2.4 Habitat Analysis

Comparisons of fish habitat can provide a measure of reservoir similarities, but would largely be an indirect measure of fish community characteristics. It has been well documented that physical habitats such as aquatic plants, flooded terrestrial vegetation, and rocks are an important life requisite for the sunfish, black bass crappie, and channel catfish. The importance of these variables are summarized in the Habitat Suitability Index Models developed by the U.S. Fish and Wildlife Service (FWS) (Robison and Buchanan, 1992; Miller, 1987; FWS, 1982a; FWS, 1982b; FWS, 1982c; FWS 1982d). As such, the quality and quantity of available habitats can be a good predictor of the type of fish community a reservoir can support.

Recent habitat data were available for all of the reservoirs open or recently open to the public. However, the methods for measuring and recording habitats vary between reservoirs. For instance, the number of habitat fields for reservoirs ranged from 4 to 23. In some instances, habitat surveys were confined to the shoreline, whereas in other reports, open-water habitats were documented separately. Some subjectivity was required to enable some type of comparative analysis. A suite of habitat categories was developed and are shown in Table 4. These categories were further distilled into even broader habitat categories, which include aquatic vegetation coverage, brush/trees, rock/gravel (including rip-rap), boat docks/piers, and non-descript. To help normalize data between reservoirs, the shoreline percent coverage and open-water percent coverage was averaged to develop a mean for each habitat category. The abundance of each of the habitats for each reservoir are shown on Figure 4. Squaw Creek Reservoir has the highest percentage of all habitats combined due to the high abundance of rocks/gravel and submerged trees/brush. Monticello Reservoir had the highest percent coverage of aquatic vegetation. However, up until about 2001, Martin Creek Reservoir probably had the highest percent of aquatic vegetation coverage due to the invasion of hydrilla (*Hydrilla verticillata*), which was recently, in part, eliminated by low water levels and the introduction of grass carp (*Ctenopharyngodon idella*).

The relationship between black bass, sunfish, and shad and each of the habitat categories, including a total of the habitats, was developed and is illustrated on Figure 5. A regression line was plotted and the proportion of the variance is expressed as R2 in each of the charts. A P-test was applied at the 95% (0.05) level to determine whether the relationships were significant. In all cases but two, there were no significant relationships between the electrofishing catch rates and the habitat categories. However, the relationship between sunfish and black bass electrofishing catch rates and percent total aquatic vegetation appears to be significant. Shad catch rates were not expected to be correlated with the cover types, although the studies suggest some dependence of these species on inundated vegetation for spawning (FWS, 1985; Robison and Buchanan, 1992). Since shad feed primarily on plankton, abundance of these species is probably more closely related to the fertility (trophic state) of the reservoirs.

These results do not come as a big surprise. It is well known that the relationship between aquatic vegetation and sunfish (including black bass) is usually positively correlated. However, due to the amount of error introduced by variations in sampling techniques and by lumping the habitat types together, there is a possibility that these relationships are a false positives and some of the others might be false negatives. In addition, the habitat categories were based on a one-time sample event. It is possible that the habitat surveys at this time were not representative of the normal habitat conditions in the reservoir due to differences in water levels and weather. However, normalizing the habitat data was not possible because only limited habitat data were available. Statistical comparisons between each reservoir and habitat coverage was not possible since only one survey (data point) was available for most reservoirs.

What comes as a surprise was the slight negative relationship between rocks/gravel and electrofishing catch-rates for sunfish, although not significant. However, part of this is explained by the high numbers of sunfish in Monticello Reservoir where practically no gravel or rocks are present. Instead, sunfish abundance in that reservoir was probably more closely tied to the abundance of aquatic vegetation. Although sunfish catch rates in Squaw Creek Reservoir were very low this reservoir has the highest composition of rock and gravel. As previously mentioned, electrofishing data from this reservoir might not be truly reflective of the population due to the high conductivity clear water and steep slope.

The apparent lack of relationships is generally inconsistent with what is known about cover-dependent species. However, with the available data it is difficult to support grouping the reservoirs based on habitat similarities or dissimilarities. The exception to this is aquatic vegetation. When comparing black bass and sunfish populations in reservoirs, the data indicate that aquatic vegetation should be considered. The ±25% error range was arbitrarily selected since statistical analysis were not possible. If we take the similarities in aquatic vegetation coverage, while assuming this sample error, the following reservoirs can be grouped together.

Monticello	Fairfield	Squaw Creek
Tradinghouse	Tradinghouse	Eagle Mountain
	Ray Hubbard	Martin Creek
	North	Colorado City
	Striker	Granbury

Graham Reservoir is the only reservoir that did not fall into the ±25% range of any of the representative reservoir. However, this is somewhat of a broad grouping since the error range was arbitrarily selected. Due to the weaknesses of these comparisons and since habitats provide an indirect measure of fish populations, grouping reservoirs based on habitats should be secondary to grouping the reservoirs based on the fish communities.

3.2.5 Reservoir Physical Characteristics

Physical characteristics of this set of reservoirs vary widely based on their sizes, depths, stream order of the impounded stream, shoreline development ratio (SDR), and their location in relation to the state's vegetative regions (a characterization of the vegetative regions can be found in Gould [1962]). Reservoir size and their source waters probably account for some of the variations in fish populations, such as the abundance of white bass and crappie in the main-stem reservoirs. Fish species distribution can also vary from one region to the next, but with a few exceptions, that pattern generally applies to natural surface waters. Species composition probably varies with longitude in these reservoirs, but this type of analysis could not be performed due to scarcity of non-game species accounts. Instead, the data indicate that species composition between reservoirs is largely homogenous, at least for species targeted by fisheries management. In addition, catch rates of representative species across ecoregions and latitude were assessed, but did not demonstrate any type of correlation. This can be seen on Figure 2, where catch rates of the indicator species is independent of the location of the reservoir.

Catch rates of the indicator species were also independent of reservoir size. Although each analysis is not presented in this document, an example is presented on Figure 6a where sunfish catch rates were independent of reservoir size. Monticello Reservoir, which is one of the smallest reservoirs, had the highest catch rates for sunfish. This is interesting because if the impacts of impingement are high due to these facilities, this would mean that Monticello Reservoir, which supports a base-loaded facility and is one of the smallest reservoirs, should have low catch rates of the indicator species. Instead, it appears to be the most productive of all of the reservoirs. This issue was not addressed in this study, but there appears to be little relationship between the facility to volume ratio and catch rates of indicator species.

Similar to reservoir size, SDRs were also independent of catch rates of indicator species. SDR is the ratio between the amount of shoreline length to open water. A higher SDR means there is a higher amount of shoreline to open water (an SDR of 1 is a circle or has the least amount of shoreline possible). An example of sunfish catch rate compared with the SDRs is provided in Figure 6b. While reservoir size and SDR might be good indicators of a reservoir's ability to support a larger population sizes or standing crop, they essentially have no relationship with sampling catch rates. Larger reservoir sizes and higher SDRs suggest that more fish might be available for impingement; however, with increasing reservoir size and SDR, the potential interaction between CWISs and fish is decreased due to increased distance.

4.0 RECOMMENDATIONS FOR RESERVOIR GROUPING

Based on available fisheries data, there is good support for using the reservoirs identified by TXU to represent potential impingement at the remaining facilities. It will also be important to consider the facility operations, withdrawal rates, and CWIS characteristics for estimating impingement mortality at the remaining facilities. Since TPWD data do not exist for Trinidad or Valley Lake reservoirs, and only older, standing crop data exist for Lake Creek, some judgment regarding their fisheries will be required to identify an appropriate representative reservoir. Anecdotal information from TXU staff indicate that these reservoirs share similarities with Fairfield Reservoir. In turn, this information can probably be supported by the broad similarities Fairfield Reservoir shares with other reservoirs in this study.

The following table shows the reservoirs that can be grouped using similarities in fisheries as the primary criteria and aquatic vegetation as secondary criteria. The order in which the reservoirs are listed generally reflects the order of similarity. Reservoirs are listed multiple times since they share significant statistical similarities with more than one representative reservoir.

Fairfield	Monticello	Squaw Creek
Colorado City	Fairfield	North
Martin Creek	Tradinghouse Creek	Colorado City
Monticello	Martin Creek	Granbury
Striker	Eagle Mountain	Striker
North	Ray Hubbard	Tradinghouse Creek
Tradinghouse Creek	Graham	Martin Creek
Graham	Colorado City	Graham
Ray Hubbard	Striker	Ray Hubbard
Eagle Mountain	Granbury	
Granbury		

The analysis of available physical and biological data for the reservoirs considered in this study support grouping similar reservoirs together based on recently collected fisheries data. There were significant similarities between the catch rates of many of the common species targeted by fisheries managers and various reservoirs, which allowed for reasonable reservoir grouping by fisheries. From these data and anecdotal information about impingement in Texas reservoirs, it was concluded that sunfish and shad are among the species most common to these reservoirs and are likely to represent a majority of impingement numbers. The data also support that black bass are ubiquitous and relatively abundant, but this species is probably less prone to impingement because it remains of size susceptible to impingement only for a short period of its life. This is probably the case for many other species that attain larger sizes. As such, black bass, sunfish, and shad together are good indicators of reservoir health and are good candidates for measuring impingement.

Crappie, temperate bass, and catfish are also popular sport fish, but the sampling techniques preclude statistical analysis of the early life stages of these species, which would be the age group more susceptible to impingement. Catfish catch rates are among the highest in the representative reservoirs and would be well represented by these reservoirs. Only a few reservoir support substantial catch rates of crappie and temperate bass. Among these, Ray Hubbard Reservoir has relatively high catch rates of both groups of these fish. Since these species are not represented well in the representative reservoirs, it might be possible to conduct verification monitoring shortly after their reproductive season (late spring) to determine whether these species are susceptible to impingement. Considering the infrequent and unpredictable operation of this facility, sampling of this facility might not be practicable or possible for meeting quality assurance requirements.

Aside from the situation with crappie and white bass, measurements of habitats, locations, and physical characteristics of reservoirs appeared to have little bearing on catch rates of the indicator species. However, there was a positive relationship between aquatic vegetation and catch rates of sunfish and black bass, which is worth considering. The reservoirs that demonstrated a significant relationships based on aquatic plant abundance were in line with the reservoir grouping established based on the fisheries.

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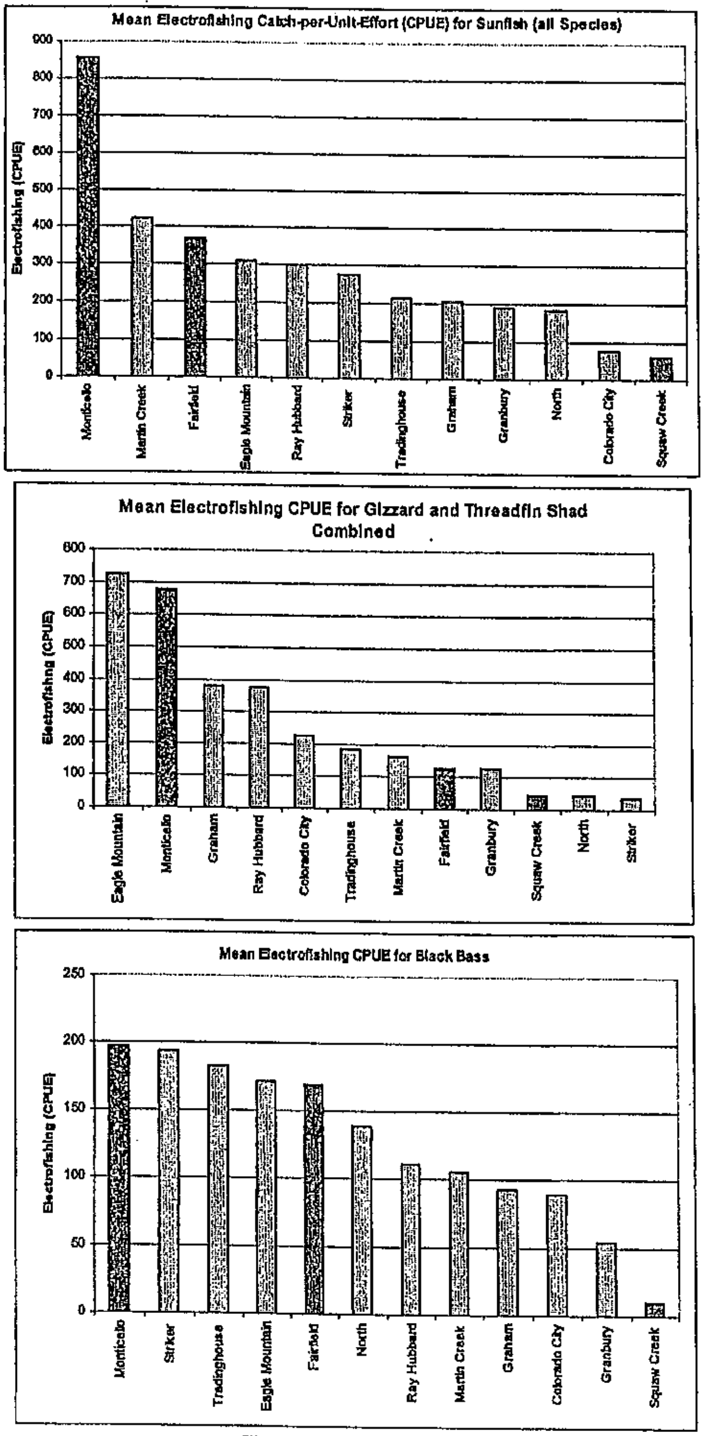
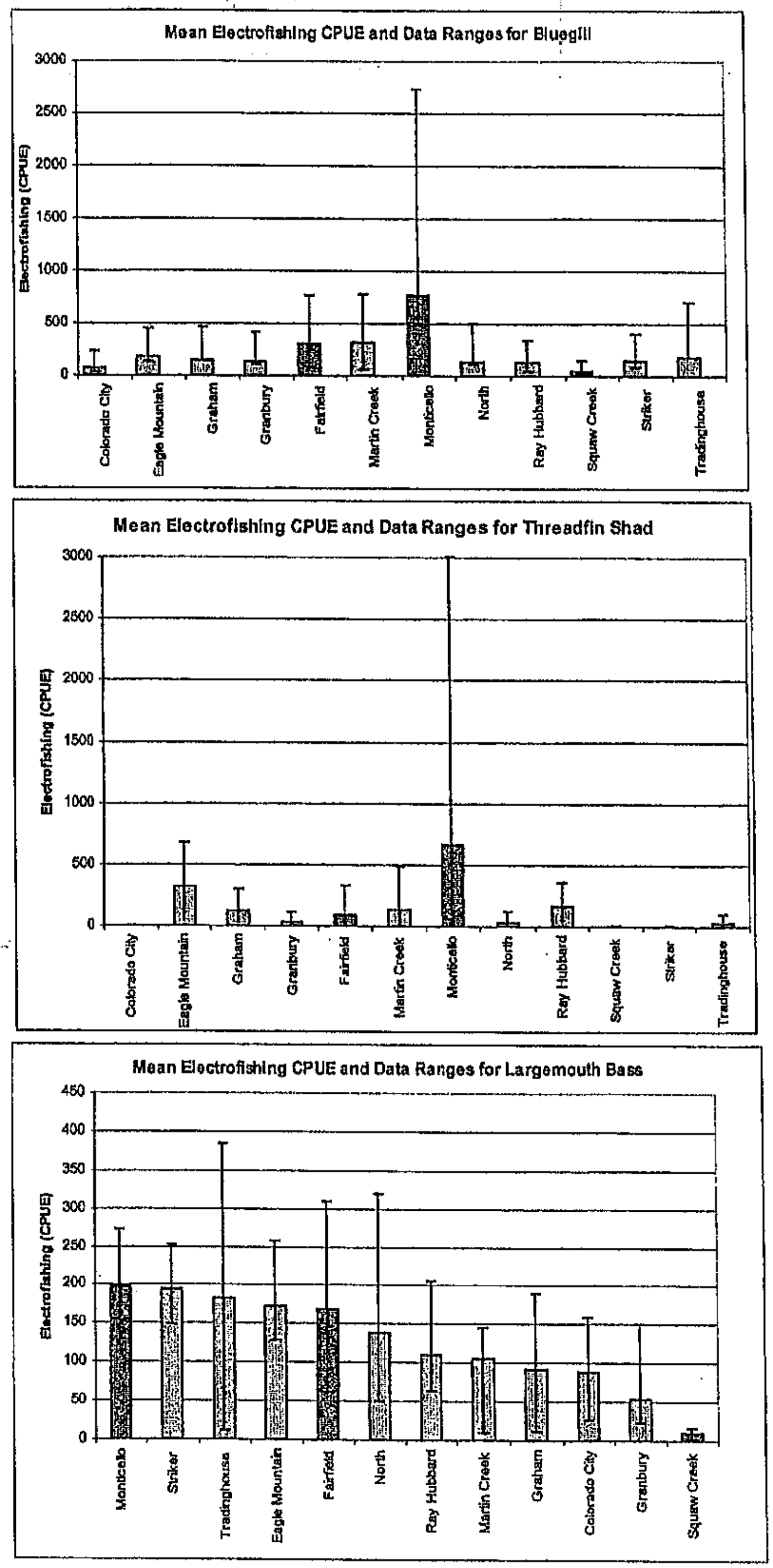
Figure 1: Mean Electrofishing CPUE for the Indicator Species, Sunfish, Shad, and Black Bass



Figures 1a, 1b, and 1c

Representative reservoirs are shaded in dark gray.
Source: TPWD performance reports.

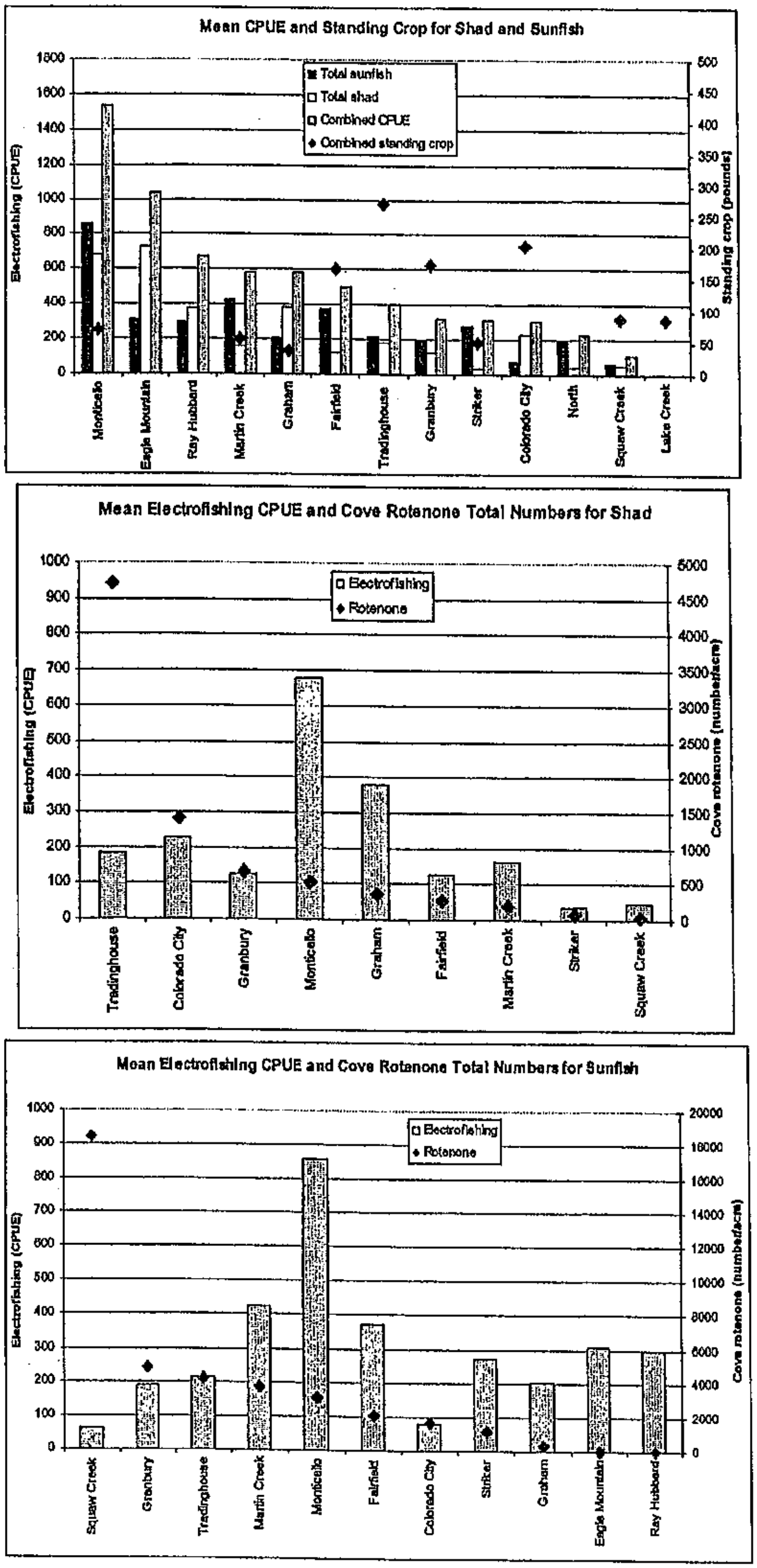
Figure 2: Mean Electrofishing and Data Ranges for Selected Species



Figures 2a, 2b, and 2c

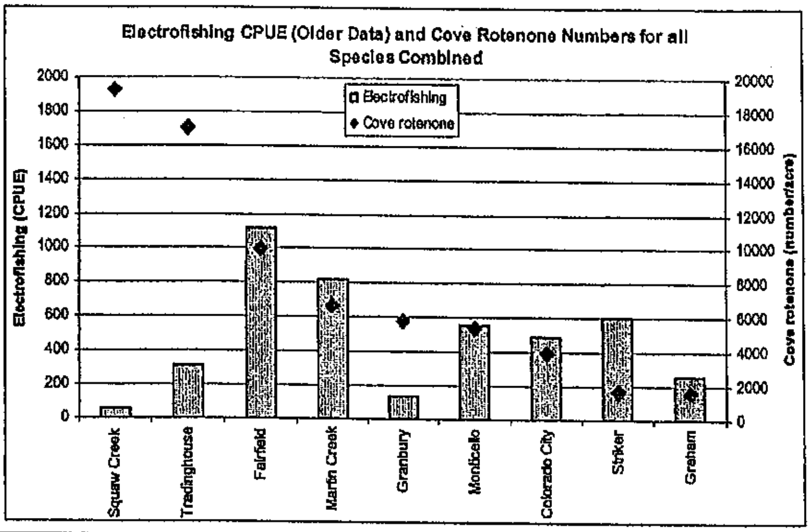
Error bars represent data ranges. Representative reservoirs are shaded in dark gray.
Source: TPWD performance reports.

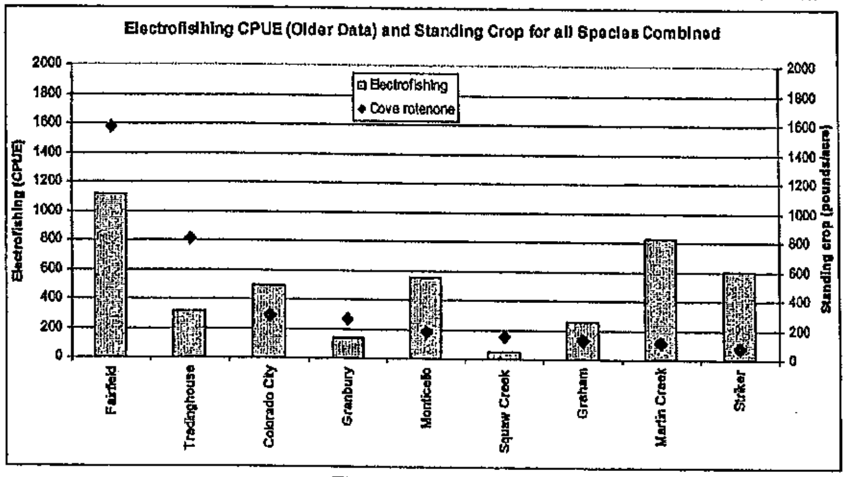
Figure 3: Comparison Between Mean Electrofishing CPUE and Cove Rotenone Data for Various Species



Figures 3a, 3b, and 3c

Figure 3 (Cont'd)





Figures 3d and 3e

Source: TPWD performance reports.

Figure 4: Percent Coverage of Selected Habitats by Reservoir

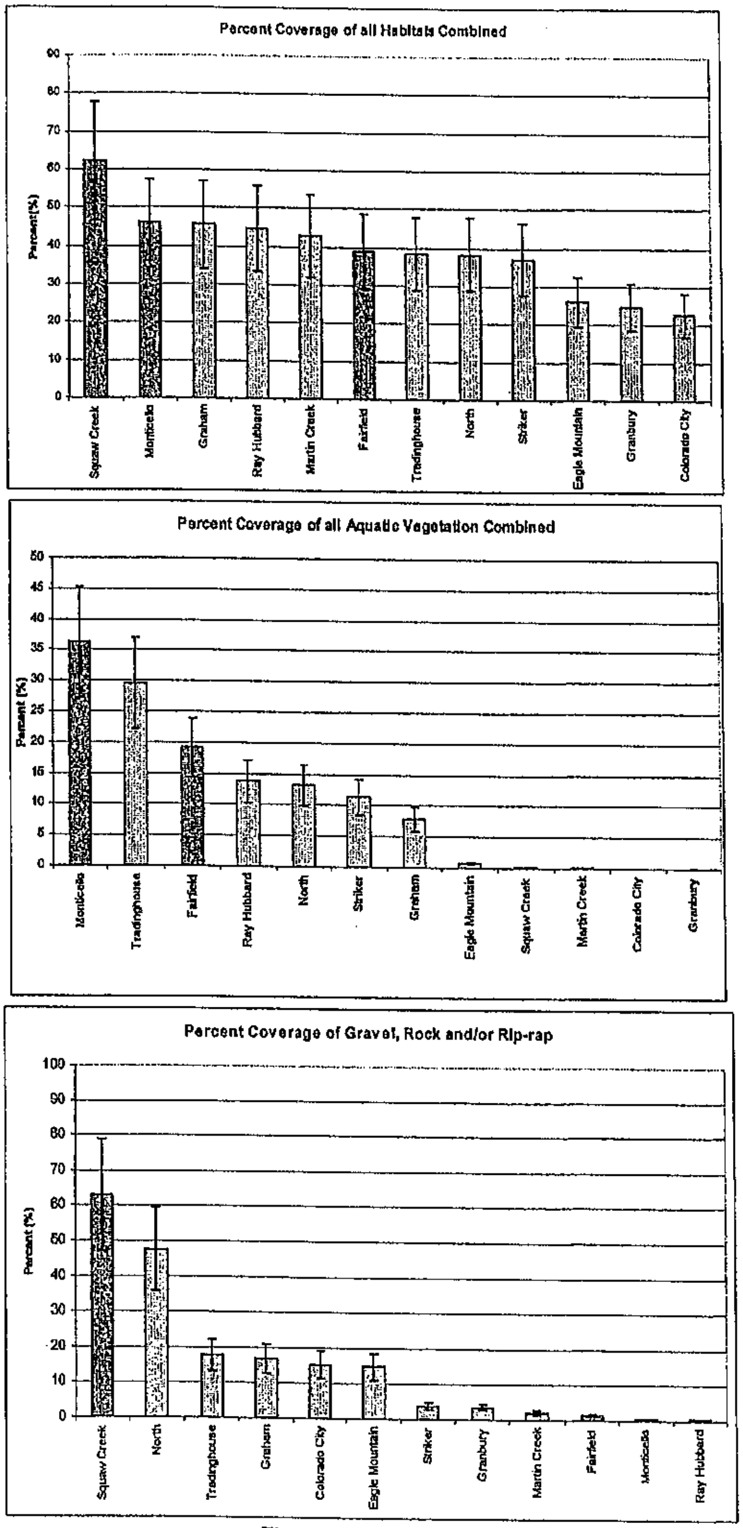
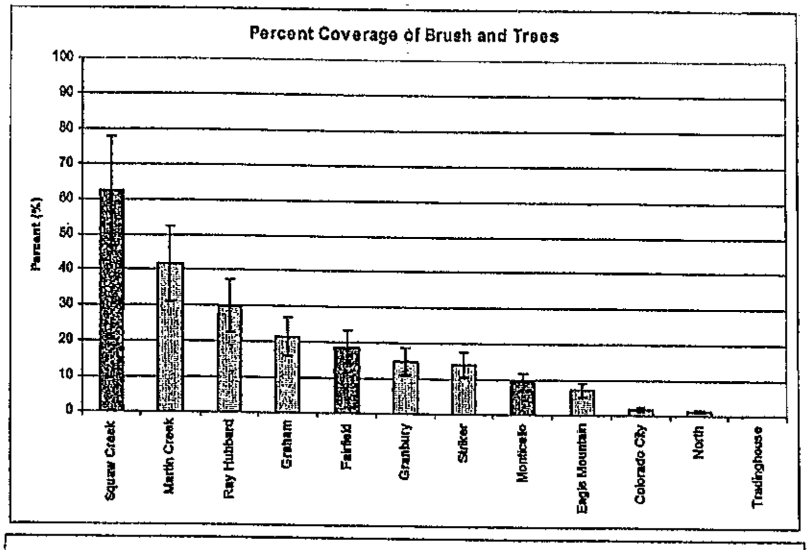


Figure 4a, 4b, and 4c

Figure 4 (Cont'd)



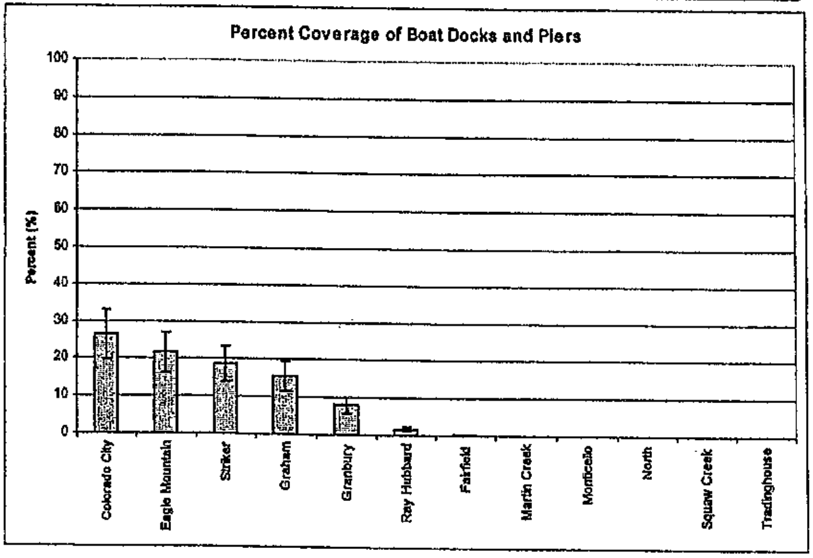
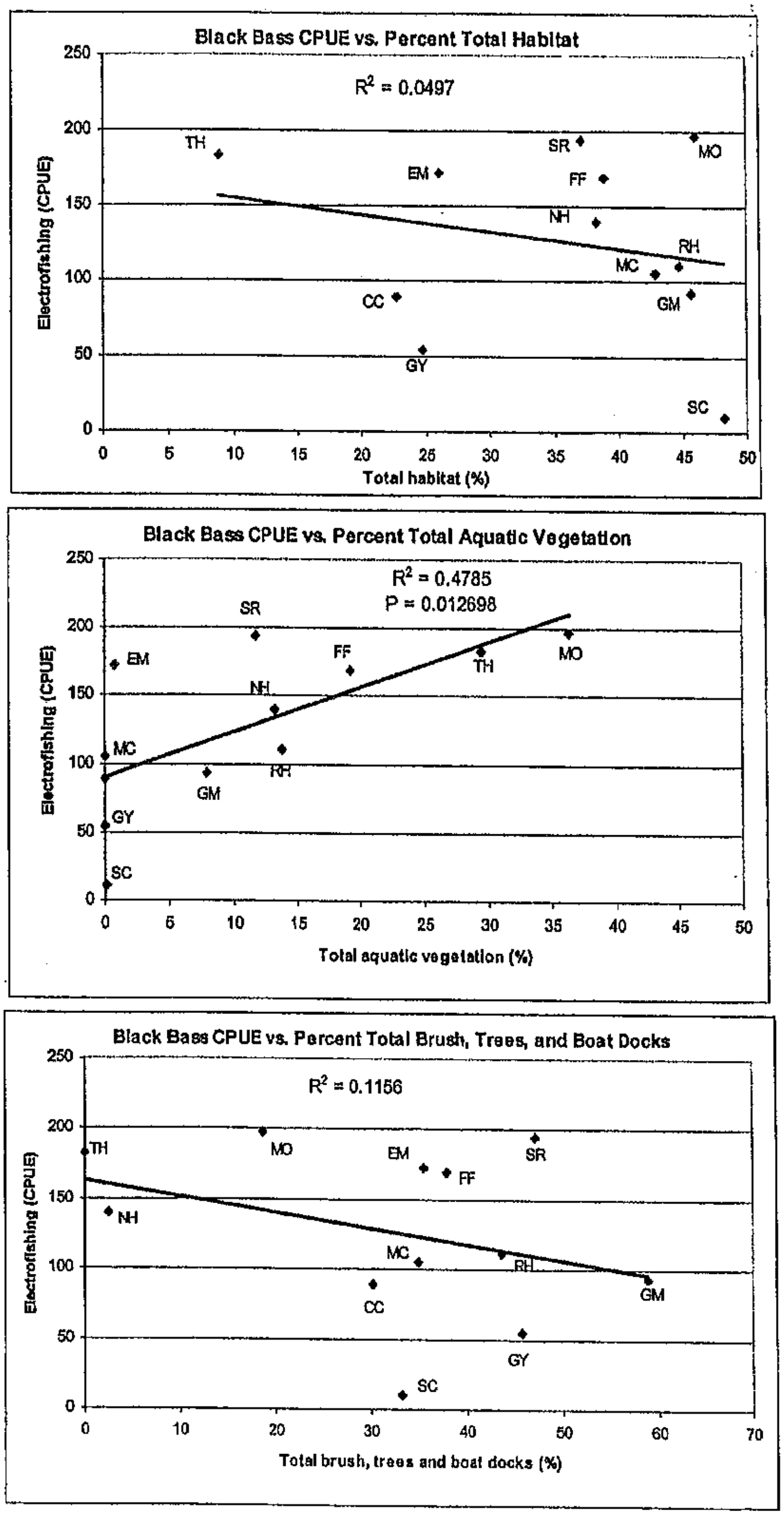


Figure 4d and 4e

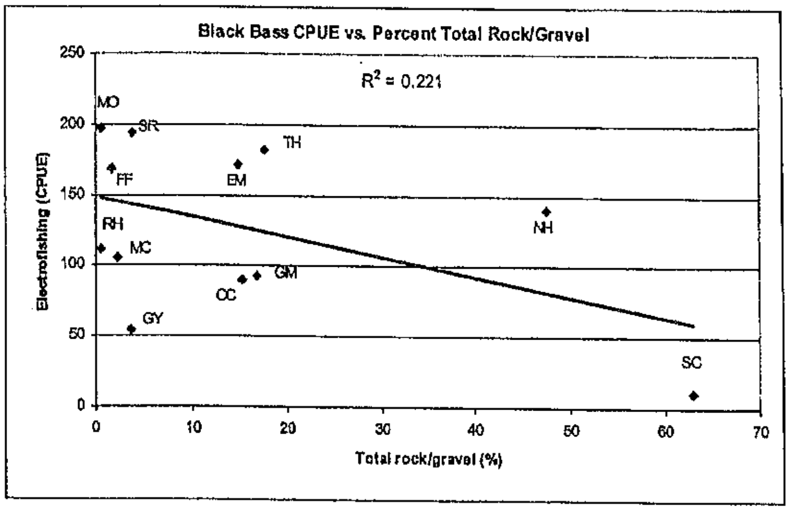
Error bars indicate ±25% error.
Source: TPWD performance reports.

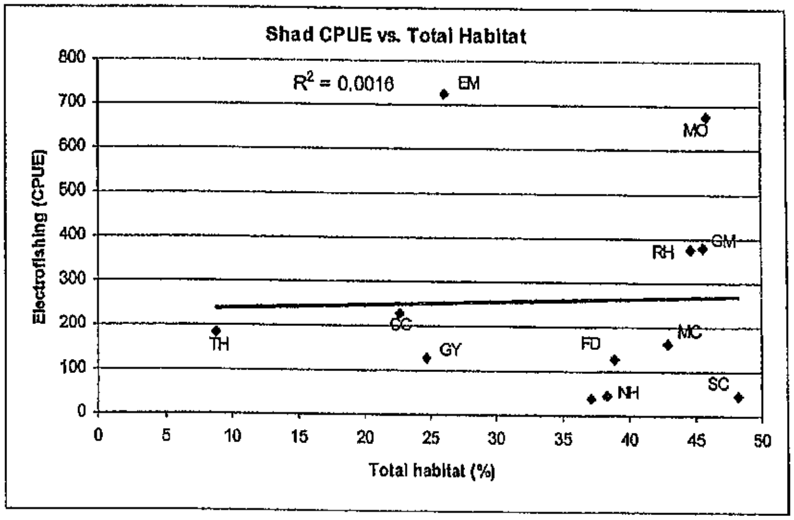
Figure 5: Relationship Between Sampling Catch Rates of Selected Species and Various Habitat Types

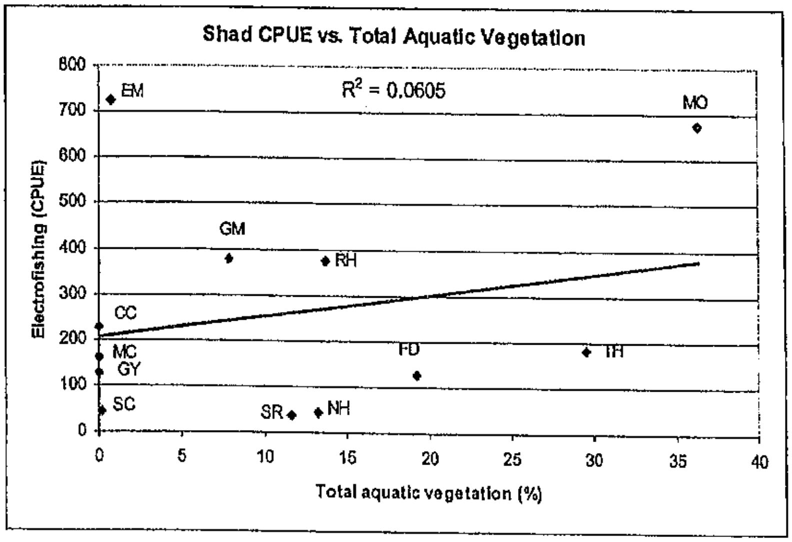


Figures 5a, 5b, and 5c

Figure 5 (Cont'd)

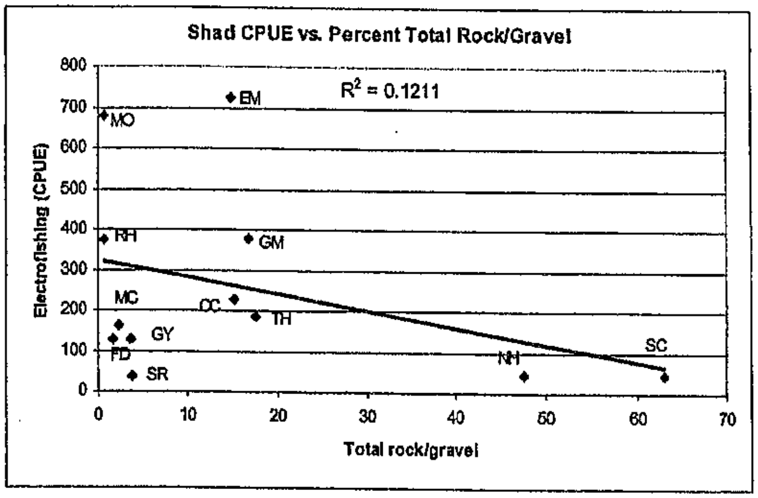


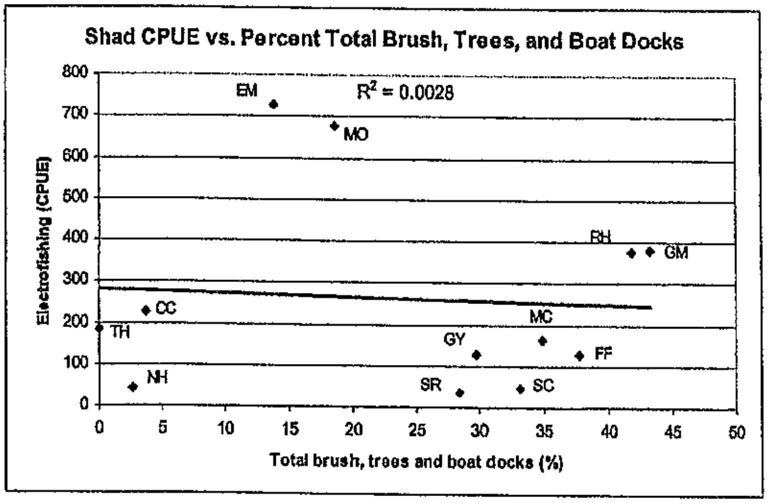


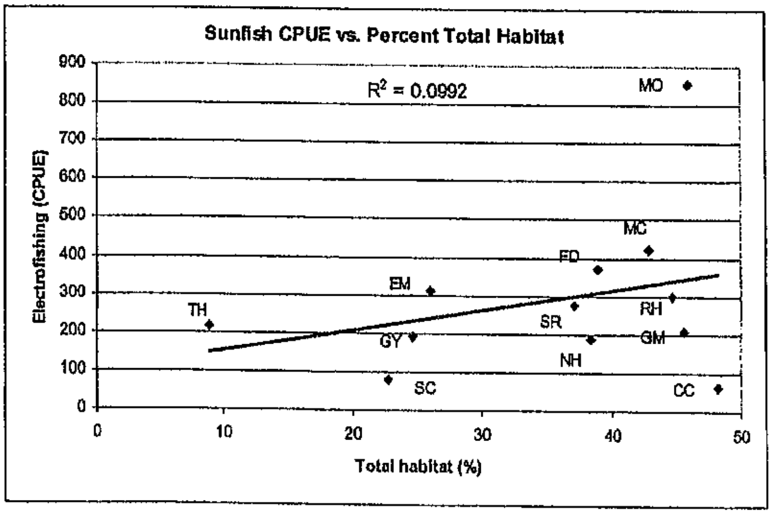


Figures 5d, 5e, and 5f

Figure 5 (Cont'd)

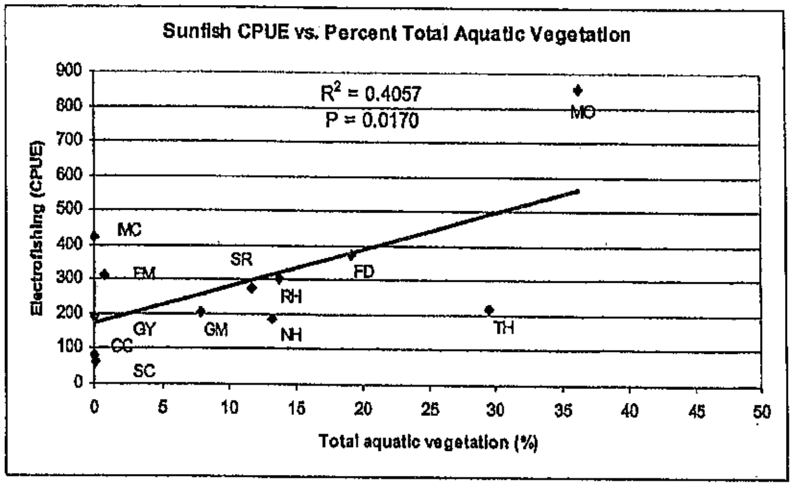


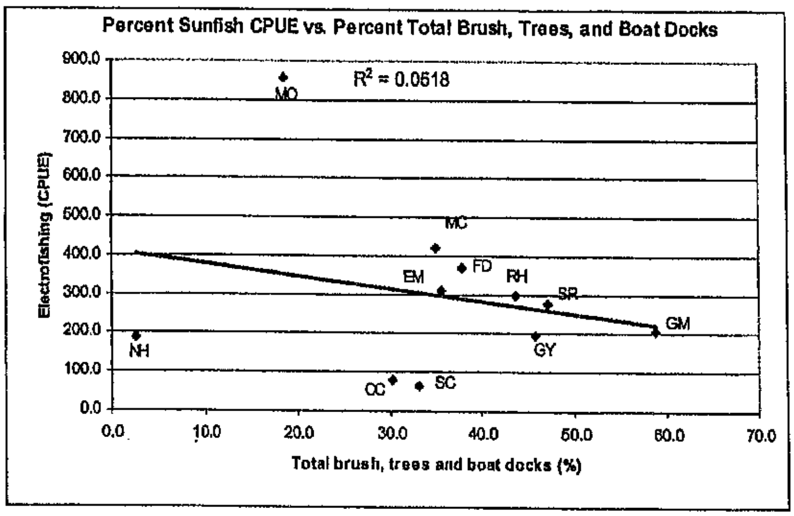


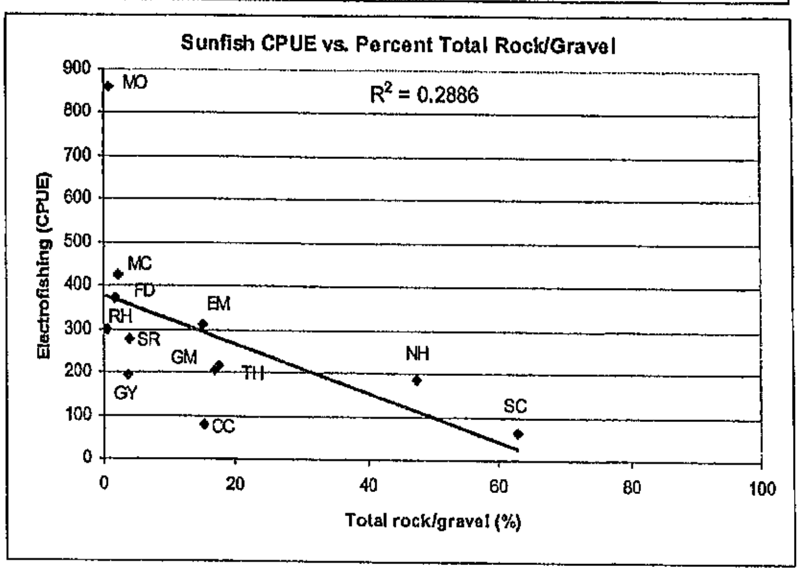


Figures 5g, 5h, and 5i

Figure 5 (Cont'd)



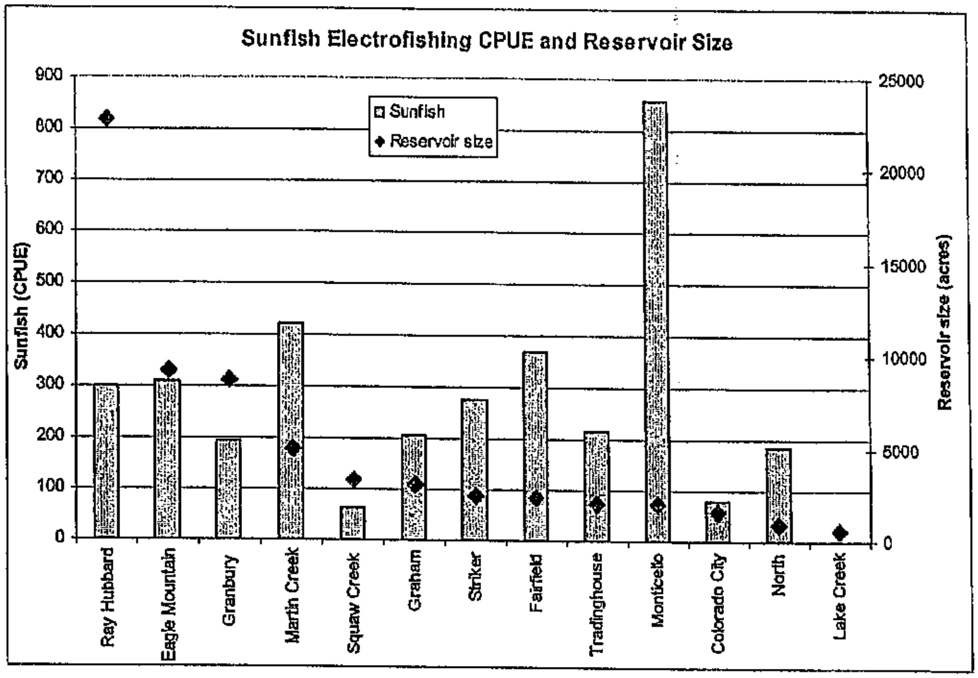


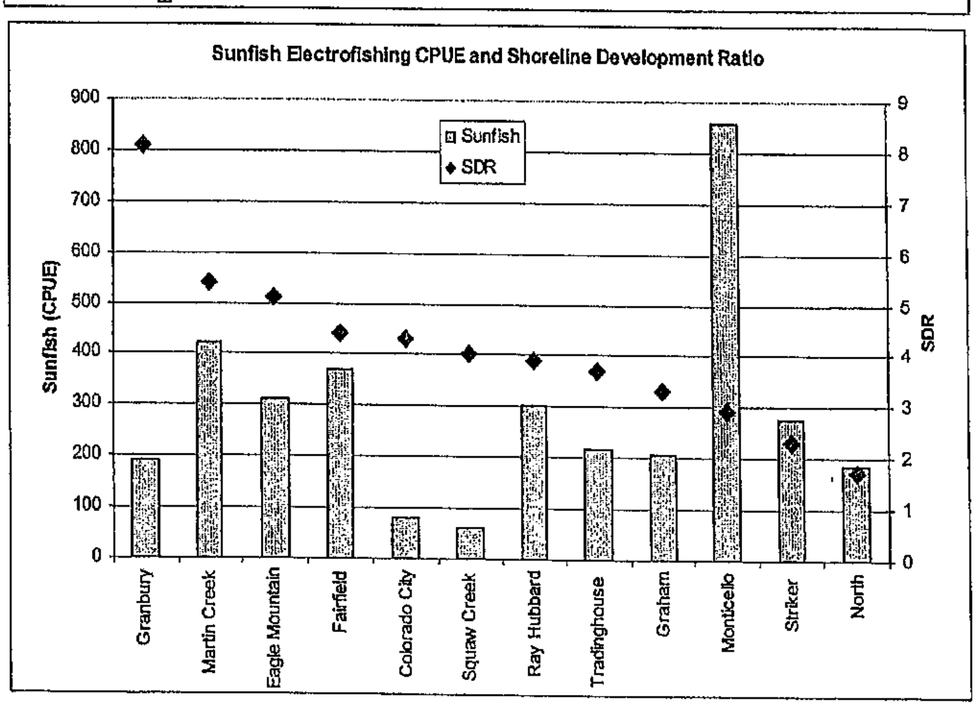


Figures 5j, 5k, and 5l

Source: TPWD performance reports.

Figure 6: Relationship Between Reseroir Sies and Shoreline Deelopment Ratios (SDR) and Sunfish Electrofishing Catch Rates





Figures 6a and 6b

Source: TPWD performance reports.

TBLE 1
RESERB PHSCA CHRCTERSTCS

Reservoir	Report year	Size (acres)	Size (square feet)	Mean Secchi Depth (feet)	Mean Depth (feet)	Max Depth (feet)	Conductivity (mho/cm)	Shoreline Length (miles)	Shoreline Length (feet)	Shoreline Development Ratio	River System	Year Built	Controlling Authority	County (dam)
Colorado City	2001	1618	70480080	3.0	12.0	51.0	360	24.0	126720	4.3	Colorado	1949	TX	Mitchell
Eagle Mountain	2000	9200	400752000	3.0	22.0	47.0	230	69.0	364320	5.1	Trinity	1954	Tarrant County Water Control and Improvement District No.1	Tarrant
Graham	2001	3000	130680000	1.0	21.0	45.0	450	25.0	132000	3.3	Brazos	1929	City of Graham	Young
Granbury	2001	8700	378972000	4.0	18.0	75.0	2400	106.0	559680	8.1	Brazos	1969	Brazos River Authority	Hood
Fairfield	2000	2353	102496680	5.0	21.5	50.0	850	30.0	158400	4.4	Trinity	1969	TX	Freestone
Lake Creek	1985	616	26832960	no data	14.4	35.0	no data	7.5	39487	2.2	Brazos	1951	TX	McLennan
Martin Creek	2001	5000	217800000	2.5	16.0	50.0	120	53.0	279840	5.4	Sabine	1974	TX	Rusk
Monticello	1999	2000	87120000	3.8	20.3	40.0	335	18.0	95040	2.9	Cypress	1972	TX	Titus
North	1998	907	39508920	5.0	20.0	55.0	300	7.5	37725	1.7	Trinity	1957	TX	Dallas
Ray Hubbard	2001	22745	990772200	3.0	21.5	40.0	200	83.0	438240	3.9	Trinity	1968	City of Dallas	Rockwall
Squaw Creek	1997	3272	142528320	5.0	46.0	135.0	1300	32.0	168960	4.0	Brazos	1979	TX	Hood, Somerville
Striker	1999	2400	104544000	2.0	15.0	35.0	200	16.0	84480	2.3	Agelina		AgelinaNacogdoches County Water Control and Improvement District	Rusk
River Crest*													TX	Red River
Tradinghouse	2000	2012	87642720	3.0	19.0	42.0	1200	23.0	121440	3.7	Brazos	1968	TX	McLennan

*Anounced for retirement and will not be considered for 316(b) compliance.
Source: TPWD Reservoir performance reports.

TABLE 2
FISHERIES SURVEY DATA FOR SELECTED SPECIES BY RESERVOIR

Black Bass Electrofishing CPUE																			
	Largemouth bass																		
Reservoir	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean
Colorado City			159.0			27.0			77.0	79.0		89.3				104.0			89.2
Eagle Mountain			173.0	121.0	110.0	119.0	222.7			150.0			93.3		105.3				136.8
Graham	23.3				12.0				90.0			149.3				188.8			92.7
Granbury			10.0		7.3		14.7			57.3			83.3			60.0			38.8
Fairfield		76.6	61.3			310.0		94.0			192.0			242.0	205.0				168.7
Martin Creek						120.7			154.0					146.0	9.4	96.7			105.4
Monticello				169.3	208.0	195.0	172.0	238.7	246.7	271.3	213.3	122.4	112.7	202.0					195.6
North			79.0			37.0	306.0			94.0			113.0						125.8
Ray Hubbard				88.0		63.0			101.0			206.5			96.0				110.9
Squaw Creek			10.7		2.0				12.7			16.0							10.4
Striker			127.3			70.7	55.3	56.0		43.3	51.3			80.0				24.0	69.1
Tradinghouse				59.3		11.1			384.0			181.0			277.0				182.5

	Spotted bass																			Total
Reservoir	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean	Mean
Colorado City			0.0			0.0			0.0	0.0		0.0				0.0			0.0	89.2
Eagle Mountain			25.0		21.0		55.0			48.0			42.0		18.7				35.0	171.7
Graham	0.0				0.0				0.0			0.0				0.0			0.0	92.7
Granbury			6.7		4.0		8.0			14.7			35.3						15.5	54.3
Fairfield		0.0	0.0			0.0		0.0			0.0			0.0	0.0				0.0	168.7
Martin Creek						0.0			0.0					0.0	0.0	0.0			0.0	105.4
Monticello				2.0	3.3	0.0	2.0	0.7	1.3	0.7	2.7	1.6	0.0	1.0					1.3	196.9
North			6.0			6.0	16.0			27.0			5.0						13.5	139.3
Ray Hubbard				0.0		0.0			0.0			0.0			0.0				0.0	110.9
Squaw Creek			0.0		0.0					0.0		0.0							0.0	10.4
Striker			108.7			111.3	132.7	171.3		72.7	258.0			77.0				66.0	124.7	193.8
Tradinghouse												0.0			0.0				0.0	182.5

Empty Cells Indicate that there was no survey for that year. CPUE = Catch Per Unit Effort.
Source: TPWD Reservoir performance reports.

TABLE 2 (Cont'd)

Reservoir	Shad Electrofishing CPUE – Gizzard shad																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean
Colorado City			141.0			77.0			121.5			410.0			380.0				225.9
Eagle Mountain			214.0		291.0		329.0			274.0			589.3		711.8				401.5
Graham	48.7				84.7				261.3			202.7				694.0			258.3
Granbury			49.3		55.3		122.7			175.3			84.7			102.7			98.3
Fairfield		26.7	5.4			26.0		28.0			56.7			18.0	60.0				31.5
Martin Creek						43.3			14.7					55.3	11.3	12.7			27.5
Monticello				0.7	0.0	1.0	0.7	2.0	30.7	28.0	21.3	14.4	22.0	2.0					11.2
North			16.0			1.0	15.0			24.0			30.0						17.2
Ray Hubbard				163.0		78.0			309.0			299.5			177.5				205.4
Squaw Creek			10.0		6.0				7.3			152.0							43.8
Striker			24.7			26.7	25.3	32.0			30.0			38.0				64.0	34.4
Tradinghouse				32.7		4.0			148.0			121.0			441.0				149.3

Reservoir	Threadfin shad																			Total
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean	Mean
Colorado City			0.0			0.0			0.0			0.0			3.0				0.6	226.5
Eagle Mountain			387.0		37.0		155.0			115.3			579.3		670.0				323.9	725.5
Graham	60.7				113.3				31.3			304.0				88.8			119.6	377.9
Granbury			0.0		110.0		36.0			5.3			4.0			14.7			28.3	126.7
Fairfield		25.3	332.0			100.0		6.0						21.0		89.0			95.6	127.1
Martin Creek						29.3			7.3					86.7	490.0	60.0			134.7	162.1
Monticello				239.3	615.3	1,040.0	1,007.3	3,010.0	143.3	267.3	401.3	230.4	5.3	370.0					666.3	677.5
North			4.0			0.0	2.0			1.0			126.0						26.6	43.8
Ray Hubbard				170.0		41.0			174.0			100.0			359.5				168.9	374.3
Squaw Creek			0.0		0.7				6.0			0.0							1.7	45.5
Striker			3.3			4.0	0.0	0.7						0.0				7.0	2.5	36.9
Tradinghouse				36.0		5.0			24.8			101.0			3.0				34.0	183.3

Empty Cells Indicate that there was no survey for that year. CPUE = Catch Per Unit Effort.
Source: TPWD Reservoir performance reports.

TABLE 2 (Cont'd)

Sunfish Electrofishing CPUE																			
	Bluegill																		
Reservoir	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean
Colorado City			158.0			30.0			61.4			50.7			46.0				69.2
Eagle Mountain			273.0		212.0		276.0			132.0			47.3		140.0				180.1
Graham	1.3				14.0				56.3			316.7				324.0			142.5
Granbury			33.3		27.3		52.7			283.3			239.3			194.7			138.4
Fairfield		220.0	234.7			412.0		283.0			227.3			329.0	459.0				309.3
Martin Creek						286.7			312.7					464.0	258.7	284.7			321.4
Monticello				330.7	541.3	1126.0	428.0	353.3	388.0	271.3	1950.7	856.8	1410.6	874.0					775.5
North			148.0			375.0	24.0			88.0			26.0						132.2
Ray Hubbard				80.0		211.0			80.6			179.0			96.0				129.3
Squaw Creek			20.7		15.3				45.3			101.0							45.6
Striker			158.8			152.7	130.0	88.7			106.7			259.0				65.0	149.3
Tradinghouse				29.3		8.0			181.6						528.0				186.7

	Other sunfish (not including bluegill)																			Total
Reservoir	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean	Mean
Colorado City			28.0			5.0			5.0						3.0				10.3	79.5
Eagle Mountain			192.0		173.0		92.0			116.7			54.7		152.7				130.2	310.2
Graham	4.7				6.7				36.3			94.7				175.2			63.5	206.0
Granbury			14.7		9.3		40.0			69.9			109.4			81.3			54.1	192.5
Fairfield		13.3	0.7			98.0		211.3			6.7			53.0	45.0				61.1	370.4
Martin Creek						102.6			131.4					105.3	34.7	131.3			101.1	422.4
Monticello				108.0	216.0	272.0	80.0	66.7	63.3	35.3	9.3	15.2	19.3	10.0					81.4	856.9
North			73.0			63.0	47.0			47.0			35.0						53.0	185.2
Ray Hubbard				212.0		281.0			45.5			263.5			52.0				170.8	300.1
Squaw Creek			10.7		24.7				4.6			29.0							17.3	62.8
Striker			136.0			194.0	177.3	43.3						78.0				62.0	125.7	275.0
Tradinghouse				8.7		1.5			28.0						80.0				29.6	216.3

Empty Cells Indicate that there was no survey for that year. CPUE = Catch Per Unit Effort.
Source: TPWD Reservoir performance reports.

TABLE 2 (Cont'd)

Reservoir	Catfish Gill Net CPUE																		
	Blue catfish																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean
Colorado City			0.0			0.8			0.0			0.2				0.4			0.3
Eagle Mountain							0.0			0.7			0.6			0.9			0.6
Graham	0.0	0.0			0.0				0.0			0.0					0.7		0.1
Granbury							0.0			0.2			0.0			0.2	0.0		0.1
Fairfield			0.0			0.0		0.0			0.0			0.0		0.0			0.0
Martin Creek									0.0			0.2					0.0		0.1
Monticello				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					0.0
North			0.0			0.0	0.0			0.0			0.0						0.0
Ray Hubbard				0.0		0.0			5.0			13.1				8.3			5.3
Squaw Creek			0.0		0.0				0.0			0.0							0.0
Striker			0.0			0.0		0.0			0.0			0.0				0.0	0.0
Tradinghouse				0.0		0.0			0.0		0.0			0.0	0.0	0.0			0.0

Reservoir	Channel Catfish																			Total Mean
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean	
Colorado City			9.0			2.8			1.6			1.2				1.6			3.2	3.5
Eagle Mountain			8.0		5.0		7.0			11.8			3.8			2.3			6.3	6.9
Graham	2.7	1.0			1.0				3.8			3.2					3.1		2.5	2.6
Granbury			5.0		3.7		4.4			4.9			3.9			5.5	5.0		4.6	4.7
Fairfield			15.5			7.2		0.8			2.6			7.0		17.4			8.4	8.4
Martin Creek						2.1			2.1			3.8					13.0		5.3	5.3
Monticello				43.4	20.2	25.8	22.8	14.2	24.4	0.0	20.6	14.6	20.2	13.8					20.0	20.0
North			2.0		0.0	2.0				1.4			2.6						1.6	1.6
Ray Hubbard				5.0		19.0			7.6			5.6				5.7			8.6	13.9
Squaw Creek			2.0		5.4				15.0			18.4							10.2	10.2
Striker			18.5			5.2		5.2			4.2			0.8				8.8	7.1	7.1
Tradinghouse				13.8		14.2			13.6		9.6			7.2	3.0	4.8			9.5	9.5

Empty Cells Indicate that there was no survey for that year. CPUE = Catch Per Unit Effort.
Source: TPWD Reservoir performance reports.

TABLE 2 (Cont'd)

Temperate Basses Gill Net CPUE

Reservoir	White bass																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean
Colorado City			7.8			0.8			1.4			16.8				30.0			11.4
Eagle Mountain			7.0		9.0		3.0			10.3			11.1			3.7			7.4
Graham		0.5	0.0		0.6				5.0			3.4					2.9		2.1
Granbury			9.5		8.5		0.7			4.1			2.3			1.9	2.3		4.2
Fairfield			0.0			0.0		0.0			0.0			0.0		0.0			0.0
Martin Creek						0.0			0.0			0.0					0.0		0.0
Monticello				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					0.0
North			3.0			0.0	4.0			3.2			0.6						2.2
Ray Hubbard				9.0		12.0			11.3			5.7				3.5			8.3
Squaw Creek			0.8		5.0				0.8			0.2							1.7
Striker			7.3			0.6		0.0		0.0	0.2			0.0				3.0	1.6
Tradinghouse				0.0		1.0			1.0			1.2		0.0	0.9	1.0			0.7

Reservoir	Striped bass																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean
Colorado City			0.0			0.0			0.0			0.0				0.0			0.0
Eagle Mountain			0.0		0.0		0.0			0.0			0.0			0.0			0.0
Graham			0.0		0.0				0.0			0.0				0.0			0.0
Granbury			2.0		0.7		2.3			1.9			1.7			0.4	1.9		1.6
Fairfield			0.0			0.0		0.0											0.0
Martin Creek						0.0			0.0			0.0					0.0		0.0
Monticello				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					0.0
North			0.0			0.0	0.0			0.0			0.0						0.0
Ray Hubbard				0.0		0.0			0.0			0.1				0.0			0.0
Squaw Creek			0.0		0.0				0.0			4.8							1.2
Striker			0.0			0.0		0.0		0.0	0.0			0.0				0.0	0.0
Tradinghouse				0.0		0.0			0.0			0.0		0.0	0.0	0.0			0.0

Reservoir	Palmetto bass (hybrid white male x striped female bass)																			Total
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean	Mean
Colorado City			0.0			0.0			0.0			0.0				0.0			0.0	11.4
Eagle Mountain			0.0		0.0		0.0			0.0		0.0				0.0			0.0	7.4
Graham	0.2	0.2			4.6				9.0			10.0					2.7		4.5	6.5
Granbury			0.0		0.0		0.0			0.0			0.0			0.0	0.0		0.0	5.7
Fairfield			11.2			8.2		4.6			11.4			1.2		1.6			6.4	6.4
Martin Creek						0.0			0.0			0.0					0.0		0.0	0.0
Monticello				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					0.0	0.0
North			0.0			0.0	0.0			0.0			0.0						0.0	2.2
Ray Hubbard			10.0			2.0			7.9			5.1				0.0			5.0	13.3
Squaw Creek			1.8		0.0				0.0			4.8							1.7	4.6
Striker			0.0			0.0		0.0		0.0	0.0			0.0				0.0	0.0	1.6
Tradinghouse				0.0		0.0			0.0			0.0		0.0	0.0	0.0			0.0	0.7

Empty Cells Indicate that there was no survey for that year. CPUE = Catch Per Unit Effort.
Source: TPWD Reservoir performance rReports.

TABLE 2 (Cont'd)

Crappie Trap Net CPUE

Reservoir	White crappie																		
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean
Colorado City			0.3			0.1			0.6			0.2	0.2		4.0				0.9
Eagle Mountain			4.0		9.0		5.0			1.4			3.4		3.2				4.3
Graham					11.0				5.6			10.8				3.6			7.8
Granbury			1.0		5.9		3.7			22.9			9.3			3.3			7.7
Fairfield		0.0	0.0			0.0		0.2			0.0			0.0	0.0				0.0
Martin Creek						1.1			2.7			0.1				0.0			1.0
Monticello				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0					0.0
North							1.0			2.2			4.2						2.5
Ray Hubbard				5.0		7.0			9.0			6.1			14.1				8.2
Squaw Creek			0.0		1.0				0.0			0.2							0.3
Striker			1.6			1.8		1.5			1.9			0.2				1.8	1.5
Tradinghouse					1.6	0.8			4.2			0.8			1.8				1.8

Reservoir	Black crappie																			Total
	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean	Mean
Colorado City			0.0			0.0			0.0			0.0	0.0		0.0				0.0	0.9
Eagle Mountain			0.0		0.0		0.0			0.5			6.4		0.7				1.3	5.6
Graham					0.2				0.0			0.0				0.0			0.1	7.8
Granbury			0.0		0.1		0.0			0.0			0.0			0.0			0.0	7.7
Fairfield		4.4	2.8			0.0		0.6			0.0			0.0	0.0				1.1	1.1
Martin Creek						1.6						1.2				1.7			1.5	2.5
Monticello				0.0	0.2	0.0	0.8	0.0	0.0	0.2	0.6	1.6	1.2	0.3					0.4	0.4
North							0.0			0.0			0.0						0.0	2.5
Ray Hubbard				0.0		0.0			0.0			5.3			2.3				1.5	9.8
Squaw Creek			0.0		0.0				0.0			0.2							0.1	0.4
Striker			0.4			0.2		0.0			0.0			0.0				0.2	0.1	1.6
Tradinghouse					0.0	0.0			0.0			0.0			9.8				2.0	3.8

Empty Cells Indicate that there was no survey for that year. CPUE = Catch Per Unit Effort.
Source: TPWD Reservoir performance rReports.

TABLE 3
STANDING CROP AND TOTAL NUMBERS FROM COVE ROTENONE SURVEYS

Reservoir	Colorado City	Eagle Mountain	Graham	Granbury	Fairfield	Lake Creek	Martin Creek	Monticello	North	Ray Hubbard	Squaw Creek	Striker	Tradinghouse
Date	1985	No data	1983	1981	1985	1984	1985	1987	No data	No data	1981	1975	1987
Area (acres)	3	available	3	3.13	2.2	3	3.8	2.2	available	available	1.53	3.61	2
Standing Crop (pounds):													
Gizzard shad (*Dorosoma cepedianum*)	154.0		27.1	51.7	32.6	47.0	9.2	0.0			24.5	11.2	128.6
Threadfin shad (*D. petenense*)	3.1		1.3	4.2	0.8	1.8	1.9	5.7			0.0	0.1	26.1
Total shad	157.1	*	28.4	55.9	33.4	48.8	11.1	5.7	*	*	24.5	11.3	154.7
Largemouth bass (*Micropterus salmoides*)	13.1		4.2	6.6	144.1	16.0	11.5	53.8			47.0	14.6	69.0
Spotted bass (*M. punctulatus*)	0.0		0.0	0.8	0.0	1.4	0.0	0.0			0.0	2.3	0.0
Total black bass	13.1	*	4.2	7.4	144.1	17.4	11.5	53.8	*	*	47.0	16.9	69.0
White crappie (*Pomoxis annularis*)	0.0		1.8	2.5	0.0	0.3	1.0	0.0			0.0	0.0	0.2
Black crappie (*P. nigromaculatus*)	0.0		0.0	0.0	0.0	0.0	0.1	0.0			0.0	0.0	0.0
Total crappie	0.0	*	1.8	2.5	0.0	0.3	1.1	0.0	*	*	0.0	0.0	0.2
Channel catfish (*Ictalurus punctatus*)	13.2		4.7	8.1	36.4	6.3	2.0	55.1			1.9	3.3	234.7
Blue catfish (*I. furcatus*)	0.0		0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0
Totla catfish	13.2	*	4.7	8.1	36.4	6.3	2.0	55.1	*	*	1.9	3.3	234.7
Bluegill (*Lepomis macrochirus*)	28.0		4.0	72.4	119.3	26.0	17.9	45.8			37.8	3.9	103.8
Other sunfish (*L. spp.*)	19.3		3.2	45.6	13.9	12.5	26.4	17.8			26.7	34.6	12.7
Total sunfish	47.3	*	7.3	118.0	133.2	38.5	44.3	63.6	*	*	64.6	38.5	116.5
White bass (*Morone chrysops*)	0.0		0.1	0.0	0.0	0.0	0.0	0.0			0.0	0.4	0.0
Striped bass (*M. saxatilis*)	0.0		0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0
Palmetto bass (*M. chrysops x M. saxatilis*)	0.0		0.0	0.0	0.0	0.0	0.3	0.0			0.0	0.0	0.0
Total temperate basses	0.0	*	0.1	0.0	0.0	0.0	0.3	0.0	*	*	0.0	0.4	0.0
Tilapia (*Oreochromis aureus*)	3.3			0.0	954.0	0.0	0.3	0.0			0.0	0.0	75.5
Other	52.3		83.3	71.8	275.0	31.7	41.3	4.4			16.3	9.2	159.4
Total	286.3	*	129.6	263.7	1,576.1	143.0	111.9	182.6	*	*	154.2	79.6	810.0

TABLE 3 (Cont'd)

Reservoir	Colorado City	Eagle Mountain	Graham	Granbury	Fairfield	Lake Creek	Martin Creek	Monticello	North	Ray Hubbard	Squaw Creek	Striker	Tradinghouse
Date		No data available							No data available	No data available			
Area (acres)													
Total number:													
Gizzard shad (*Dorosoma cepedianum*)	720.0		138.3	325.0	108.1	159.0	15.5	0.0			30.0	39.6	645.0
Threadfin shad (*D. petenense*)	679.0		220.4	343.0	155.2	662.0	183.4	518.1			0.0	32.5	4,075.0
Total shad	1,399.0	*	358.7	668.0	263.3	821.0	198.9	518.1	*	*	30.0	72.2	4,720.0
Largemouth bass (*Micropterus salmoides*)	142.5		146.1	73.0	1,817.7	114.0	404.2	1,473.2			340.0	109.2	376.0
Spotted bass (*M. punctulatus*)	0.0		0.0	16.0	0.0	21.0	0.0	0.0			0.0	19.8	0.0
Total black bass	142.5	*	146.1	89.0	1,817.7	135.0	404.2	1,473.2	*	*	340.0	129.1	376.0
White crappie (*Pomoxis annularis*)			13.2	49.0	0.0	9.0	2.8	0.0			1.0	10.4	1.0
Black crappie (*P. nigromaculatus*)			0.0	0.0	0.0	0.0	1.1	0.0			0.0	0.8	0.0
Total crappie	0.0	*	13.2	49.0	0.0	0.0	3.9	0.0	*	*	1.0	11.1	1.0
Channel catfish (*Ictalurus punctatus*)	110.0		53.3	17.0	68.9	34.0	21.7	64.4			2.0	51.3	690.0
Blue catfish (*I. furcatus*)	0.0		0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0
Totla catfish	110.0	*	53.3	17.0	68.9	34.0	21.7	64.4	*	*	2.0	51.3	690.0
Bluegill (*Lepomis macrochirus*)	879.0		195.0	3,218.0	1,853.4	906.0	2,498.6	2,352.3			14,473.0	167.7	3,968.0
Other sunfish (*L. spp.*)	796.9		141.7	1,661.0	245.3	285.0	1,253.9	739.3			3,914.0	1,014.4	301.0
Total sunfish	1,675.9	*	336.7	4,879.0	2,098.7	1,191.0	3,752.5	3,091.6	*	*	18,387.0	1,182.1	4,269.0
White bass (*Morone chrysops*)	0.0		0.6	0.0	0.0	0.0	0.0	0.0			0.0	1.4	0.0
Striped bass (*M. saxatilis*)	0.0		0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0
Palmetto bass (*M. chrysops x M. saxatilis*)	0.0		0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0	0.0
Total temperate basses	0.0	*	0.6	0.0	0.0	0.0	0.0	0.0	*	*	0.0	1.4	0.0
Tilapia (*Oreochromis aureus*)	4.2		0.0	0.0	4,388.5	0.0	0.6	0.0			0.0	0.0	3,212.0
Other	611.6		737.5	54.0	1,284.8	456.0	2,280.0	244.9			521.0	254.1	3,776.0
Total	3,943.2	*	1,646.1	5,756.0	9,921.9	2,637.0	6,661.8	5,392.2	*	*	19,281.0	1,701.3	17,044.0

* Data not available

The most recent cove rotenone survey for each reservoir are represented above.

Source: TPWD Reservoir performance reports.

TABLE 4
SURVEYED HABITATS BY RESERVOIR

	Habitat Availability																												
	Shoreline/littoral																Open water												
Reservoir	Shoreline length (miles)	Nondescript (miles)	Nondescript (%)	Gravel (miles)	Gravel (%)	Rip-rap, rock, and boulders (miles)	Rip-rap, rock, and boulders (%)	Emerged aquatic vegetation including floating (miles)	Emerged vegetation (%)	Submerged aquatic vegetation (miles)	Submerged aquatic vegetation (%)	Total aquatic vegetation (%)	Boat docks and piers (miles)	Boat docks and piers (%)	Brush and trees (miles)	Brush and trees (%)	Percent total shoreline habitat	Reservoir area (acres)	Open water (acres)	Open water (%)	Trees and brush (acres)	Trees and brush (%)	Emerged aquatic vegetation including floating (acres)	Emerged vegetation (%)	Submerged aquatic vegetation (acres)	Submerged aquatic vegetation (%)	Total aquatic vegetation (%)	Percent total open-water habitat	Percent total habitat
Colorado City	24.0	12.8	53.2	2.0	8.2	1.7	7.0					0.0	6.4	26.6	0.9	3.6	45.4	1618	1618	100.0							0.0	0.0	22.7
Eagle Mountain	69.0	33.3	48.3	2.4	3.4	7.8	11.3					0.0	15.0	21.7	9.5	13.8	50.3	9200	9028	98.1	38.0	0.4	136.0	1.5			1.5	1.89	26.1
Graham	25.0	6.1	24.4	2.1	8.4	2.1	8.4	3.9	15.6			15.6	3.9	15.6	10.8	43.2	91.2	3000	3000	100.0							0.0	0.00	45.6
Granbury	106.0	70.3	66.3			3.8	3.6					0.0		16.0	31.5	29.7	49.3	8700	8700	100.0							0.0	0.00	24.7
Fairfield	30.0	11.5	38.4			0.5	1.6	6.9	22.9			22.9	0.1	0.2	11.3	37.7	62.4	2353	2353	100.0			160.0	6.8	204.0	8.7	15.5	15.47	38.9
Lake Creek	ND																												
Martin Creek	53.0	33.6	63.4			1.2	2.3					0.0			18.5	34.9	37.2	5000	2574	51.5	2426.0	48.5	1.0	0.0	0.1	0.0	0.0	48.54	42.9
Monticello	18.0	1.4	7.8			0.1	0.8	10.3	57.0	2.8	15.6	72.6			3.3	18.6	91.4	2000	2000	100.0							0.0	0.00	45.9
North	7.5	1.8	23.8			3.6	47.5	2.0	26.4			26.4			0.2	2.6	76.6	907	907	100.0							0.0	0.00	38.3
Ray Hubbard	83.0	24.2	29.2	0.5	0.6		0.0	22.1	26.6			26.6	1.4	1.7	34.7	41.8	70.7	22475	18282	81.3	3394.0	17.5			199.0	0.9	0.9	18.86	44.7
Squaw Creek	32.0	1.1	3.3	9.5	29.8	10.6	33.1	0.1	0.3			0.3			10.6	33.1	96.4	3272	3272	100.0							0.0	0.00	48.2
Striker	16.0	3.9	24.6			0.6	3.8	3.7	23.3			23.3	3.0	18.7	4.6	28.4	74.1	2400	2400	100.0							0.0	0.00	37.1
Tradinghouse	23.0	4.5	19.7			4.1	17.6	13.6	59.0			59.0					76.6	2012	2012	100.0					1.0	0.0	0.0	0.05	38.3

ND = Data not available.
Habitats represent most current surveys for each reservoir. (Some habitat fields in the reservoir performance reports were combined.)
Source: TPWD Reservoir performance reports.

TABLE 5
FISH COMMUNITY COMPARISON BETWEEN RESERVOIRS

	Fairfield	Colorado City	Tradinghouse	Martin Creek	Monticello	North	Striker	Graham	Ray Hubbard	Eagle Mountain	Granbury	Squaw Creek
Black bass												
Shad												
Sunfish												
Catfish												
Crappie												
Temperate bass												

	Monticello	Fairfield	Tradinghouse	Martin Creek	Eagle Mountain	Ray Hubbard	Colorado City	Graham	Striker	North	Granbury	Squaw Creek
Black bass												
Shad												
Sunfish												
Catfish												
Crappie												
Temperate bass												

	Squaw Creek	North	Colorado City	Granbury	Striker	Tradinghouse	Martin Creek	Graham	Ray Hubbard	Fairfield	Eagle Mountain	Monticello
Black bass												
Shad												
Sunfish												
Catfish												
Crappie												
Temperate bass												

Cells shaded in gray are the representative reservoirs. Cells without shading are indicate similarity at the 95% confidence level between reservoirs. Cells shaded in black indicate that the reservoirs are dissimilar.

Graham Creek Steam Electric Station
WQ0000551000
PLAIN LANGUAGE SUMMARY

The following summary is provided for this pending water quality permit application being reviewed by the Texas Commission on Environmental Quality as required by 30 Texas Administrative Code Chapter 39. The information provided in this summary may change during the technical review of the application and are not federal enforceable representations of the permit application.

Luminant Generation Company LLC (CN603256413) operates the Graham Steam Electric Station (RN102563426), a two-unit natural gas-fired steam electric generating facility. The facility is located at 480 Power Plant Rd, Graham, Young County, Texas 76450.

This application is for the renewal of Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000551000 (EPA I.D. No. TX0001163) which authorizes the discharge of wastewaters at a daily average flow not to exceed 505.4 million gallons per day via Outfall 001. The permit also authorizes the discharge of low volume waste, storm water and previously monitored effluent (metal cleaning waste) via Outfall 002.

The discharge of once-through cooling water via Outfall 001, low volume waste via Outfall 002 and previously monitored effluent via Outfall 201 from this facility is subject to federal effluent limitation guidelines at 40 CFR Part 423. The pollutants expected from these discharges based on 40 CFR Part 423 are: total residual chlorine, free available chlorine, total suspended solids, oil and grease, total iron, total copper and pH. Temperature is also expected from discharges of 001. Additional potential pollutants are included in the Industrial Wastewater Application Technical Report, Worksheet 2.0.

The raw water supply for the facility's cooling water system is from Lake Grahm Reservoir, supplied by the City of Graham. Potable water is also supplied by the City of Graham. A chemical feed system supplies water conditioning chemicals to the once-through cooling water to minimize corrosion and control the formation of mineral scale and bio-fouling. Storm water is collected through various storm drains and is discharged under the TCEQ Industrial Multi-Sector General Permit TXR05W674. Domestic wastes are routed to the City of Grahm wastewater treatment plant disposal.

Estación eléctrica de vapor de Graham Creek
WQ0000551000
RESUMEN EN LENGUAJE SENCILLO

El siguiente resumen se proporciona para esta solicitud de permiso de calidad del agua pendiente que está siendo revisada por la Comisión de Calidad Ambiental de Texas según lo exige el Capítulo 39 del Código Administrativo de Texas 30. La información proporcionada en este resumen puede cambiar durante la revisión técnica de la solicitud y no es federal. representaciones ejecutables de la solicitud de permiso.

Luminant Generation Company LLC (CN603256413) opera la Graham Steam Electric Station (RN102563426), una instalación de generación eléctrica de vapor alimentada con gas natural de dos unidades. La instalación está ubicada en 480 Power Plant Rd, Graham, condado de Young, Texas 76450.

Esta solicitud es para la renovación del Permiso No. WQ0000551000 del Sistema de Eliminación de Descarga de Contaminantes de Texas (TPDES) (N.º de identificación de la EPA TX0001163), que autoriza la descarga de aguas residuales a un flujo promedio diario que no exceda los 505.4 millones de galones por día a través del Emisario 001. El permiso también autoriza la descarga de residuos de bajo volumen, aguas pluviales y efluentes previamente monitoreados (residuos de limpieza de metales) a través del Emisario 002.

La descarga de agua de enfriamiento de un solo paso a través del Emisario 001, desechos de bajo volumen a través del Emisario 002 y efluentes previamente monitoreados a través del Emisario 201 de esta instalación están sujetos a pautas federales de limitación de efluentes en 40 CFR Parte 423. Los contaminantes esperados de estas descargas se basan en 40 CFR Parte 423 son: cloro residual total, cloro libre disponible, sólidos suspendidos totales, aceite y grasa, hierro total, cobre total y pH. También se espera temperatura de las descargas de 001. Se incluyen contaminantes potenciales adicionales en el Informe técnico de aplicación de aguas residuales industriales, Hoja de trabajo 2.0.

El suministro de agua cruda para el sistema de agua de refrigeración de la instalación proviene del embalse del lago Grahm, suministrado por la ciudad de Graham. La ciudad de Graham también suministra agua potable. Un sistema de alimentación de químicos suministra químicos acondicionadores de agua al agua de enfriamiento de un solo paso para minimizar la corrosión y controlar la formación de incrustaciones minerales y bioincrustaciones. El agua pluvial se recolecta a través de varios drenajes pluviales y se descarga según el Permiso general industrial multisectorial TXR05W674 de la TCEQ. Los desechos domésticos se envían a la planta de tratamiento de aguas residuales de la ciudad de Grahm.

TPDES PERMIT NO. WQ0000551000
*[For TCEQ office use only -
EPA I.D. No. TX0001163]*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
P.O. Box 13087
Austin, Texas 78711-3087

This major amendment supersedes and replaces TPDES Permit No. WQ0000551000, issued on June 10, 2015.

PERMIT TO DISCHARGE WASTES
under provisions of
Section 402 of the Clean Water Act
and Chapter 26 of the Texas Water Code

Luminant Generation Company LLC

whose mailing address is

6555 Sierra Drive
Irving, Texas 75039

is authorized to treat and discharge wastes from Graham Steam Electric Station (SIC 4911)

located at 480 Power Plant Road, on the shores of Lakes Eddleman and Graham adjacent to United States Highway 380, approximately 2.5 miles northwest of the City of Graham, in Young County, Texas 76450

via Outfall 001 directly to the Lake Eddleman portion of Graham Lake in Segment 1231 of the Brazos River Basin; and via Outfall 002 to Salt Creek; thence to the Brazos River Above Possum Kingdom Lake in Segment 1208 of the Brazos River Basin

only according to effluent limitations, monitoring requirements, and other conditions set forth in this permit, as well as the rules of the Texas Commission on Environmental Quality (TCEQ), the laws of the State of Texas, and other orders of the TCEQ. The issuance of this permit does not grant to the permittee the right to use private or public property for conveyance of wastewater along the discharge route described in this permit. This includes, but is not limited to, property belonging to any individual, partnership, corporation, or other entity. Neither does this permit authorize any invasion of personal rights nor any violation of federal, state, or local laws or regulations. It is the responsibility of the permittee to acquire property rights as may be necessary to use the discharge route.

This permit shall expire at midnight, five years from the date of permit issuance.

ISSUED DATE: **November 27, 2019**

For the Commission

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS — Outfall Number 001

1. During the period beginning upon the date of issuance and lasting through the date of expiration, the permittee is authorized to discharge once-through cooling water subject to the following effluent limitations:

   The daily average and the daily maximum flow of effluent shall not exceed 505.4 million gallons per day (MGD).

Effluent Characteristics	Discharge Limitations					Minimum Self-Monitoring Requirements Report Daily Average and Daily Maximum	
	Daily Average		Daily Maximum		Single Grab		
	lbs/day	mg/L	lbs/day	mg/L	mg/L	Measurement Frequency	Sample Type
Flow	505.4 MGD		505.4 MGD		N/A	Continuous	Record
Temperature [1]	108°F [1]		110°F [1]		N/A	Continuous	Record
Free Available Chlorine [2]	70	0.2	176	0.5	0.5	1/week	Grab [4]
Total Residual Chlorine [3]	N/A	N/A	140	0.2	0.2	1/week	Grab [4]

1 See Other Requirements Nos. 12 and 17.
2 See Other Requirement No. 7.
3 See Other Requirement No. 8.
4 Samples shall be representative of periods of chlorination

2. There shall be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

3. Effluent monitoring samples shall be taken at the following location: at Outfall 001, where once-through cooling water discharges through the barrier fence into Lake Eddleman prior to mixing with any other waters.

1. During the period beginning upon the date of issuance and lasting through the date of expiration, the permittee is authorized to discharge low volume waste sources[1], stormwater runoff, and previously monitored effluent (metal cleaning waste via internal Outfall 102) subject to the following effluent limitations:

   Volume: Flow variable

Effluent Characteristics	Discharge Limitations			Minimum Self-Monitoring Requirements Report Daily Average and Daily Maximum	
	Daily Average mg/L	Daily Maximum mg/L	Single Grab mg/L	Measurement Frequency	Sample Type
Flow	Report (MGD)	Report (MGD)	N/A	1/day	Estimate [2]
Total Suspended Solids	30	100	100	1/week	Grab [2, 3]
Oil and Grease	15	20	20	1/week	Grab [2, 3]
Total Dissolved Solids	N/A	1500	1500	1/year	Grab

[1] See Other Requirement No. 9.
[2] In addition to regular monitoring requirements, Outfall 002 shall be monitored simultaneously whenever discharge occurs from Outfall 102.
[3] See Other Requirement No. 15.

2. The pH must not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 1/week by grab sample. In addition to regular monitoring requirements, pH shall be monitored simultaneously whenever discharge occurs from Outfall 102.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

4. Effluent monitoring samples shall be taken at the following location: at Outfall 002, at discharge pipe from the treatment pond prior to entering Salt Creek.

1. During the period beginning upon the date of issuance and lasting through the date of expiration, the permittee is authorized to discharge metal cleaning waste[1] on an intermittent basis subject to the following effluent limitations:

Volume: Intermittent and flow variable.

Effluent Characteristics	Discharge Limitations			Minimum Self-Monitoring Requirements Report Daily Average and Daily Maximum	
	Daily Average mg/L	Daily Maximum mg/L	Single Grab mg/L	Measurement Frequency	Sample Type
Flow	Report (MGD)	Report (MGD)	N/A	1/day[2]	Estimate
Total Copper	0.5	1.0	1.0	1/week[2]	Grab
Total Iron	1.0	1.0	1.0	1/week[2]	Grab

[1] See Other Requirement No. 10.
[2] When discharge occurs; Outfall 002 shall be monitored simultaneously when discharging via Outfall 102.

2. The pH must not be less than 6.0 standard units nor greater than 9.0 standard units and shall be monitored 1/week, by grab sample, when discharge occurs. Outfall 002 shall be monitored simultaneously when discharging via Outfall 102.

3. There shall be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil.

4. Effluent monitoring samples shall be taken at the following location: at internal Outfall 102, where cleaning wastewater is discharged prior to mixing with any other waters.

DEFINITIONS AND STANDARD PERMIT CONDITIONS

As required by Title 30 Texas Administrative Code (TAC) Chapter 305, certain regulations appear as standard conditions in waste discharge permits. 30 TAC §§305.121 - 305.129 (relating to Permit Characteristics and Conditions) as promulgated under the Texas Water Code (TWC) §§5.103 and 5.105, and the Texas Health and Safety Code (THSC) §§361.017 and 361.024(a), establish the characteristics and standards for waste discharge permits, including sewage sludge, and those sections of 40 Code of Federal Regulations (CFR) Part 122 adopted by reference by the Commission. The following text includes these conditions and incorporates them into this permit. All definitions in Texas Water Code §26.001 and 30 TAC Chapter 305 shall apply to this permit and are incorporated by reference. Some specific definitions of words or phrases used in this permit are as follows:

1. Flow Measurements

   a. Annual average flow - the arithmetic average of all daily flow determinations taken within the preceding 12 consecutive calendar months. The annual average flow determination shall consist of daily flow volume determinations made by a totalizing meter, charted on a chart recorder, and limited to major domestic wastewater discharge facilities with a one million gallons per day or greater permitted flow.

   b. Daily average flow - the arithmetic average of all determinations of the daily flow within a period of one calendar month. The daily average flow determination shall consist of determinations made on at least four separate days. If instantaneous measurements are used to determine the daily flow, the determination shall be the arithmetic average of all instantaneous measurements taken during that month. Daily average flow determination for intermittent discharges shall consist of a minimum of three flow determinations on days of discharge.

   c. Daily maximum flow - the highest total flow for any 24-hour period in a calendar month.

   d. Instantaneous flow - the measured flow during the minimum time required to interpret the flow measuring device.

   e. 2-hour peak flow (domestic wastewater treatment plants) - the maximum flow sustained for a two-hour period during the period of daily discharge. The average of multiple measurements of instantaneous maximum flow within a two-hour period may be used to calculate the 2-hour peak flow.

   f. Maximum 2-hour peak flow (domestic wastewater treatment plants) - the highest 2-hour peak flow for any 24-hour period in a calendar month.

2. Concentration Measurements

   a. Daily average concentration - the arithmetic average of all effluent samples, composite or grab as required by this permit, within a period of one calendar month, consisting of at least four separate representative measurements.

      i. For domestic wastewater treatment plants - When four samples are not available in a calendar month, the arithmetic average (weighted by flow) of all values in the previous four consecutive month period consisting of at least four measurements shall be utilized as the daily average concentration.

      ii. For all other wastewater treatment plants - When four samples are not available in a calendar month, the arithmetic average (weighted by flow) of all values taken during the month shall be utilized as the daily average concentration.

   b. 7-day average concentration - the arithmetic average of all effluent samples, composite or grab as required by this permit, within a period of one calendar week, Sunday through Saturday.

   c. Daily maximum concentration - the maximum concentration measured on a single day, by the sample type specified in the permit, within a period of one calendar month.

   d. Daily discharge - the discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. For pollutants with limitations expressed in terms of mass, the "daily discharge" is calculated as the total mass of the pollutant discharged over the sampling day. For pollutants with limitations expressed in other units of measurement, the "daily discharge" is calculated as the average measurement of the pollutant over the sampling day.

The "daily discharge" determination of concentration made using a composite sample shall be the concentration of the composite sample. When grab samples are used, the "daily discharge" determination of concentration shall be the arithmetic average (weighted by flow value) of all samples collected during that day.

e. Bacteria concentration (Fecal coliform, *E. coli*, or Enterococci) – the number of colonies of bacteria per 100 milliliters effluent. The daily average bacteria concentration is a geometric mean of the values for the effluent samples collected in a calendar month. The geometric mean shall be determined by calculating the nth root of the product of all measurements made in a calendar month, where n equals the number of measurements made; or computed as the antilogarithm of the arithmetic mean of the logarithms of all measurements made in a calendar month. For any measurement of bacteria equaling zero, a substitute value of one shall be made for input into either computation method. If specified, the 7-day average for bacteria is the geometric mean of the values for all effluent samples collected during a calendar week.

f. Daily average loading (lbs/day) - the arithmetic average of all daily discharge loading calculations during a period of one calendar month. These calculations must be made for each day of the month that a parameter is analyzed. The daily discharge, in terms of mass (lbs/day), is calculated as (Flow, MGD × Concentration, mg/L × 8.34).

g. Daily maximum loading (lbs/day) - the highest daily discharge, in terms of mass (lbs/day), within a period of one calendar month.

3. Sample Type

a. Composite sample - For domestic wastewater, a composite sample is a sample made up of a minimum of three effluent portions collected in a continuous 24-hour period or during the period of daily discharge if less than 24 hours, and combined in volumes proportional to flow, and collected at the intervals required by 30 TAC §319.9(a). For industrial wastewater, a composite sample is a sample made up of a minimum of three effluent portions collected in a continuous 24-hour period or during the period of daily discharge if less than 24 hours, and combined in volumes proportional to flow, and collected at the intervals required by 30 TAC §319.9(c).

b. Grab sample - an individual sample collected in less than 15 minutes.

4. Treatment Facility (facility) - wastewater facilities used in the conveyance, storage, treatment, recycling, reclamation or disposal of domestic sewage, industrial wastes, agricultural wastes, recreational wastes, or other wastes including sludge handling or disposal facilities under the jurisdiction of the Commission.

5. The term "sewage sludge" is defined as solid, semi-solid, or liquid residue generated during the treatment of domestic sewage in 30 TAC Chapter 312. This includes the solids that have not been classified as hazardous waste separated from wastewater by unit processes.

6. Bypass - the intentional diversion of a waste stream from any portion of a treatment facility.

MONITORING AND REPORTING REQUIREMENTS

1. Self-Reporting

Monitoring results shall be provided at the intervals specified in the permit. Unless otherwise specified in this permit or otherwise ordered by the Commission, the permittee shall conduct effluent sampling and reporting in accordance with 30 TAC §§319.4 - 319.12. Unless otherwise specified, effluent monitoring data shall be submitted each month, to the Enforcement Division (MC 224), by the 20th day of the following month for each discharge that is described by this permit whether or not a discharge is made for that month. Monitoring results must be submitted online using the NetDMR reporting system available through the TCEQ website unless the permittee requests and obtains an electronic reporting waiver. Monitoring results must be signed and certified as required by Monitoring and Reporting Requirements No. 10.

As provided by state law, the permittee is subject to administrative, civil and criminal penalties, as applicable, for negligently or knowingly violating the Clean Water Act; TWC Chapters 26, 27, and 28; and THSC Chapter 361, including but not limited to knowingly making any false statement, representation, or certification on any report, record, or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, or falsifying, tampering with or knowingly rendering inaccurate any monitoring device or method required by this permit or violating any other requirement imposed by state or federal regulations.

2. Test Procedures

   a. Unless otherwise specified in this permit, test procedures for the analysis of pollutants shall comply with procedures specified in 30 TAC §§319.11 - 319.12. Measurements, tests, and calculations shall be accurately accomplished in a representative manner.

   b. All laboratory tests submitted to demonstrate compliance with this permit must meet the requirements of 30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification.

3. Records of Results

   a. Monitoring samples and measurements shall be taken at times and in a manner so as to be representative of the monitored activity.

   b. Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR Part 503), monitoring and reporting records, including strip charts and records of calibration and maintenance, copies of all records required by this permit, records of all data used to complete the application for this permit, and the certification required by 40 CFR §264.73(b)(9) shall be retained at the facility site, or shall be readily available for review by a TCEQ representative for a period of three years from the date of the record or sample, measurement, report, application or certification. This period shall be extended at the request of the Executive Director.

   c. Records of monitoring activities shall include the following:

      i. date, time, and place of sample or measurement;
      ii. identity of individual who collected the sample or made the measurement;
      iii. date and time of analysis;
      iv. identity of the individual and laboratory who performed the analysis;
      v. the technique or method of analysis; and
      vi. the results of the analysis or measurement and quality assurance/quality control records.

   The period during which records are required to be kept shall be automatically extended to the date of the final disposition of any administrative or judicial enforcement action that may be instituted against the permittee.

4. Additional Monitoring by Permittee

   If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit using approved analytical methods as specified above, all results of such monitoring shall be included in the calculation and reporting of the values submitted on the approved self-report form. Increased frequency of sampling shall be indicated on the self-report form.

5. Calibration of Instruments

   All automatic flow measuring or recording devices and all totalizing meters for measuring flows shall be accurately calibrated by a trained person at plant start-up and as often thereafter as necessary to ensure accuracy, but not less often than annually unless authorized by the Executive Director for a longer period. Such person shall verify in writing that the device is operating properly and giving accurate results. Copies of the verification shall be retained at the facility site or shall be readily available for review by a TCEQ representative for a period of three years.

6. Compliance Schedule Reports

   Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of the permit shall be submitted no later than 14 days following each schedule date to the regional office and the Enforcement Division (MC 224).

7. Noncompliance Notification

   a. In accordance with 30 TAC §305.125(9) any noncompliance that may endanger human health or safety, or the environment shall be reported by the permittee to the TCEQ. Report of such information shall be provided orally or by facsimile transmission (FAX) to the regional office within 24 hours of becoming aware of the noncompliance. A written submission of such information shall also be provided by the permittee to the regional office and the Enforcement Division (MC 224) within five working days of becoming aware of the noncompliance. For Publicly Owned Treatment Works (POTWs), effective September 1, 2020, the permittee must submit the written report for unauthorized discharges and unanticipated bypasses that exceed any effluent limit in the permit using the online electronic reporting system available through the TCEQ website unless the permittee requests and obtains an electronic reporting waiver. The written submission shall contain a description of the noncompliance and its cause; the potential danger to human health or safety, or the environment; the period of noncompliance, including exact dates and times; if the noncompliance has not been corrected, the time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance, and to mitigate its adverse effects.

   b. The following violations shall be reported under Monitoring and Reporting Requirement 7.a.:

      i. unauthorized discharges as defined in Permit Condition 2(g).
      ii. any unanticipated bypass that exceeds any effluent limitation in the permit.
      iii. violation of a permitted maximum daily discharge limitation for pollutants listed specifically in the Other Requirements section of an Industrial TPDES permit.

   c. In addition to the above, any effluent violation that deviates from the permitted effluent limitation by more than 40% shall be reported by the permittee in writing to the regional office and the Enforcement Division (MC 224) within 5 working days of becoming aware of the noncompliance.

   d. Any noncompliance other than that specified in this section, or any required information not submitted or submitted incorrectly, shall be reported to the Enforcement Division (MC 224) as promptly as possible. For effluent limitation violations, noncompliances shall be reported on the approved self-report form.

8. In accordance with the procedures described in 30 TAC §§35.301 - 35.303 (relating to Water Quality Emergency and Temporary Orders) if the permittee knows in advance of the need for a bypass, it shall submit prior notice by applying for such authorization.

9. Changes in Discharges of Toxic Substances

   All existing manufacturing, commercial, mining, and silvicultural permittees shall notify the regional office, orally or by facsimile transmission within 24 hours, and both the regional office and the Enforcement Division (MC 224) in writing within five (5) working days, after becoming aware of or having reason to believe:

   a. That any activity has occurred or will occur that would result in the discharge, on a routine or frequent basis, of any toxic pollutant listed at 40 CFR Part 122, Appendix D, Tables II and III (excluding Total Phenols) that is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

      i. one hundred micrograms per liter (100 μg/L);
      ii. two hundred micrograms per liter (200 μg/L) for acrolein and acrylonitrile; five hundred micrograms per liter (500 μg/L) for 2,4-dinitrophenol and for 2-methyl-4,6-dinitrophenol; and one milligram per liter (1 mg/L) for antimony;
      iii. five (5) times the maximum concentration value reported for that pollutant in the permit application; or
      iv. the level established by the TCEQ.

b. That any activity has occurred or will occur that would result in any discharge, on a nonroutine or infrequent basis, of a toxic pollutant that is not limited in the permit, if that discharge will exceed the highest of the following "notification levels":

   i. five hundred micrograms per liter (500 μg/L);
   ii. one milligram per liter (1 mg/L) for antimony;
   iii. ten (10) times the maximum concentration value reported for that pollutant in the permit application; or
   iv. the level established by the TCEQ.

10. Signatories to Reports

All reports and other information requested by the Executive Director shall be signed by the person and in the manner required by 30 TAC §305.128 (relating to Signatories to Reports).

11. All POTWs must provide adequate notice to the Executive Director of the following:

   a. any new introduction of pollutants into the POTW from an indirect discharger that would be subject to CWA §301 or §306 if it were directly discharging those pollutants;

   b. any substantial change in the volume or character of pollutants being introduced into that POTW by a source introducing pollutants into the POTW at the time of issuance of the permit; and

   c. for the purpose of this paragraph, adequate notice shall include information on:

      i. the quality and quantity of effluent introduced into the POTW; and
      ii. any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

PERMIT CONDITIONS

1. General

   a. When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in an application or in any report to the Executive Director, it shall promptly submit such facts or information.

   b. This permit is granted on the basis of the information supplied and representations made by the permittee during action on an application, and relying upon the accuracy and completeness of that information and those representations. After notice and opportunity for a hearing, this permit may be modified, suspended, or revoked, in whole or in part, in accordance with 30 TAC Chapter 305, Subchapter D, during its term for good cause including, but not limited to, the following:

      i. violation of any terms or conditions of this permit;
      ii. obtaining this permit by misrepresentation or failure to disclose fully all relevant facts; or
      iii. a change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

   c. The permittee shall furnish to the Executive Director, upon request and within a reasonable time, any information to determine whether cause exists for amending, revoking, suspending, or terminating the permit. The permittee shall also furnish to the Executive Director, upon request, copies of records required to be kept by the permit.

2. Compliance

   a. Acceptance of the permit by the person to whom it is issued constitutes acknowledgment and agreement that such person will comply with all the terms and conditions embodied in the permit, and the rules and other orders of the Commission.

   b. The permittee has a duty to comply with all conditions of the permit. Failure to comply with any permit condition constitutes a violation of the permit and the Texas Water Code or the Texas Health and Safety Code, and is grounds for enforcement action, for permit amendment, revocation, or suspension, or for denial of a permit renewal application or an application for a permit for another facility.

c. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit.

d. The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal or other permit violation that has a reasonable likelihood of adversely affecting human health or the environment.

e. Authorization from the Commission is required before beginning any change in the permitted facility or activity that may result in noncompliance with any permit requirements.

f. A permit may be amended, suspended and reissued, or revoked for cause in accordance with 30 TAC §§305.62 and 305.66 and TWC §7.302. The filing of a request by the permittee for a permit amendment, suspension and reissuance, or termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

g. There shall be no unauthorized discharge of wastewater or any other waste. For the purpose of this permit, an unauthorized discharge is considered to be any discharge of wastewater into or adjacent to water in the state at any location not permitted as an outfall or otherwise defined in the Other Requirements section of this permit.

h. In accordance with 30 TAC §305.535(a), the permittee may allow any bypass to occur from a TPDES permitted facility that does not cause permitted effluent limitations to be exceeded or an unauthorized discharge to occur, but only if the bypass is also for essential maintenance to assure efficient operation.

i. The permittee is subject to administrative, civil, and criminal penalties, as applicable, under Texas Water Code §§7.051 - 7.075 (relating to Administrative Penalties), 7.101 - 7.111 (relating to Civil Penalties), and 7.141 - 7.202 (relating to Criminal Offenses and Penalties) for violations including, but not limited to, negligently or knowingly violating the federal CWA §§301, 302, 306, 307, 308, 318, or 405, or any condition or limitation implementing any sections in a permit issued under the CWA §402, or any requirement imposed in a pretreatment program approved under the CWA §§402(a)(3) or 402(b)(8).

3. Inspections and Entry

a. Inspection and entry shall be allowed as prescribed in the TWC Chapters 26, 27, and 28, and THSC Chapter 361.

b. The members of the Commission and employees and agents of the Commission are entitled to enter any public or private property at any reasonable time for the purpose of inspecting and investigating conditions relating to the quality of water in the state or the compliance with any rule, regulation, permit, or other order of the Commission. Members, employees, or agents of the Commission and Commission contractors are entitled to enter public or private property at any reasonable time to investigate or monitor or, if the responsible party is not responsive or there is an immediate danger to public health or the environment, to remove or remediate a condition related to the quality of water in the state. Members, employees, Commission contractors, or agents acting under this authority who enter private property shall observe the establishment's rules and regulations concerning safety, internal security, and fire protection, and if the property has management in residence, shall notify management or the person then in charge of his presence and shall exhibit proper credentials. If any member, employee, Commission contractor, or agent is refused the right to enter in or on public or private property under this authority, the Executive Director may invoke the remedies authorized in TWC §7.002. The statement above, that Commission entry shall occur in accordance with an establishment's rules and regulations concerning safety, internal security, and fire protection, is not grounds for denial or restriction of entry to any part of the facility, but merely describes the Commission's duty to observe appropriate rules and regulations during an inspection.

4. Permit Amendment or Renewal

   a. The permittee shall give notice to the Executive Director as soon as possible of any planned physical alterations or additions to the permitted facility if such alterations or additions would require a permit amendment or result in a violation of permit requirements. Notice shall also be required under this paragraph when:

      i. the alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in accordance with 30 TAC §305.534 (relating to New Sources and New Dischargers); or

      ii. the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are subject neither to effluent limitations in the permit, nor to notification requirements in Monitoring and Reporting Requirements No. 9; or

      iii. the alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

   b. Prior to any facility modifications, additions, or expansions that will increase the plant capacity beyond the permitted flow, the permittee must apply for and obtain proper authorization from the Commission before commencing construction.

   c. The permittee must apply for an amendment or renewal at least 180 days prior to expiration of the existing permit in order to continue a permitted activity after the expiration date of the permit. If an application is submitted prior to the expiration date of the permit, the existing permit shall remain in effect until the application is approved, denied, or returned. If the application is returned or denied, authorization to continue such activity shall terminate upon the effective date of the action. If an application is not submitted prior to the expiration date of the permit, the permit shall expire and authorization to continue such activity shall terminate.

   d. Prior to accepting or generating wastes that are not described in the permit application or that would result in a significant change in the quantity or quality of the existing discharge, the permittee must report the proposed changes to the Commission. The permittee must apply for a permit amendment reflecting any necessary changes in permit conditions, including effluent limitations for pollutants not identified and limited by this permit.

   e. In accordance with the TWC §26.029(b), after a public hearing, notice of which shall be given to the permittee, the Commission may require the permittee, from time to time, for good cause, in accordance with applicable laws, to conform to new or additional conditions.

   f. If any toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is promulgated under CWA §307(a) for a toxic pollutant that is present in the discharge and that standard or prohibition is more stringent than any limitation on the pollutant in this permit, this permit shall be modified or revoked and reissued to conform to the toxic effluent standard or prohibition. The permittee shall comply with effluent standards or prohibitions established under CWA §307(a) for toxic pollutants within the time provided in the regulations that established those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

5. Permit Transfer

   a. Prior to any transfer of this permit, Commission approval must be obtained. The Commission shall be notified in writing of any change in control or ownership of facilities authorized by this permit. Such notification should be sent to the Applications Review and Processing Team (MC 148) of the Water Quality Division.

   b. A permit may be transferred only according to the provisions of 30 TAC §305.64 (relating to Transfer of Permits) and 30 TAC §50.133 (relating to Executive Director Action on Application or WQMP update).

6. Relationship to Hazardous Waste Activities

   This permit does not authorize any activity of hazardous waste storage, processing, or disposal that requires a permit or other authorization pursuant to the Texas Health and Safety Code.

7. Relationship to Water Rights

   Disposal of treated effluent by any means other than discharge directly to water in the state must be specifically authorized in this permit and may require a permit pursuant to Texas Water Code Chapter 11.

8. Property Rights

   A permit does not convey any property rights of any sort, or any exclusive privilege.

9. Permit Enforceability

   The conditions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstances, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

10. Relationship to Permit Application

    The application pursuant to which the permit has been issued is incorporated herein; provided, however, that in the event of a conflict between the provisions of this permit and the application, the provisions of the permit shall control.

11. Notice of Bankruptcy.

    a. Each permittee shall notify the executive director, in writing, immediately following the filing of a voluntary or involuntary petition for bankruptcy under any chapter of Title 11 (Bankruptcy) of the United States Code (11 USC) by or against:

       i. the permittee;
       ii. an entity (as that term is defined in 11 USC, §101(15)) controlling the permittee or listing the permit or permittee as property of the estate; or
       iii. an affiliate (as that term is defined in 11 USC, §101(2)) of the permittee.

    b. This notification must indicate:

       i. the name of the permittee;
       ii. the permit number(s);
       iii. the bankruptcy court in which the petition for bankruptcy was filed; and
       iv. the date of filing of the petition.

OPERATIONAL REQUIREMENTS

1. The permittee shall at all times ensure that the facility and all of its systems of collection, treatment, and disposal are properly operated and maintained. This includes, but is not limited to, the regular, periodic examination of wastewater solids within the treatment plant by the operator in order to maintain an appropriate quantity and quality of solids inventory as described in the various operator training manuals and according to accepted industry standards for process control. Process control, maintenance, and operations records shall be retained at the facility site, or shall be readily available for review by a TCEQ representative, for a period of three years.

2. Upon request by the Executive Director, the permittee shall take appropriate samples and provide proper analysis in order to demonstrate compliance with Commission rules. Unless otherwise specified in this permit or otherwise ordered by the Commission, the permittee shall comply with all applicable provisions of 30 TAC Chapter 312 concerning sewage sludge use and disposal and 30 TAC §§319.21 - 319.29 concerning the discharge of certain hazardous metals.

3. Domestic wastewater treatment facilities shall comply with the following provisions:

   a. The permittee shall notify the Municipal Permits Team, Wastewater Permitting Section (MC 148) of the Water Quality Division, in writing, of any facility expansion at least 90 days prior to conducting such activity.

   b. The permittee shall submit a closure plan for review and approval to the Municipal Permits Team, Wastewater Permitting Section (MC 148) of the Water Quality Division, for any closure activity at least 90 days prior to conducting such activity. Closure is the act of permanently taking a waste management unit or treatment facility out of service and includes the permanent removal from service of any pit, tank, pond, lagoon, surface impoundment or other treatment unit regulated by this permit.

4. The permittee is responsible for installing prior to plant start-up, and subsequently maintaining, adequate safeguards to prevent the discharge of untreated or inadequately treated wastes during electrical power failures by means of alternate power sources, standby generators, or retention of inadequately treated wastewater.

5. Unless otherwise specified, the permittee shall provide a readily accessible sampling point and, where applicable, an effluent flow measuring device or other acceptable means by which effluent flow may be determined.

6. The permittee shall remit an annual water quality fee to the Commission as required by 30 TAC Chapter 21. Failure to pay the fee may result in revocation of this permit under TWC §7.302(b)(6).

7. Documentation

   For all written notifications to the Commission required of the permittee by this permit, the permittee shall keep and make available a copy of each such notification under the same conditions as self-monitoring data are required to be kept and made available. Except for information required for TPDES permit applications, effluent data, including effluent data in permits, draft permits and permit applications, and other information specified as not confidential in 30 TAC §1.5(d), any information submitted pursuant to this permit may be claimed as confidential by the submitter. Any such claim must be asserted in the manner prescribed in the application form or by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, information may be made available to the public without further notice. If the Commission or Executive Director agrees with the designation of confidentiality, the TCEQ will not provide the information for public inspection unless required by the Texas Attorney General or a court pursuant to an open records request. If the Executive Director does not agree with the designation of confidentiality, the person submitting the information will be notified.

8. Facilities that generate domestic wastewater shall comply with the following provisions; domestic wastewater treatment facilities at permitted industrial sites are excluded.

   a. Whenever flow measurements for any domestic sewage treatment facility reach 75% of the permitted daily average or annual average flow for three consecutive months, the permittee must initiate engineering and financial planning for expansion or upgrading of the domestic wastewater treatment or collection facilities. Whenever the flow reaches 90% of the permitted daily average or annual average flow for three consecutive months, the permittee shall obtain necessary authorization from the Commission to commence construction of the necessary additional treatment or collection facilities. In the case of a domestic wastewater treatment facility that reaches 75% of the permitted daily average or annual average flow for three consecutive months, and the planned population to be served or the quantity of waste produced is not expected to exceed the design limitations of the treatment facility, the permittee shall submit an engineering report supporting this claim to the Executive Director of the Commission.

      If in the judgment of the Executive Director the population to be served will not cause permit noncompliance, then the requirement of this section may be waived. To be effective, any waiver must be in writing and signed by the Director of the Enforcement Division (MC 149) of the Commission, and such waiver of these requirements will be reviewed upon expiration of the existing permit; however, any such waiver shall not be interpreted as condoning or excusing any violation of any permit parameter.

b. The plans and specifications for domestic sewage collection and treatment works associated with any domestic permit must be approved by the Commission, and failure to secure approval before commencing construction of such works or making a discharge is a violation of this permit and each day is an additional violation until approval has been secured.

c. Permits for domestic wastewater treatment plants are granted subject to the policy of the Commission to encourage the development of area-wide waste collection, treatment, and disposal systems. The Commission reserves the right to amend any domestic wastewater permit in accordance with applicable procedural requirements to require the system covered by this permit to be integrated into an area-wide system, should such be developed; to require the delivery of the wastes authorized to be collected in, treated by or discharged from said system, to such area-wide system; or to amend this permit in any other particular to effectuate the Commission's policy. Such amendments may be made when the changes required are advisable for water quality control purposes and are feasible on the basis of waste treatment technology, engineering, financial, and related considerations existing at the time the changes are required, exclusive of the loss of investment in or revenues from any then existing or proposed waste collection, treatment or disposal system.

9. Domestic wastewater treatment plants shall be operated and maintained by sewage plant operators holding a valid certificate of competency at the required level as defined in 30 TAC Chapter 30.

10. For Publicly Owned Treatment Works (POTWs), the 30-day average (or monthly average) percent removal for BOD and TSS shall not be less than 85%, unless otherwise authorized by this permit.

11. Facilities that generate industrial solid waste as defined in 30 TAC §335.1 shall comply with these provisions:

a. Any solid waste, as defined in 30 TAC §335.1 (including but not limited to such wastes as garbage, refuse, sludge from a waste treatment, water supply treatment plant or air pollution control facility, discarded materials, discarded materials to be recycled, whether the waste is solid, liquid, or semisolid), generated by the permittee during the management and treatment of wastewater, must be managed in accordance with all applicable provisions of 30 TAC Chapter 335, relating to Industrial Solid Waste Management.

b. Industrial wastewater that is being collected, accumulated, stored, or processed before discharge through any final discharge outfall, specified by this permit, is considered to be industrial solid waste until the wastewater passes through the actual point source discharge and must be managed in accordance with all applicable provisions of 30 TAC Chapter 335.

c. The permittee shall provide written notification, pursuant to the requirements of 30 TAC §335.8(b)(1), to the Corrective Action Section (MC 127) of the Remediation Division informing the Commission of any closure activity involving an Industrial Solid Waste Management Unit, at least 90 days prior to conducting such an activity.

d. Construction of any industrial solid waste management unit requires the prior written notification of the proposed activity to the Registration and Reporting Section (MC 129) of the Permitting and Remediation Support Division. No person shall dispose of industrial solid waste, including sludge or other solids from wastewater treatment processes, prior to fulfilling the deed recordation requirements of 30 TAC §335.5.

e. The term "industrial solid waste management unit" means a landfill, surface impoundment, waste-pile, industrial furnace, incinerator, cement kiln, injection well, container, drum, salt dome waste containment cavern, or any other structure vessel, appurtenance, or other improvement on land used to manage industrial solid waste.

f. The permittee shall keep management records for all sludge (or other waste) removed from any wastewater treatment process. These records shall fulfill all applicable requirements of 30 TAC Chapter 335 and must include the following, as it pertains to wastewater treatment and discharge:

i. volume of waste and date(s) generated from treatment process;
ii. volume of waste disposed of on-site or shipped off-site;
iii. date(s) of disposal;

iv. identity of hauler or transporter;
v. location of disposal site; and
vi. method of final disposal.

The above records shall be maintained on a monthly basis. The records shall be retained at the facility site, or shall be readily available for review by authorized representatives of the TCEQ for at least five years.

12. For industrial facilities to which the requirements of 30 TAC Chapter 335 do not apply, sludge and solid wastes, including tank cleaning and contaminated solids for disposal, shall be disposed of in accordance with THSC Code Chapter 361.

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OTHER REQUIREMENTS

1. This provision supersedes and replaces Provision 1, Paragraph 1 of Monitoring and Reporting Requirements found on Page 4 of this permit.

   Monitoring results shall be provided at the intervals specified in the permit. Unless otherwise specified in this permit or otherwise ordered by the Commission, the permittee shall conduct effluent sampling and reporting in accordance with 30 TAC §§ 319.4 - 319.12. Unless otherwise specified, a monthly effluent report shall be submitted each month, to the location(s) specified on the reporting form or the instruction sheet, by the 25th day of the following month for each discharge which is described by this permit whether or not a discharge is made for that month. Monitoring results must be reported on the approved TPDES self-report form, Discharge Monitoring Report (DMR) Form EPA No. 3320-1, including the approved TCEQ electronic reporting system, signed and certified as required by Monitoring and Reporting Requirements No. 10.

2. Monitoring results shall be provided at the intervals specified in the permit. For pollutants which are monitored annually, effluent reports shall be submitted in September of each year. For pollutants which are monitored twice per year, effluent reports shall be submitted in January and July of each year. For pollutants which are monitored four times per year, effluent reports shall be submitted in January, April, July and October of each year.

3. Violations of daily maximum limitations for the following pollutants shall be reported orally or by facsimile to TCEQ Region 3 within 24 hours from the time the permittee becomes aware of the violation, followed by a written report within five working days to TCEQ Region 3 and the Enforcement Division (MC 224):

   Copper (Total)

   Test methods utilized shall be sensitive enough to demonstrate compliance with the permit effluent limitations. Permit compliance/noncompliance determinations will be based on the effluent limitations contained in this permit with consideration given to the minimum analytical level (MAL) for the parameter(s) specified below:

Pollutant	MAL (mg/L)
Copper (Total)	0.010
Iron (Total)	0.005

   Test methods used must be sensitive enough to demonstrate compliance with the permit effluent limitations. If an effluent limit for a pollutant is less than the minimum analytical level (MAL), then the test method for that pollutant must be sensitive enough to demonstrate compliance at the MAL. Permit compliance/noncompliance determinations will be based on the effluent limitations contained in this permit, with consideration given to the MAL for the pollutants specified above.

   When an analysis of an effluent sample for a pollutant listed above indicates no detectable levels above the MAL and the test method detection level is as sensitive as the specified MAL, a value of zero shall be used for that measurement when making calculations for the self-reporting form. This applies to determinations of daily maximum concentration, calculations of loading and daily averages, and other reportable results.

When a reported value is zero based on this MAL provision, the permittee shall submit the following statement with the self-reporting form either as a separate attachment to the form or as a statement in the comments section of the form:

> "The reported value(s) of zero for ____[list pollutant(s)]____ on the self-reporting form for [monitoring period date range]___ is based on the following conditions: (1) the analytical method used had a method detection level as sensitive as the MAL specified in the permit, and (2) the analytical results contained no detectable levels above the specified MAL."

When an analysis of an effluent sample for a pollutant indicates no detectable levels and the test method detection level is not as sensitive as the MAL specified in the permit, or an MAL is not specified in the permit for that pollutant, the level of detection achieved shall be used for that measurement when making calculations for the self-reporting form. A zero may not be used.

4. COOLING WATER INTAKE STRUCTURE REQUIREMENTS

A. Specialized Definitions

(1) Actual Intake Flow (AIF), as defined at 40 CFR § 125.92(a), means the average volume of water withdrawn on an annual basis by the cooling water intake structures over the past three years. After October 14, 2019, AIF means the average volume of water withdrawn on an annual basis by the cooling water intake structures over the previous five years. Actual intake flow is measured at a location within the *cooling water intake structure* that the Director deems appropriate. The calculation of actual intake flow includes days of zero flow. AIF does not include flows associated with emergency and fire suppression capacity.

(2) Closed Cycle Recirculating System (CCRS), as defined as 40 CFR § 125.92(c), means a system designed and properly operated using minimized make-up and blowdown flows withdrawn from a water of the United States to support contact or non-contact cooling uses within a facility, or a system designed to include certain impoundments. A closed-cycle recirculating system passes cooling water through the condenser and other components of the cooling system and reuses the water for cooling multiple times.

a. CCRS includes a facility with wet, dry, or hybrid cooling towers, a system of impoundments that are not waters of the United States, or any combination thereof. A properly operated and maintained CCRS withdraws new source water (make-up water) only to replenish losses that have occurred due to blowdown, drift, and evaporation. If waters of the United States are withdrawn for purposes of replenishing losses to a closed-cycle recirculating system other than those due to blowdown, drift, and evaporation from the cooling system, the Director may determine a cooling system is a CCRS if the facility demonstrates to the satisfaction of the Director that make-up water withdrawals attributed specifically to the cooling portion of the cooling system have been minimized.

b. CCRS also includes a system with impoundments of waters of the United States (WOTUS) where the impoundment was constructed prior to October 14, 2014 and created for the purpose of serving as part of the cooling water system as documented in the project purpose statement for any required Clean Water Act section 404 permit obtained to construct the impoundment. In the case of an impoundment whose construction pre-dated the CWA requirement to obtain a section 404 permit, documentation of the project's purpose must be demonstrated to the satisfaction of the Director. This documentation could be some other license or permit obtained to lawfully construct the impoundment for the purposes of a cooling water system, or other such evidence as the Director finds necessary. For impoundments constructed in uplands or not in WOTUS, no documentation of a section 404 or other permit is required. If WOTUS are withdrawn for purposes of replenishing losses to a CCRS other than those due to blowdown, drift, and evaporation from the cooling system, the Director may determine a cooling system is a CCRS if the facility demonstrates to the satisfaction of the Director that make-up water withdrawals attributed specifically to the cooling portion of the cooling system have been minimized.

B. Operation and Maintenance

The permittee shall adhere to the requirements of 40 CFR § 125.96 when the CWIS is in operation. Specifically, the facility shall:

(1) monitor actual intake flow, as defined at 40 CFR § 125.92(a), withdrawn by the CWIS for cooling purposes, including cooling water withdrawals and blowdown volumes, on a daily basis; and

(2) conduct visual or remote inspections, on a weekly basis, as required by 40 CFR § 125.96(e).

Alternatives to the procedures described at 40 CFR § 125.96(e) have not been approved by the TCEQ. Requests for alternative procedures must be submitted in writing to the TCEQ's Industrial Permits Team (MC-148) for review and approval, with a copy sent to the TCEQ Compliance Monitoring Team (MC-224).

Results of monitoring activities conducted during the term of this permit must be submitted to the TCEQ with the subsequent renewal permit application, as required by 40 CFR § 122.21(r).

C. Record Keeping

Records (e.g. electronic logs, data acquisition system records, operating procedures, operator logs, etc.) documenting the operation and maintenance described above shall be kept on site until the subsequent permit is issued, per the requirements of 40 CFR § 125.97(d), and made available to TCEQ personnel upon request.

D. Changes in the Cooling Water Intake Structure

The facility must notify the TCEQ Industrial Permits Team (MC 148), Compliance Monitoring Team (MC-224), and TCEQ Region 9 Office in writing at least 30 days prior to any changes or modifications of the design of the CWIS and copy the TCEQ Compliance Monitoring Team (MC-224).

If it is determined that the proposed CWIS configuration does not meet best technology available standards for impingement mortality and entrainment, the permit may be reopened to incorporate additional requirements.

5. The permittee submitted a study to the TCEQ's Water Quality Assessment Section on February 5, 1999 analyzing the partitioning of aluminum in Lake Eddleman. This study was approved on April 5, 1999 and an aluminum partitioning coefficient of 0.24 was utilized for Lake Eddleman for the calculation of water quality-based effluent limitations for the protection of aquatic life at Outfall 001.

   The permittee submitted a study to the TCEQ's Water Quality Assessment Section in March 2018 analyzing the partitioning of aluminum in Salt Creek. This study was approved on August 27, 2018 and an aluminum partitioning coefficient of 0.19 was utilized for Salt Creek for the calculation of water quality-based effluent limitations for the protection of aquatic life at Outfall 002.

6. There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid.

7. <u>FREE AVAILABLE CHLORINE</u>

   A. The term *free available chlorine* means the value obtained using any of the "chlorine—free available" methods in Table IB in 40 CFR 136.3(a) where the method has the capability of measuring free available chlorine, or other methods approved by the permitting authority.

   B. Free available chlorine (FAC) may not be discharged from any unit for more than two hours in any one day, and not more than one unit in any plant may discharge free available chlorine at any one time unless the permittee can demonstrate to the permitting authority that the units in a particular location cannot operate at or below this level of chlorination.

   C. Daily mass loading of FAC must be calculated using the following equation:

   FAC (lbs/day) = FAC (mg/L) × flow (MGD) × 8.345 × (# hours/24 hours) × (# of units)

   where: *FAC (mg/L)* = maximum concentration (in milligrams per liter) of FAC measured in the effluent during representative period of chlorination

   flow (MGD) = total actual flow (in million gallons) of discharge via outfall during sampling day

   # hours = number of hours chlorination occurred during the operating day

   # of units = number of units subject to chlorination during the operating day

8. <u>TOTAL RESIDUAL CHLORINE</u>

   A. The term *total residual chlorine* (or total residual oxidants for intake water with bromides) means the value obtained using any of the "chlorine—total residual" methods in Table IB in 40 CFR §136.3(a), or other methods approved by the permitting authority.

B. Total residual chlorine (TRC) may not be discharged from any single generating unit for more than two hours per day unless the discharger demonstrates to the permitting authority that discharge for more than two hours is required for macroinvertebrate control.

C. Simultaneous multi-unit chlorination is not permitted.

D. The daily maximum mass loading of TRC must be calculated using the following equation:

TRC (lbs/day) = TRC (mg/L) × flow (MGD) × 8.345 × (# hours/24 hours) × (# of units)

where: *TRC (mg/L)* = maximum concentration (in milligrams per liter) of TRC measured in the effluent during representative period of chlorination

flow (MGD) = total actual flow (in million gallons) of discharge via outfall during sampling day

 # hours = number of hours chlorination occurred during the operating day

# of units = number of units subject to chlorination during the operating day

9. The term *low volume waste sources* means, taken collectively as if from one source, wastewater from all sources except those for which specific limitations or standards are otherwise established in this part. Low volume waste sources include, but are not limited to, the following: Wastewaters from ion exchange water treatment systems, water treatment evaporator blowdown, laboratory and sampling streams, boiler blowdown, floor drains, cooling tower basin cleaning wastes, recirculating house service water systems, and wet scrubber air pollution control systems whose primary purpose is particulate removal. Sanitary wastes, air conditioning wastes, and wastewater from carbon capture or sequestration systems are not included in this definition.

10. METAL CLEANING WASTE

A. The term *metal cleaning waste* means any wastewater resulting from cleaning [with or without chemical cleaning compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning.

B. The term *chemical metal cleaning waste* means any wastewater resulting from the cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning.

11. The term "once through cooling water" means water passed through the main cooling condensers in one or two passes for the purpose of removing waste heat.

12. TEMPERATURE

A. The *flow-weighted average temperature* (FWAT) must be computed and recorded on a daily basis. FWAT must be computed at equal time intervals not greater than two hours. The method of calculating FWAT is as follows:

$$\text{FWAT} = \frac{\sum (\text{INSTANTANEOUS FLOW} \times \text{INSTANTANEOUS TEMPERATURE})}{\sum (\text{INSTANTANEOUS FLOW})}$$

B. The *daily average temperature* must be calculated as the arithmetic average of all FWATs calculated during the calendar month.

C. The *daily maximum temperature* must be established as the highest FWAT calculated during the calendar month.

13. This permit does not authorize the discharge of domestic sewage. Domestic sewage shall be disposed of in an approved manner including, but not limited to, one of the following methods:

A. route domestic sewage to an approved on-site septic system; or

B. route domestic sewage to an authorized third party for treatment and disposal.

It is noted that at the time of permit issuance domestic sewage is routed to the City of Graham's sewage treatment plant. The permittee shall provide written notification to the TCEQ of any change in the manner of handling and disposal of domestic sewage generated at the facility.

14. MIXING ZONE DEFINITIONS

Outfall 001 The chronic aquatic life mixing zone is defined as a volume within a radius of 100 feet from the point of discharge. Chronic toxic criteria apply at the edge of the chronic aquatic life mixing zone.

Outfall 002 There is no mixing zone established for this discharge to an intermittent stream with perennial pools. Acute and chronic toxic criteria apply at the point of discharge.

15. During periods of inclement weather, samples taken for the discharge at Outfall 002 may be grab samples obtained from individual waste streams and will be combined into a single flow-weighted sample for analysis and reporting.

16. The discharge of clarifier sludge is not authorized by this permit. The disposal of the clarifier sludge shall be handled in accordance with 30 TAC 335 relating to Industrial Solid Waste.

17. The permittee submitted a thermal plume characterization study to the TCEQ for approval and implementation in accordance with the agreement reached by the TCEQ and the EPA in their letters dated April 29, 2014, and May 12, 2014, respectively. The permittee is hereby placed on notice that the Executive Director of the TCEQ will be initiating changes to evaluation procedures and/or rulemaking that may affect thermal requirements for this facility.

18. The permittee shall notify the Executive Director in writing, at least 90 days prior to discontinuing use of any surface impoundment, pit, or basin authorized by this permit. The permittee shall, at the request of the Executive Director, submit such information as is necessary to evaluate closure of the waste management unit(s) including, but not limited to, chemical analyses of bottom sediments, soils, and groundwater samples.

19. POND REQUIREMENTS

A wastewater pond must comply with the following requirements. A wastewater pond (or lagoon) is an earthen structure used to evaporate, hold, store, or treat water that contains a *waste* or *pollutant* or that would cause *pollution* upon *discharge* as those terms are defined in Texas Water Code §26.001, but does not include a pond that contains only stormwater.

A. A wastewater pond **subject to 40 CFR Part 257, Subpart D** (related to coal combustion residuals) must comply with those requirements in lieu of the requirements in B through G of POND REQUIREMENTS.

B. An **existing** wastewater pond must be maintained to meet or exceed the original approved design and liner requirements; or, in the absence of original approved requirements, must be maintained to prevent unauthorized discharges of wastewater into or adjacent to water in the state. The permittee shall maintain copies of all liner construction and testing documents at the facility or in a reasonably accessible location and make the information available to the executive director upon request.

C. A **new** wastewater pond constructed after the issuance date of this permit must be lined in compliance with one of the following requirements if it will contain process wastewater as defined in 40 CFR §122.2. The executive director will review ponds that will contain only non-process wastewater on a case-by-case basis to determine whether the pond must be lined. If a pond will contain only non-process wastewater, the owner shall notify the Industrial Permits Team (MC-148) to obtain a written determination at least 90 days before the pond is placed into service and copy the TCEQ Compliance Monitoring Team (MC-224). The permittee must submit all information about the proposed pond contents that is reasonably necessary for the executive director to make a determination. If the executive director determines that a pond does not need to be lined, then the pond is exempt from C(1) through C(3) and D through G of POND REQUIREMENTS.

A wastewater pond that only contains domestic wastewater must comply with the design requirements in 30 TAC Chapter 217 and 30 TAC §309.13(d) in lieu of items C(1) through C(3) of this subparagraph.

(1) Soil liner: The soil liner must contain clay-rich soil material (at least 30% of the liner material passing through a #200 mesh sieve, liquid limit greater than or equal to 30, and plasticity index greater than or equal to 15) that completely covers the sides and bottom of the pond. The liner must be at least 3.0 feet thick. The liner material must be compacted in lifts of no more than 8 inches to 95% standard proctor density at the optimum moisture content in accordance with ASTM D698 to achieve a permeability less than or equal to 1×10^{-7} ($\leq$ 0.0000001) cm/sec. For in-situ soil material that meets the permeability requirement, the material must be scarified at least 8 inches deep and then re-compacted to finished grade.

(2) Synthetic membrane: The liner must be a synthetic membrane liner at least 40 mils in thickness that completely covers the sides and the bottom of the pond. The liner material used must be compatible with the wastewater and be resistant to degradation (e.g., from ultraviolet light, chemical reactions, wave action, erosion, etc.). The liner material must be installed and maintained in accordance with the manufacturer's guidelines. A wastewater pond with a synthetic membrane liner must include an underdrain with a leak detection and collection system.

(3) Alternate liner: The permittee shall submit plans signed and sealed by a Texas-licensed professional engineer for any other equivalently protective pond lining method to the Industrial Permits Team (MC-148) and copy the Compliance Monitoring Team (MC-224).

D. For a pond that must be lined according to subparagraph C (including ponds with in-situ soil liners), the permittee shall provide certification, signed and sealed by a Texas-licensed professional engineer, stating that the completed pond lining and any required underdrain with leak detection and collection system for the pond meet the requirements in subparagraph C(1) – C(3) before using the pond. The certification shall include the following minimum details about the pond lining system: (1) pond liner type (in-situ soil, amended in-situ soil, imported soil, synthetic membrane, or alternative), (2) materials used, (3) thickness of materials, and (4) either permeability test results or a leak detection and collection system description, as applicable.

The certification must be provided to the TCEQ Water Quality Assessment Team (MC-150), Industrial Permits Team (MC-148), Compliance Monitoring Team (MC-224) and regional office. A copy of the liner certification and construction details (i.e., as-built drawings, construction QA/QC documentation, and post construction testing) must be kept on-site or in a reasonably accessible location (in either hardcopy or digital format) until the pond is closed.

E. Protection and maintenance requirements for a pond subject to subparagraph B or C (including ponds with in-situ soil liners).

(1) The permittee shall maintain a liner to prevent the unauthorized discharge of wastewater into or adjacent to water in the state.

(2) A liner must be protected from damage caused by animals. Fences or other protective devices or measures may be used to satisfy this requirement.

(3) The permittee shall maintain the structural integrity of the liner and shall keep the liner and embankment free of woody vegetation, animal burrows, and excessive erosion.

(4) The permittee shall inspect each pond liner and each leak detection system at least once per month. Evidence of damage or unauthorized discharge must be evaluated by a Texas-licensed professional engineer or Texas-licensed professional geoscientist within 30 days. The permittee is not required to drain an operating pond or to inspect below the waterline during these routine inspections.

a. A Texas-licensed professional engineer or Texas-licensed professional geoscientist must evaluate damage to a pond liner, including evidence of an unauthorized discharge without visible damage.

b. Pond liner damage must be repaired at the recommendation of a Texas-licensed professional engineer or Texas-licensed professional geoscientist. If the damage is significant or could result in an unauthorized discharge, then the repair must be documented and certified by a Texas-licensed professional engineer. Within 60 days after a repair is completed, the liner certification must be provided to the TCEQ Water Quality Assessment Team (MC-150), Compliance Monitoring Section (MC-224), and regional office. A copy of the liner certification must be maintained at the facility or in a reasonably accessible location and made available to the executive director upon request.

c. A release determination and subsequent corrective action will be based on 40 CFR Part 257 or the Texas Risk Reduction Program (30 TAC Chapter 350), as applicable. If evidence indicates that an unauthorized discharge occurred, including evidence that the actual permeability exceeds the design permeability, the matter may also be referred to the TCEQ Enforcement Division to ensure the protection of the public and the environment.

F. For a pond subject to subparagraph B or C (including ponds with in-situ soil liners), the permittee shall have a Texas-licensed professional engineer perform an evaluation of each pond that requires a liner at least once every five years. The evaluation must include: (1) a physical inspection of the pond liner to check for structural integrity, damage, and evidence of leaking; (2) a review of the liner documentation for the pond; and (3) a review of all documentation related to liner repair and maintenance performed since the last evaluation. For the purposes of this evaluation, evidence of leaking also includes evidence that the actual permeability exceeds the design permeability. The permittee is not required to drain an operating pond or to inspect below the waterline during the evaluation. A copy of the engineer's evaluation report must be maintained at the facility or in a reasonably accessible location and made available to the executive director upon request.

G. For a pond subject to subparagraph B or C (including ponds with in-situ soil liners), the permittee shall maintain at least 2.0 feet of freeboard in the pond except when:

(1) the freeboard requirement temporarily cannot be maintained due to a large storm event that requires the additional retention capacity to be used for a limited period of time;

(2) the freeboard requirement temporarily cannot be maintained due to upset plant conditions that require the additional retention capacity to be used for treatment for a limited period of time; or

(3) the pond was not required to have at least 2.0 feet of freeboard according to the requirements at the time of construction.

CHRONIC BIOMONITORING REQUIREMENTS: FRESHWATER

The provisions of this section apply to Outfall 001 for whole effluent toxicity (WET) testing.

1. Scope, Frequency, and Methodology

   a. The permittee shall test the effluent for toxicity in accordance with the provisions below. Such testing will determine if an appropriately dilute effluent sample adversely affects the survival, reproduction, or growth of the test organisms.

   b. The permittee shall conduct the following toxicity tests utilizing the test organisms, procedures, and quality assurance requirements specified in this part of this permit and in accordance with "Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms," fourth edition (EPA-821-R-02-013) or its most recent update:

      1) Chronic static renewal survival and reproduction test using the water flea (*Ceriodaphnia dubia*) (Method 1002.0). This test should be terminated when 60% of the surviving adults in the control produce three broods or at the end of eight days, whichever occurs first. This test shall be conducted once per quarter.

      2) Chronic static renewal 7-day larval survival and growth test using the fathead minnow (*Pimephales promelas*) (Method 1000.0). A minimum of five replicates with eight organisms per replicate shall be used in the control and in each dilution. This test shall be conducted once per quarter.

   The permittee must perform and report a valid test for each test species during the prescribed reporting period. An invalid test must be repeated during the same reporting period. An invalid test is defined as any test failing to satisfy the test acceptability criteria, procedures, and quality assurance requirements specified in the test methods and permit.

   c. The permittee shall use five effluent dilution concentrations and a control in each toxicity test. These effluent dilution concentrations are 32%, 42%, 56%, 75%, and 100% effluent. The critical dilution, defined as 100% effluent, is the effluent concentration representative of the proportion of effluent in the receiving water during critical low flow or critical mixing conditions.

   d. This permit may be amended to require a WET limit, a chemical-specific effluent limit, a best management practice, or other appropriate actions to address toxicity. The permittee may be required to conduct a toxicity reduction evaluation (TRE) after multiple toxic events.

   e. Testing Frequency Reduction

      1) If none of the first four consecutive quarterly tests demonstrates significant toxicity, the permittee may submit this information in writing and, upon approval, reduce the testing frequency to once per six months for the invertebrate test species and once per year for the vertebrate test species.

      2) If one or more of the first four consecutive quarterly tests demonstrates significant toxicity, the permittee shall continue quarterly testing for that species until this permit is reissued. If a testing frequency reduction had been

previously granted and a subsequent test demonstrates significant toxicity, the permittee will resume a quarterly testing frequency for that species until this permit is reissued.

2. Required Toxicity Testing Conditions

a. Test Acceptance - The permittee shall repeat any toxicity test, including the control and all effluent dilutions, which fail to meet the following criteria:

1) a control mean survival of 80% or greater;

2) a control mean number of water flea neonates per surviving adult of 15 or greater;

3) a control mean dry weight of surviving fathead minnow larvae of 0.25 mg or greater;

4) a control coefficient of variation percent (CV%) of 40 or less between replicates for the young of surviving females in the water flea test; and the growth and survival endpoints in the fathead minnow test;

5) a critical dilution CV% of 40 or less for the young of surviving females in the water flea test; and the growth and survival endpoints for the fathead minnow test. However, if statistically significant lethal or nonlethal effects are exhibited at the critical dilution, a CV% greater than 40 shall not invalidate the test;

6) a percent minimum significant difference of 47 or less for water flea reproduction; and

7) a percent minimum significant difference of 30 or less for fathead minnow growth.

b. Statistical Interpretation

1) For the water flea survival test, the statistical analyses used to determine if there is a significant difference between the control and an effluent dilution shall be the Fisher's exact test as described in the manual referenced in Part 1.b.

2) For the water flea reproduction test and the fathead minnow larval survival and growth tests, the statistical analyses used to determine if there is a significant difference between the control and an effluent dilution shall be in accordance with the manual referenced in Part 1.b.

3) The permittee is responsible for reviewing test concentration-response relationships to ensure that calculated test-results are interpreted and reported correctly. The document entitled "Method Guidance and Recommendation for Whole Effluent Toxicity (WET) Testing (40 CFR Part 136)" (EPA 821-B-00-004) provides guidance on determining the validity of test results.

4) If significant lethality is demonstrated (that is, there is a statistically significant difference in survival at the critical dilution when compared to the survival in the control), the conditions of test acceptability are met, and the survival of the test organisms are equal to or greater than 80% in the critical dilution and all

dilutions below that, then the permittee shall report a survival No Observed Effect Concentration (NOEC) of not less than the critical dilution for the reporting requirements.

5) The NOEC is defined as the greatest effluent dilution at which no significant effect is demonstrated. The Lowest Observed Effect Concentration (LOEC) is defined as the lowest effluent dilution at which a significant effect is demonstrated. A significant effect is herein defined as a statistically significant difference between the survival, reproduction, or growth of the test organism in a specified effluent dilution when compared to the survival, reproduction, or growth of the test organism in the control.

6) The use of NOECs and LOECs assumes either a monotonic (continuous) concentration-response relationship or a threshold model of the concentration-response relationship. For any test result that demonstrates a non-monotonic (non-continuous) response, the NOEC should be determined based on the guidance manual referenced in Item 3.

7) Pursuant to the responsibility assigned to the permittee in Part 2.b.3), test results that demonstrate a non-monotonic (non-continuous) concentration-response relationship may be submitted, prior to the due date, for technical review. The guidance manual referenced in Item 3 will be used when making a determination of test acceptability.

8) TCEQ staff will review test results for consistency with rules, procedures, and permit requirements.

c. Dilution Water

1) Dilution water used in the toxicity tests must be the receiving water collected as close to the point of discharge as possible but unaffected by the discharge.

2) Where the receiving water proves unsatisfactory as a result of pre-existing instream toxicity (i.e. fails to fulfill the test acceptance criteria of Part 2.a.), the permittee may substitute synthetic dilution water for the receiving water in all subsequent tests provided the unacceptable receiving water test met the following stipulations:

a) a synthetic lab water control was performed (in addition to the receiving water control) which fulfilled the test acceptance requirements of Part 2.a;

b) the test indicating receiving water toxicity was carried out to completion (i.e., 7 days);

c) the permittee submitted all test results indicating receiving water toxicity with the reports and information required in Part 3.

3) The synthetic dilution water shall consist of standard, moderately hard, reconstituted water. Upon approval, the permittee may substitute other appropriate dilution water with chemical and physical characteristics similar to that of the receiving water.

d. Samples and Composites

1) The permittee shall collect a minimum of three composite samples from Outfall 001. The second and third composite samples will be used for the renewal of the dilution concentrations for each toxicity test.

2) The permittee shall collect the composite samples such that the samples are representative of any periodic episode of chlorination, biocide usage, or other potentially toxic substance being discharged on an intermittent basis.

3) The permittee shall initiate the toxicity tests within 36 hours after collection of the last portion of the first composite sample. The holding time for any subsequent composite sample shall not exceed 72 hours. Samples shall be maintained at a temperature of 0-6 degrees Centigrade during collection, shipping, and storage.

4) If Outfall 001 ceases discharging during the collection of effluent samples, the requirements for the minimum number of effluent samples, the minimum number of effluent portions, and the sample holding time are waived during that sampling period. However, the permittee must have collected an effluent composite sample volume sufficient to complete the required toxicity tests with renewal of the effluent. When possible, the effluent samples used for the toxicity tests shall be collected on separate days if the discharge occurs over multiple days. The sample collection duration and the static renewal protocol associated with the abbreviated sample collection must be documented in the full report.

3. Reporting

All reports, tables, plans, summaries, and related correspondence required this section shall be submitted to the attention of the Standards Implementation Team (MC 150) of the Water Quality Division.

a. The permittee shall prepare a full report of the results of all tests conducted in accordance with the manual referenced in Part 1.b. for every valid and invalid toxicity test initiated whether carried to completion or not.

b. The permittee shall routinely report the results of each biomonitoring test on the Table 1 forms provided with this permit.

1) Annual biomonitoring test results are due on or before January 20th for biomonitoring conducted during the previous 12-month period.

2) Semiannual biomonitoring test results are due on or before July 20th and January 20th for biomonitoring conducted during the previous 6-month period.

3) Quarterly biomonitoring test results are due on or before April 20th, July 20th, October 20th, and January 20th for biomonitoring conducted during the previous calendar quarter.

4) Monthly biomonitoring test results are due on or before the 20th day of the month following sampling.

c. Enter the following codes for the appropriate parameters for valid tests only:

1) For the water flea, Parameter TLP3B, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

2) For the water flea, Parameter TOP3B, report the NOEC for survival.

3) For the water flea, Parameter TXP3B, report the LOEC for survival.

4) For the water flea, Parameter TWP3B, enter a "1" if the NOEC for reproduction is less than the critical dilution; otherwise, enter a "0."

5) For the water flea, Parameter TPP3B, report the NOEC for reproduction.

6) For the water flea, Parameter TYP3B, report the LOEC for reproduction.

7) For the fathead minnow, Parameter TLP6C, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

8) For the fathead minnow, Parameter TOP6C, report the NOEC for survival.

9) For the fathead minnow, Parameter TXP6C, report the LOEC for survival.

10) For the fathead minnow, Parameter TWP6C, enter a "1" if the NOEC for growth is less than the critical dilution; otherwise, enter a "0."

11) For the fathead minnow, Parameter TPP6C, report the NOEC for growth.

12) For the fathead minnow, Parameter TYP6C, report the LOEC for growth.

d. Enter the following codes for retests only:

1) For retest number 1, Parameter 22415, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

2) For retest number 2, Parameter 22416, enter a "1" if the NOEC for survival is less than the critical dilution; otherwise, enter a "0."

4. <u>Persistent Toxicity</u>

The requirements of this Part apply only when a test demonstrates a significant effect at the critical dilution. Significant effect and significant lethality were defined in Part 2.b. Significant sublethality is defined as a statistically significant difference in growth/reproduction at the critical dilution when compared to the growth/reproduction of the test organism in the control.

a. The permittee shall conduct a total of 2 additional tests (retests) for any species that demonstrates a significant effect (lethal or sublethal) at the critical dilution. The two retests shall be conducted monthly during the next two consecutive months. The permittee shall not substitute either of the two retests in lieu of routine toxicity testing. All reports shall be submitted within 20 days of test completion. Test completion is defined as the last day of the test.

b. If the retests are performed due to a demonstration of significant lethality, and one or both of the two retests specified in Part 4.a. demonstrates significant lethality, the permittee shall initiate the TRE requirements as specified in Part 5. The provisions of Part 4.a. are suspended upon completion of the two retests and submittal of the TRE action plan and schedule defined in Part 5.

If neither test demonstrates significant lethality and the permittee is testing under the reduced testing frequency provision of Part 1.e., the permittee shall return to a quarterly testing frequency for that species.

c. If the two retests are performed due to a demonstration of significant sublethality, and one or both of the two retests specified in Part 4.a. demonstrates significant lethality, the permittee shall again perform two retests as stipulated in Part 4.a.

d. If the two retests are performed due to a demonstration of significant sublethality, and neither test demonstrates significant lethality, the permittee shall continue testing at the quarterly frequency.

e. Regardless of whether retesting for lethal or sublethal effects or a combination of the two, no more than one retest per month is required for a species.

5. Toxicity Reduction Evaluation

a. Within 45 days of the retest that demonstrates significant lethality, or within 45 days of being so instructed due to multiple toxic events, the permittee shall submit a general outline for initiating a TRE. The outline shall include, but not be limited to, a description of project personnel, a schedule for obtaining consultants (if needed), a discussion of influent and effluent data available for review, a sampling and analytical schedule, and a proposed TRE initiation date.

b. Within 90 days of the retest that demonstrates significant lethality, or within 90 days of being so instructed due to multiple toxic events, the permittee shall submit a TRE action plan and schedule for conducting a TRE. The plan shall specify the approach and methodology to be used in performing the TRE. A TRE is a step-wise investigation combining toxicity testing with physical and chemical analyses to determine actions necessary to eliminate or reduce effluent toxicity to a level not effecting significant lethality at the critical dilution. The TRE action plan shall describe an approach for the reduction or elimination of lethality for both test species defined in Part 1.b. At a minimum, the TRE action plan shall include the following:

1) Specific Activities - The TRE action plan shall specify the approach the permittee intends to utilize in conducting the TRE, including toxicity characterizations, identifications, confirmations, source evaluations, treatability studies, and alternative approaches. When conducting characterization analyses, the permittee shall perform multiple characterizations and follow the procedures specified in the document entitled "Toxicity Identification Evaluation: Characterization of Chronically Toxic Effluents, Phase I" (EPA/600/6-91/005F) or alternate procedures. The permittee shall perform multiple identifications and follow the methods specified in the documents entitled "Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/080) and "Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/081). All characterization,

identification, and confirmation tests shall be conducted in an orderly and logical progression;

2) Sampling Plan - The TRE action plan should describe sampling locations, methods, holding times, chain of custody, and preservation techniques. The effluent sample volume collected for all tests shall be adequate to perform the toxicity characterization/identification/confirmation procedures and chemical-specific analyses when the toxicity tests show significant lethality. Where the permittee has identified or suspects a specific pollutant and source of effluent toxicity, the permittee shall conduct, concurrent with toxicity testing, chemical-specific analyses for the identified and suspected pollutant and source of effluent toxicity;

3) Quality Assurance Plan - The TRE action plan should address record keeping and data evaluation, calibration and standardization, baseline tests, system blanks, controls, duplicates, spikes, toxicity persistence in the samples, randomization, reference toxicant control charts, and mechanisms to detect artifactual toxicity; and

4) Project Organization - The TRE action plan should describe the project staff, project manager, consulting engineering services (where applicable), consulting analytical and toxicological services, etc.

c. Within 30 days of submittal of the TRE action plan and schedule, the permittee shall implement the TRE.

d. The permittee shall submit quarterly TRE activities reports concerning the progress of the TRE. The quarterly reports are due on or before April 20th, July 20th, October 20th, and January 20th. The report shall detail information regarding the TRE activities including:

1) results and interpretation of any chemical-specific analyses for the identified and suspected pollutant performed during the quarter;

2) results and interpretation of any characterization, identification, and confirmation tests performed during the quarter;

3) any data and substantiating documentation which identifies the pollutant and source of effluent toxicity;

4) results of any studies/evaluations concerning the treatability of the facility's effluent toxicity;

5) any data which identifies effluent toxicity control mechanisms that will reduce effluent toxicity to the level necessary to meet no significant lethality at the critical dilution; and

6) any changes to the initial TRE plan and schedule that are believed necessary as a result of the TRE findings.

e. During the TRE, the permittee shall perform, at a minimum, quarterly testing using the more sensitive species. Testing for the less sensitive species shall continue at the frequency specified in Part 1.b.

f. If the effluent ceases to effect significant lethality, i.e., there is a cessation of lethality, the permittee may end the TRE. A cessation of lethality is defined as no significant lethality for a period of 12 consecutive months with at least monthly testing. At the end of the 12 months, the permittee shall submit a statement of intent to cease the TRE and may then resume the testing frequency specified in Part 1.b.

This provision accommodates situations where operational errors and upsets, spills, or sampling errors triggered the TRE, in contrast to a situation where a single toxicant or group of toxicants cause lethality. This provision does not apply as a result of corrective actions taken by the permittee. Corrective actions are herein defined as proactive efforts that eliminate or reduce effluent toxicity. These include, but are not limited to, source reduction or elimination, improved housekeeping, changes in chemical usage, and modifications of influent streams and effluent treatment.

The permittee may only apply this cessation of lethality provision once. If the effluent again demonstrates significant lethality to the same species, the permit will be amended to add a WET limit with a compliance period, if appropriate. However, prior to the effective date of the WET limit, the permittee may apply for a permit amendment removing and replacing the WET limit with an alternate toxicity control measure by identifying and confirming the toxicant and an appropriate control measure.

g. The permittee shall complete the TRE and submit a final report on the TRE activities no later than 28 months from the last test day of the retest that confirmed significant lethal effects at the critical dilution. The permittee may petition the Executive Director (in writing) for an extension of the 28-month limit. However, to warrant an extension the permittee must have demonstrated due diligence in its pursuit of the toxicity identification evaluation/TRE and must prove that circumstances beyond its control stalled the toxicity identification evaluation/TRE. The report shall provide information pertaining to the specific control mechanism selected that will, when implemented, result in reduction of effluent toxicity to no significant lethality at the critical dilution. The report will also provide a specific corrective action schedule for implementing the selected control mechanism.

h. Based upon the results of the TRE and proposed corrective actions, this permit may be amended to modify the biomonitoring requirements, where necessary, require a compliance schedule for implementation of corrective actions, specify a WET limit, specify a best management practice, and specify a chemical-specific limit.

i. Copies of any and all required TRE plans and reports shall also be submitted to the U.S. EPA Region 6 office, 6WQ-PO.

TABLE 1 (SHEET 1 OF 4)

BIOMONITORING REPORTING

CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION

		Date Time		Date Time
Dates and Times Composites Collected	No. 1 FROM:	________________	TO:	____________________
	No. 2 FROM:	________________	TO:	____________________
	No. 3 FROM:	________________	TO:	____________________

Test initiated: ______________________________am/pm ____________________________date

Dilution water used: ________ Receiving Water _______ Synthetic Dilution Water

NUMBER OF YOUNG PRODUCED PER ADULT AT END OF TEST

	Percent effluent (%)					
REP	0%	32%	42%	56%	75%	100%
A						
B						
C						
D						
E						
F						
G						
H						
I						
J						
Survival Mean						
Total Mean						
CV%*						
PMSD						

*Coefficient of Variation = standard deviation x 100/mean (calculation based on young of the surviving adults) Designate males (M), and dead females (D), along with number of neonates (x) released prior to death.

TABLE 1 (SHEET 2 OF 4)

CERIODAPHNIA DUBIA SURVIVAL AND REPRODUCTION TEST

1. Dunnett's Procedure or Steel's Many-One Rank Test or Wilcoxon Rank Sum Test (with Bonferroni adjustment) or t-test (with Bonferroni adjustment) as appropriate:

Is the mean number of young produced per adult significantly less than the number of young per adult in the control for the % effluent corresponding to significant nonlethal effects?

CRITICAL DILUTION (100%): _______ YES _______ NO

PERCENT SURVIVAL

	Percent effluent					
Time of Reading	0%	32%	42%	56%	75%	100%
24h						
48h						
End of Test						

2. Fisher's Exact Test:

Is the mean survival at test end significantly less than the control survival for the % effluent corresponding to lethality?

CRITICAL DILUTION (100%): _______ YES _______ NO

3. Enter percent effluent corresponding to each NOEC/LOEC below:

a.) NOEC survival = __________% effluent

b.) LOEC survival = __________% effluent

c.) NOEC reproduction = __________% effluent

d.) LOEC reproduction = __________% effluent

TABLE 1 (SHEET 3 OF 4)

BIOMONITORING REPORTING

FATHEAD MINNOW LARVAE GROWTH AND SURVIVAL

		Date Time		Date Time
Dates and Times Composites Collected	No. 1 FROM:	__________	TO:	__________
	No. 2 FROM:	__________	TO:	__________
	No. 3 FROM:	__________	TO:	__________

Test initiated: ______________________am/pm ______________________date

Dilution water used: _________ Receiving Water _________ Synthetic Dilution Water

FATHEAD MINNOW GROWTH DATA

Effluent Concentration	Average Dry Weight in milligrams in replicate chambers					Mean Dry Weight	CV%*
	A	B	C	D	E		
0%							
32%							
42%							
56%							
75%							
100%							
PMSD							

* Coefficient of Variation = standard deviation x 100/mean

1. Dunnett's Procedure or Steel's Many-One Rank Test or Wilcoxon Rank Sum Test (with Bonferroni adjustment) or t-test (with Bonferroni adjustment) as appropriate:

   Is the mean dry weight (growth) at 7 days significantly less than the control's dry weight (growth) for the % effluent corresponding to significant nonlethal effects?

   CRITICAL DILUTION (100%): _______ YES _______ NO

TABLE 1 (SHEET 4 OF 4)

BIOMONITORING REPORTING

FATHEAD MINNOW GROWTH AND SURVIVAL TEST

FATHEAD MINNOW SURVIVAL DATA

Effluent Concentration	Percent Survival in replicate chambers					Mean percent survival			CV%*
	A	B	C	D	E	24h	48h	7 day	
0%									
32%									
42%									
56%									
75%									
100%									

* Coefficient of Variation = standard deviation x 100/mean

2. Dunnett's Procedure or Steel's Many-One Rank Test or Wilcoxon Rank Sum Test (with Bonferroni adjustment) or t-test (with Bonferroni adjustment) as appropriate:

   Is the mean survival at 7 days significantly less (p=0.05) than the control survival for the % effluent corresponding to lethality?

   CRITICAL DILUTION (100%): _______ YES _______ NO

3. Enter percent effluent corresponding to each NOEC/LOEC below:

   a.) NOEC survival = __________% effluent

   b.) LOEC survival = __________% effluent

   c.) NOEC growth = __________% effluent

   d.) LOEC growth = __________% effluent

24-HOUR ACUTE BIOMONITORING REQUIREMENTS: FRESHWATER

The provisions of this section apply to Outfall 001 and 002 for whole effluent toxicity (WET) testing.

1. Scope, Frequency, and Methodology

   a. The permittee shall test the effluent for lethality in accordance with the provisions in this section. Such testing will determine compliance with Texas Surface Water Quality Standard 30 TAC § 307.6(e)(2)(B), which requires greater than 50% survival of the appropriate test organisms in 100% effluent for a 24-hour period.

   b. The toxicity tests specified shall be conducted once per six months. The permittee shall conduct the following toxicity tests using the test organisms, procedures, and quality assurance requirements specified in this section of the permit and in accordance with "Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms," fifth edition (EPA-821-R-02-012) or its most recent update:

      1) Acute 24-hour static toxicity test using the water flea (*Daphnia pulex* or *Ceriodaphnia dubia*). A minimum of five replicates with eight organisms per replicate shall be used in the control and each dilution.

      2) Acute 24-hour static toxicity test using the fathead minnow (*Pimephales promelas*). A minimum of five replicates with eight organisms per replicate shall be used in the control and each dilution.

      The permittee must perform and report a valid test for each test species during the prescribed reporting period. An invalid test must be repeated during the same reporting period. An invalid test is defined as any test failing to satisfy the test acceptability criteria, procedures, and quality assurance requirements specified in the test methods and permit. All test results, valid or invalid, must be submitted as described below.

   c. In addition to an appropriate control, a 100% effluent concentration shall be used in the toxicity tests. The control and dilution water shall consist of standard, synthetic, moderately hard, reconstituted water.

   d. This permit may be amended to require a WET limit, a best management practice, a chemical-specific limit, or other appropriate actions to address toxicity. The permittee may be required to conduct a toxicity reduction evaluation (TRE) after multiple toxic events.

   e. As the dilution series specified in the Chronic Biomonitoring Requirements includes a 100% effluent concentration, the results from those tests may fulfill the requirements of this section; any tests performed in the proper time interval may be substituted. Compliance will be evaluated as specified in Part 1.a. The 50% survival in 100% effluent for a 24-hour period standard applies to all tests utilizing a 100% effluent dilution, regardless of whether the results are submitted to comply with the minimum testing frequency.

2. Required Toxicity Testing Conditions

a. Test Acceptance – The permittee shall repeat any toxicity test, including the control, if the control fails to meet a mean survival equal to or greater than 90%.

b. Dilution Water - In accordance with Part 1.c., the control and dilution water shall consist of standard, synthetic, moderately hard, reconstituted water.

c. Samples and Composites

1) The permittee shall collect one composite sample from Outfall 001.

2) The permittee shall collect the composite sample such that the sample is representative of any periodic episode of chlorination, biocide usage, or other potentially toxic substance discharged on an intermittent basis.

3) The permittee shall initiate the toxicity tests within 36 hours after collection of the last portion of the composite sample. Samples shall be maintained at a temperature of 0-6 degrees Centigrade during collection, shipping, and storage.

4) If Outfall 001 ceases discharging during the collection of the effluent composite sample, the requirements for the minimum number of effluent portions are waived. However, the permittee must have collected a composite sample volume sufficient for completion of the required test. The abbreviated sample collection, duration, and methodology must be documented in the full report.

3. Reporting

All reports, tables, plans, summaries, and related correspondence required in this section shall be submitted to the attention of the Standards Implementation Team (MC 150) of the Water Quality Division.

a. The permittee shall prepare a full report of the results of all tests conducted pursuant to this permit in accordance with the manual referenced in Part 1.b. for every valid and invalid toxicity test initiated.

b. The permittee shall routinely report the results of each biomonitoring test on the Table 2 forms provided with this permit.

1) Semiannual biomonitoring test results are due on or before July 20th and January 20th for biomonitoring conducted during the previous 6-month period.

2) Quarterly biomonitoring test results are due on or before April 20th, July 20th, and October 20th, and January 20th for biomonitoring conducted during the previous calendar quarter.

c. Enter the following codes for the appropriate parameters for valid tests only:

1) For the water flea, Parameter TIE3D, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

2) For the fathead minnow, Parameter TIE6C, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

d. Enter the following codes for retests only:

1) For retest number 1, Parameter 22415, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

2) For retest number 2, Parameter 22416, enter a "0" if the mean survival at 24 hours is greater than 50% in the 100% effluent dilution; if the mean survival is less than or equal to 50%, enter "1."

4. Persistent Mortality

The requirements of this part apply when a toxicity test demonstrates significant lethality, which is defined as a mean mortality of 50% or greater to organisms exposed to the 100% effluent concentration for 24 hours.

a. The permittee shall conduct 2 additional tests (retests) for each species that demonstrates significant lethality. The two retests shall be conducted once per week for 2 weeks. Five effluent dilution concentrations in addition to an appropriate control shall be used in the retests. These effluent concentrations are 6%, 13%, 25%, 50%, and 100% effluent. The first retest shall be conducted within 15 days of the laboratory determination of significant lethality. All test results shall be submitted within 20 days of test completion of the second retest. Test completion is defined as the 24th hour.

b. If one or both of the two retests specified in Part 4.a. demonstrates significant lethality, the permittee shall initiate the TRE requirements as specified in Part 5.

5. Toxicity Reduction Evaluation

a. Within 45 days of the retest that demonstrates significant lethality, the permittee shall submit a general outline for initiating a TRE. The outline shall include, but not be limited to, a description of project personnel, a schedule for obtaining consultants (if needed), a discussion of influent and effluent data available for review, a sampling and analytical schedule, and a proposed TRE initiation date.

b. Within 90 days of the retest that demonstrates significant lethality, the permittee shall submit a TRE action plan and schedule for conducting a TRE. The plan shall specify the approach and methodology to be used in performing the TRE. A TRE is a step-wise investigation combining toxicity testing with physical and chemical analyses to determine actions necessary to eliminate or reduce effluent toxicity to a level not effecting significant lethality at the critical dilution. The TRE action plan shall lead to the successful elimination of significant lethality for both test species defined in item 1.b. As a minimum, the TRE action plan shall include the following:

1) Specific Activities - The TRE action plan shall specify the approach the permittee intends to utilize in conducting the TRE, including toxicity characterizations, identifications, confirmations, source evaluations, treatability studies, and alternative approaches. When conducting characterization analyses, the permittee shall perform multiple characterizations and follow the

procedures specified in the document entitled "Methods for Aquatic Toxicity Identification Evaluations: Phase I Toxicity Characterization Procedures" (EPA/600/6-91/003) or alternate procedures. The permittee shall perform multiple identifications and follow the methods specified in the documents entitled "Methods for Aquatic Toxicity Identification Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/080) and "Methods for Aquatic Toxicity Identification Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity" (EPA/600/R-92/081). All characterization, identification, and confirmation tests shall be conducted in an orderly and logical progression;

2) Sampling Plan - The TRE action plan should describe sampling locations, methods, holding times, chain of custody, and preservation techniques. The effluent sample volume collected for all tests shall be adequate to perform the toxicity characterization/identification/confirmation procedures and chemical-specific analyses when the toxicity tests show significant lethality. Where the permittee has identified or suspects a specific pollutant and source of effluent toxicity, the permittee shall conduct, concurrent with toxicity testing, chemical-specific analyses for the identified and suspected pollutant and source of effluent toxicity;

3) Quality Assurance Plan - The TRE action plan should address record keeping and data evaluation, calibration and standardization, baseline tests, system blanks, controls, duplicates, spikes, toxicity persistence in the samples, randomization, reference toxicant control charts, and mechanisms to detect artifactual toxicity; and

4) Project Organization - The TRE action plan should describe the project staff, manager, consulting engineering services (where applicable), consulting analytical and toxicological services, etc.

c. Within 30 days of submittal of the TRE action plan and schedule, the permittee shall implement the TRE.

d. The permittee shall submit quarterly TRE activities reports concerning the progress of the TRE. The quarterly TRE activities reports are due on or before April 20th, July 20th, October 20th, and January 20th. The report shall detail information regarding the TRE activities including:

1) results and interpretation of any chemical-specific analyses for the identified and suspected pollutant performed during the quarter;

2) results and interpretation of any characterization, identification, and confirmation tests performed during the quarter;

3) any data and substantiating documentation that identifies the pollutant(s) and source of effluent toxicity;

4) results of any studies/evaluations concerning the treatability of the facility's effluent toxicity;

5) any data that identifies effluent toxicity control mechanisms that will reduce effluent toxicity to the level necessary to eliminate significant lethality; and

6) any changes to the initial TRE Plan and Schedule that are believed necessary as a result of the TRE findings.

e. During the TRE, the permittee shall perform, at a minimum, quarterly testing using the more sensitive species. Testing for the less sensitive species shall continue at the frequency specified in Part 1.b.

f. If the effluent ceases to effect significant lethality, i.e., there is a cessation of lethality, the permittee may end the TRE. A cessation of lethality is defined as no significant lethality for a period of 12 consecutive weeks with at least weekly testing. At the end of the 12 weeks, the permittee shall submit a statement of intent to cease the TRE and may then resume the testing frequency specified in Part 1.b.

This provision accommodates situations where operational errors and upsets, spills, or sampling errors triggered the TRE, in contrast to a situation where a single toxicant or group of toxicants cause lethality. This provision does not apply as a result of corrective actions taken by the permittee. Corrective actions are herein defined as proactive efforts that eliminate or reduce effluent toxicity. These include, but are not limited to, source reduction or elimination, improved housekeeping, changes in chemical usage, and modifications of influent streams and effluent treatment.

The permittee may only apply this cessation of lethality provision once. If the effluent again demonstrates significant lethality to the same species, the permit will be amended to add a WET limit with a compliance period, if appropriate. However, prior to the effective date of the WET limit, the permittee may apply for a permit amendment removing and replacing the WET limit with an alternate toxicity control measure by identifying and confirming the toxicant and an appropriate control measure.

g. The permittee shall complete the TRE and submit a final report on the TRE activities no later than 18 months from the last test day of the retest that demonstrates significant lethality. The permittee may petition the Executive Director (in writing) for an extension of the 18-month limit. However, to warrant an extension the permittee must have demonstrated due diligence in its pursuit of the toxicity identification evaluation/TRE and must prove that circumstances beyond its control stalled the toxicity identification evaluation/TRE. The report shall specify the control mechanism that will, when implemented, reduce effluent toxicity as specified in item 5.h. The report shall also specify a corrective action schedule for implementing the selected control mechanism.

h. Within 3 years of the last day of the test confirming toxicity, the permittee shall comply with 30 TAC § 307.6(e)(2)(B), which requires greater than 50% survival of the test organism in 100% effluent at the end of 24-hours. The permittee may petition the Executive Director (in writing) for an extension of the 3-year limit. However, to warrant an extension the permittee must have demonstrated due diligence in its pursuit of the toxicity identification evaluation/TRE and must prove that circumstances beyond its control stalled the toxicity identification evaluation/TRE.

The permittee may be exempted from complying with 30 TAC § 307.6(e)(2)(B) upon proving that toxicity is caused by an excess, imbalance, or deficiency of dissolved salts. This exemption excludes instances where individually toxic components (e.g., metals) form a salt compound. Following the exemption, this permit may be amended to include an ion-adjustment protocol, alternate species testing, or single species testing.

i. Based upon the results of the TRE and proposed corrective actions, this permit may be amended to modify the biomonitoring requirements where necessary, require a compliance schedule for implementation of corrective actions, specify a WET limit, specify a best management practice, and specify a chemical specific limit.

j. Copies of any and all required TRE plans and reports shall also be submitted to the U.S. EPA Region 6 office, 6WQ-PO.

TABLE 2 (SHEET 1 OF 2)

WATER FLEA SURVIVAL

GENERAL INFORMATION

	Time	Date
Composite Sample Collected		
Test Initiated		

PERCENT SURVIVAL

Time	Rep	Percent effluent					
		0%	6%	13%	25%	50%	100%
24h	A						
	B						
	C						
	D						
	E						
	MEAN*						

Enter percent effluent corresponding to the LC50 below:

24 hour LC50 = ______% effluent

TABLE 2 (SHEET 2 OF 2)

FATHEAD MINNOW SURVIVAL

GENERAL INFORMATION

	Time	Date
Composite Sample Collected		
Test Initiated		

PERCENT SURVIVAL

Time	Rep	Percent effluent					
		0%	6%	13%	25%	50%	100%
24h	A						
	B						
	C						
	D						
	E						
	MEAN						

Enter percent effluent corresponding to the LC50 below:

24 hour LC50 = ______% effluent

FACT SHEET AND EXECUTIVE DIRECTOR'S PRELIMINARY DECISION

For draft Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000551000, U.S. Environmental Protection Agency (EPA) ID No. TX0001163, to discharge to water in the state

Issuing Office:	Texas Commission on Environmental Quality (TCEQ) P.O. Box 13087 Austin, Texas 78711-3087
Applicant:	Luminant Generation Company LLC 6555 Sierra Drive Irving, Texas 75039
Prepared By:	Ruiqiang Zong Wastewater Permitting Section Water Quality Division (512) 239-4589
Date:	July 3, 2025
Permit Action:	Renewal; TPDES Permit No. WQ0000551000

I. EXECUTIVE DIRECTOR RECOMMENDATION

The Executive Director has made a preliminary decision that this permit, if issued, meets all statutory and regulatory requirements. The draft permit will expire at midnight, five years from the date of permit issuance according to the requirements of 30 Texas Administrative Code (TAC) §305.127(1)(C)(i).

II. APPLICANT ACTIVITY

The applicant currently operates Graham Steam Electric Station.

III. DISCHARGE LOCATION

As described in the application, the facility is located at 480 Power Plant Road, on the shores of Lakes Eddleman and Graham adjacent to United States Highway 380, approximately 2.5 miles northwest of the City of Graham, Young County, Texas 76450. Discharge is via Outfall 001 directly to the Lake Eddleman portion of Lake Graham in Segment No. 1231 of the Brazos River Basin; and via Outfall 002 to Salt Creek, thence to the Brazos River Above Possum Kingdom Lake in Segment No.1208 of the Brazos River Basin.

IV. RECEIVING STREAM USES

The unclassified receiving water uses are high aquatic life use for Salt Creek. The designated uses are primary contact recreation and high aquatic life use for Segment No. 1208; and for Segment No. 1231 are primary contact recreation, public water supply, and high aquatic life use.

V. STREAM STANDARDS

The general criteria and numerical criteria that make up the stream standards are provided in 30 TAC §§ 307.1 - 307.10.

VI. DISCHARGE DESCRIPTION

The following is a quantitative description of the discharge described in the monthly effluent report data for the period July 2019 through December 2024. The "average of daily average" values presented in the following table are the average of all daily average values for the reporting period for each pollutant. The "maximum of daily maximum" values presented in the following table are the individual maximum values for the reporting period for each pollutant. Flows are expressed in million gallons per day (MGD). All pH values are expressed in standard units (SU).

A. Flow

Outfall	Frequency	Average of Daily Average, MGD	Maximum of Daily Maximum, MGD
001	Continuous	272	456
002	Continuous	0.174	13.2
102	Intermittent	No discharge	No discharge

B. Temperature

Outfall	Average of Daily Average, °F	Maximum of Daily Maximum, °F
001	71.7	105

C. Effluent Characteristics

Outfall	Pollutant	Average of Daily Average,	Maximum of Daily Maximum,
001	Free Available Chlorine (FAC)	0.079 mg/L 14.8 lbs/day	0.26 mg/L 79.2 lbs/day
	Total Residual Chlorine (TRC)	N/A	0.3 mg/L 91.9 lbs/day
002	Total Suspended Solids (TSS)	6.3 mg/L	85.4 mg/L
	Oil and Grease	3.3 mg/L	18.7 mg/L
	Total Dissolved Solids (TDS)	N/A	788 mg/L
	pH	6.6 SU, min	8.8 SU
102	Total Copper	No discharge	No discharge
	Total Iron		
	pH		

Effluent limit violations documented in the monthly effluent reports are summarized in the following table.

Outfall	Pollutant (units)	Month/ Year	Daily Maximum	
			Limit	Reported
001	TRC (mg/L)	6/2023	0.2	0.3
	TRC (mg/L)	9/2023	0.2	0.29

The draft permit was not changed to address these effluent limit violations because the two violations are isolated and do not indicate a non-compliance pattern.

VII. DRAFT EFFLUENT LIMITATIONS

The draft permit authorizes the discharge of once-through cooling water at a daily average flow not to exceed 505.4 MGD via Outfall 001; low volume waste sources, stormwater runoff, and previously monitored effluent (metal cleaning waste via internal Outfall 102) on a flow-variable basis via Outfall 002

Effluent limitations are established in the draft permit as follows:

Outfall	Pollutant	Daily Average	Daily Maximum
001	Flow	505.4 MGD	505.4 MGD
	Temperature	108°F	110°F
	Free Available Chlorine	70 lbs/day 0.2 mg/L	176 lbs/day 0.5 mg/L
	Total Residual Chlorine	N/A	140 lbs/day 0.2 mg/L
002	Flow	Report (MGD)	Report (MGD)
	Total Suspended Solids	30 mg/L	100 mg/L
	Oil and Grease	15 mg/L	20 mg/L
	Total Dissolved Solids	N/A	1500 mg/L
	pH	6.0 SU (min)	9.0 SU
102	Flow	Report (MGD)	Report (MGD)
	Total Copper	0.5 mg/L	1.0 mg/L
	Total Iron	1.0 mg/L	1.0 mg/L
	pH	6.0 SU (min)	9.0 SU

OUTFALL LOCATIONS

Outfall	Latitude	Longitude
001	33.133353 N	98.609709 W
002	33.130283 N	98.615402 W

VIII. SUMMARY OF CHANGES FROM APPLICATION

No changes were made from the application.

IX. SUMMARY OF CHANGES FROM EXISTING PERMIT

The following changes have been made to the draft permit:

1. Pages 3-13 were updated (May 2021 version).
2. The minimal analytical levels (MALs) for total copper and total iron have been updated to the current MALs in Other Requirement No. 3.
3. Existing Other Requirement No. 13 has been revised/updated to current language related to the disposal of domestic wastewater.

4. A new Other Requirement No. 19 has been added for retesting requirement for free available cyanide with a MAL down to 2.0 ug/L.
5. Existing Other Requirement No. 17 has been removed from the draft permit because it's no longer applicable.
6. Existing Other Requirement No. 2 has been revised to remove unrelated information.
7. Existing Other Requirement Nos. 18 and 19 have been renumbered as Nos. 17 and 18. In the draft permit.

X. DRAFT PERMIT RATIONALE

The following section sets forth the statutory and regulatory requirements considered in preparing the draft permit. Also set forth are any calculations or other necessary explanations of the derivation of specific effluent limitations and conditions, including a citation to the applicable effluent limitation guidelines and water quality standards.

A. REASON FOR PERMIT ISSUANCE

The applicant applied to the TCEQ for a renewal of TPDES Permit No. WQ0000551000, which authorizes the discharge of once-through cooling water at a daily average flow not to exceed 505.4 MGD via Outfall 001; and low volume waste sources, stormwater runoff, and previously monitored effluent (metal cleaning waste via internal Outfall 102) on flow-variable basis via Outfall 002.

B. WATER QUALITY SUMMARY

Discharge Routes

The discharge routes are via Outfall 001 directly to the Lake Eddleman portion of Graham Lake in Segment 1231 of the Brazos River Basin; and via Outfall 002 to Salt Creek; thence to the Brazos River Above Possum Kingdom Lake in Segment 1208 of the Brazos River Basin. The unclassified receiving water uses are high aquatic life use for Salt Creek. The designated uses for Segment No. 1231 are primary contact recreation, public water supply, and high aquatic life use and for Segment No. 1208 are primary contact recreation, and high aquatic life use. Effluent limitations and conditions established in the draft permit comply with state water quality standards and the applicable water quality management plan. The effluent limits in the draft permit will maintain and protect the existing instream uses. Additional discussion of the water quality aspects of the draft permit can be found at Section X.D. of this fact sheet.

Endangered Species Review

The discharge from this permit is not expected to have an effect on any federal endangered or threatened aquatic or aquatic-dependent species or proposed species or their critical habitat. This determination is based on the United States Fish and Wildlife Service's (USFWS) biological opinion on the State of Texas authorization of the TPDES (September 14, 1998; October 21, 1998 update). To make this determination for TPDES permits, TCEQ and EPA only considered aquatic or aquatic-dependent species occurring in watersheds of critical concern or high priority as listed in Appendix A of the USFWS's biological opinion. The determination is subject to reevaluation due to subsequent updates or amendments to the biological opinion. The permit does not require EPA review with respect to the presence of endangered or threatened species.

Impaired Water Bodies
Segment 1208 and Segment 1231 are currently listed on the State's inventory of impaired and threatened waters (the 2022 Clean Water Act Section 303(d) list). The Segment 1208 listing is for elevated bacteria levels in water from the confluence with Spring Branch upstream to the confluence with Fish Creek (AU 1208_02), and from the confluence with Boggy Creek upstream to the confluence with Lake Creek (AUs 1208_04 and 1208_05). The Segment 1231 listing is for excessive algal growth in water from Graham Dam and Eddleman Dam in Young County up to the normal pool elevation of 1075 feet (impounds Salt Creek and Flint Creek) (AU 1231_01).

The draft permit does not authorize the discharge of domestic wastewater. There are no other known sources of bacteria in the effluent. Therefore, discharges from the facility are not expected to adversely impact the bacterial levels in Segment No. 1208. Outfall 001, which discharges to Segment No. 1231, authorizes the discharge of once-through cooling water. The nature of once-through cooling water is not anticipated to contain significant nutrients to nourish the algal growth. The application is for renewal only with no request for increase in flow or pollutant loading. Therefore, the discharge is not expected to impact the impairment of excessive algal growth in Segment No. 1231.

Completed Total Maximum Daily Loads (TMDLs)
There are no completed TMDLs for Segment Nos. 1208 and 1231.

C. TECHNOLOGY-BASED EFFLUENT LIMITATIONS/CONDITIONS

1. GENERAL COMMENTS

Regulations in Title 40 of the Code of Federal Regulations (40 CFR) require that technology-based limitations be placed in wastewater discharge permits based on effluent limitations guidelines, where applicable, or on best professional judgment (BPJ) in the absence of guidelines.

The draft permit authorizes the discharge of once-through cooling water at a daily average flow not to exceed 505.4 MGD via Outfall 001; and low volume waste sources, stormwater runoff, and previously monitored effluent (consisting of metal cleaning waste via internal Outfall 102) on a flow-variable basis via Outfall 002.

The discharge of once-through cooling water via Outfall 001, low volume waste sources via Outfall 002, and metal cleaning waste via internal Outfall 102 thence via Outfall 002 from this facility is subject to federal effluent limitation guidelines at 40 CFR Part 423. A new source determination was performed, and these discharges are not a new source as defined at 40 CFR §122.2. Therefore, new source performance standards (NSPS) are not required for these discharges.

The discharge of stormwater runoff via Outfall 002 is not subject to federal effluent limitation guidelines and any technology-based effluent limitations are based on BPJ.

The Graham Steam Electric Station is a two-unit natural gas-fired steam electric generating facility. Unit 1 started to operate in 1960 with a capacity of 218 megawatts and Unit 2 started to operate in 1969 with a capacity of 392 megawatts. Wastewater produced at the Station consists of once-through and auxiliary cooling water, low volume wastes (floor/equipment drains, boiler blowdown and water treatment wastes), metal cleaning wastes and storm water runoff. Wastewater generated by the facility is collected, treated and discharged via three permitted outfalls (one being an internal outfall). Domestic wastewater is discharged to the City of Graham sanitary sewer system.

Outfall 001

Water from Lake Graham is withdrawn at the intake structure, treated chemically and then passed through condensers and auxiliary equipment on a once-through basis to cool equipment and condense exhaust steam. This water is treated with sodium hypochlorite to prevent biofouling. Sodium bromide may also be used to enhance the effectiveness of sodium hypochlorite in occasional circumstances. The once-through and auxiliary cooling wastewater streams are commingled and discharged to Eddleman Reservoir via Outfall 001.

Outfall 002

Low volume wastes consist of boiler blowdown, floor/equipment drains and water treatment wastes (demineralizer regenerant, filter backwash, reverse osmosis wastes, coagulator blowdown, and non-chemical metal cleaning wastes) along with stormwater runoff (diked oil storage areas, yard drains, and drainage ditches) are routed to a treatment pond for sedimentation and oil removal treatment. Demineralizer regenerant is treated in an elementary neutralization unit prior to discharge to the treatment pond. Floor/equipment drains, as well as some stormwater runoff, is passed through oil/water separators prior to discharge to the treatment pond. The treatment pond discharges through an oil skimmer via Outfall 002 to Salt Creek.

Internal Outfall 102

Metal cleaning wastes generated by the chemical cleaning of large pieces of equipment are either disposed off-site or evaporated in an on-site Hypalon-lined evaporation pond, occasionally, the wastes within this pond are treated and discharged via internal Outfall 102. These metal cleaning wastes are commingled with low volume wastes prior to discharge via Outfall 002.

2. CALCULATIONS

See Appendix A of this fact sheet for calculations and further discussion of technology-based effluent limitations proposed in the draft permit.

Technology-based effluent limitations for total residual chlorine at Outfall 001 are continued from the existing TPDES permit and are based on the discharge of once-through cooling water in accordance with 40 CFR 423.13(b)(1) and EPA anti-backsliding regulations [40 CFR 122.44(l)].

Technology-based effluent limitations for free available chlorine at Outfall 001 are continued from the existing TPDES permit and are based on the discharge of once-through cooling water in accordance with 40 CFR 423.12(b)(6) and EPA anti-backsliding regulations [40 CFR 122.44(l)].

Effluent limitations for temperature at Outfall 001 are continued from the current permit based on EPA anti-backsliding regulations [40 CFR 122.44(l)] and were originally established based on BPJ.

Technology-based effluent limitations for TDS, TSS, oil and grease, and pH at Outfall 002 are continued from the existing TPDES permit and are based on the discharge of low volume waste sources in accordance with 40 CFR 423.12(b) and EPA anti-backsliding regulations [40 CFR 122.44(l)].

Technology-based effluent limitations for total iron and the daily maximum limitation for total copper at internal Outfall 102 are continued from the existing TPDES permit and are based on the discharge of metal cleaning waste in accordance with 40 CFR 423.12(b)(5) and EPA anti-backsliding regulations [40 CFR 122.44(l)].

The daily average copper limit at Outfall 102 is continued from the existing TPDES permit based upon 30 TAC 319.22.

The following technology-based effluent limitations are proposed in the draft permit:

Outfall	Pollutant	Daily Average	Daily Maximum
001	Flow	505.4 MGD	505.4 MGD
	Temperature	108°F (*1)	110°F (*1)
	Free Available Chlorine	70 lbs/day 0.2 mg/L	176 lbs/day 0.5 mg/L
	Total Residual Chlorine	N/A	140 lbs/day 0.2 mg/L
002	Flow	Report (MGD)	Report (MGD)
	Total Suspended Solids	30 mg/L	100 mg/L
	Oil and Grease	15 mg/L	20 mg/L
	Total Dissolved Solids	N/A	1500 mg/L
	pH	6.0 SU (min)	9.0 SU
102	Flow	Report (MGD)	Report (MGD)
	Total Copper	0.5 mg/L	1.0 mg/L
	Total Iron	1.0 mg/L	1.0 mg/L
	pH	6.0 SU (min)	9.0 SU

3. <u>316(B) COOLING WATER INTAKE STRUCTURES</u>

a. <u>SCREENING</u>

Luminant Generation Company LLC owns and operates the cooling water intake structure (CWIS) located on the eastern shore of Lake Graham, in Young County. to obtain water cooling purposes. The facility is subject to the requirements of Section 316(b) of the CWA because the CWIS withdraws more than 2 MGD of water from waters of the United States and more than 25% of the water withdrawn (actual intake flow) is used for cooling purposes within the facility.

Lake Graham is a cooling water impoundment and the facility's CWIS is operated in a manner consistent with a closed-cycle recirculating system (CCRS), as defined at 40 CFR 125.92(c), withdrawing surface water for make-up purposes only.

The operation of a CCRS (i.e., cooling water impoundment) reduces withdrawals from surface waters effectively, thereby reducing the impingement and entrainment of aquatic organisms. The facility meets Best Technology Available (BTA) standards. The executive director will review this determination upon receipt of additional information in accordance with 40 CFR § 122.21(r); 40 CFR Part 125, Subpart J; or both; as applicable.

b. PERMIT ACTION

Existing Other Requirement No. 4 has been continued to require the permittee to notify the TCEQ of any changes in the operation and maintenance of the cooling water system or in the method by which cooling water is obtained.

D. WATER QUALITY-BASED EFFLUENT LIMITATIONS/CONDITIONS

1. GENERAL COMMENTS

The *Texas Surface Water Quality Standards* found at 30 TAC Chapter 307 state that surface waters will not be toxic to man from ingestion of water, consumption of aquatic organisms, or contact with the skin, or to terrestrial or aquatic life. The methodology outlined in the TCEQ guidance document *Procedures to Implement the Texas Surface Water Quality Standards* (IPs) is designed to ensure compliance with 30 TAC Chapter 307. Specifically, the methodology is designed to ensure that no source will be allowed to discharge any wastewater that (1) results in instream aquatic toxicity; (2) causes a violation of an applicable narrative or numerical state water quality standard; (3) results in the endangerment of a drinking water supply; or (4) results in aquatic bioaccumulation that threatens human health. Calculated water quality-based effluent limits can be found in Appendix B of this fact sheet.

TPDES permits contain technology-based effluent limits reflecting the best controls available. Where these technology-based permit limits do not protect water quality or the designated uses, additional water quality-based effluent limitations or conditions are included. State narrative and numerical water quality standards are used in conjunction with EPA criteria and other toxicity databases to determine the adequacy of technology-based permit limits and the need for additional water quality-based controls. A comparison of technology-based effluent limits and calculated water quality-based effluent limits can be found in Appendix C of this fact sheet.

2. AQUATIC LIFE CRITERIA

a. SCREENING

Water quality-based effluent limitations are calculated from freshwater aquatic life criteria found in Table 1 of the *Texas Surface Water Quality Standards* (30 TAC Chapter 307).

Outfall 001

Acute freshwater criteria are applied at the edge of the zone of initial dilution (ZID), and chronic freshwater criteria are applied at the edge of the aquatic life mixing zone. The ZID for this discharge is defined as volume within a radius of 25 feet from the point where the discharge enters the Lake Eddleman portion of Graham Lake. The aquatic life mixing zone for this discharge is defined as volume within a radius of 100 feet from the point where the discharge enters the Lake Eddleman portion of Graham Lake.

TCEQ uses the EPA horizontal jet plume model to estimate dilution at the edges of the ZID and aquatic life mixing zone for discharges greater than 10 MGD into lakes or reservoirs. General assumptions used in the horizontal jet plume model are a non-buoyant discharge, a submersed pipe, and no cross flow. Based on this analysis, the following critical effluent percentages are calculated based on the two-year maximum monthly average flow of 437.4 MGD:

Acute Effluent % 100% Chronic Effluent % 100%

Outfall 002

There is no mixing zone for this discharge directly to Salt Creek, an intermittent stream with perennial pools; acute and chronic freshwater criteria apply at the end of pipe. The following critical effluent percentages are being used:

Acute Effluent % 100% Chronic Effluent % 100 %

General Screening Procedures

Wasteload allocations (WLAs) are calculated using the above estimated effluent percentages, criteria outlined in the *Texas Surface Water Quality Standards*, and partitioning coefficients for metals (when appropriate and designated in the implementation procedures). The WLA is the end-of-pipe effluent concentration that can be discharged when, after mixing in the receiving stream, the instream numerical criteria will not be exceeded.

For the discharge via Outfall 001 to the Lake Eddleman portion of Graham Lake, a long-term average (LTA) is calculated from the WLA using a lognormal probability distribution, a given coefficient of variation (0.6), and a 99th percentile confidence level. The LTA is the long-term average effluent concentration for which the WLA will never be exceeded using a selected percentile confidence level.

For the discharge via Outfall 002 to Salt Creek, a LTA is calculated from the WLA using a lognormal probability distribution, a given coefficient of variation (0.6), and a 90th percentile confidence level. The LTA is the long-term average effluent concentration for which the WLA will never be exceeded using a selected percentile confidence level.

The lower of the two LTAs (acute and chronic) is used to calculate a daily average and daily maximum effluent limitation for the protection of aquatic life using the same statistical considerations with the 99th percentile confidence level and a standard number of monthly effluent samples collected (12).

Assumptions used in deriving the effluent limitations include segment-specific values for TSS, pH, hardness, and chloride according to the *IPs*. The segment values for Segment No. 1208 are 12 mg/L for TSS, 7.7 standard units for pH, 493 mg/L for hardness (as calcium carbonate, $CaCO_3$), and 2154 mg/L for chloride. The segment values for Segment No. 1231 are 5.0 mg/L for TSS, 7.9 standard units for pH, 196 mg/L for hardness (as calcium carbonate, CaCO3), and 108 mg/L for chloride. For additional details on the calculation of water quality-based effluent limitations, refer to the *IPs*.

In addition to the default inputs referenced above, the calculated effluent limitations for total aluminum used site-specific partition coefficient (Kp) dissolved fraction values. The following site-specific inputs are included for the respective outfalls.

Outfall	Parameter	Input value Dissolved Fraction (Kp)	Receiving Water
001	Total Aluminum	0.24	Lake Eddleman
002	Total Aluminum	0.19	Salt Creek

The dissolved fractions for total aluminum at Outfalls 001 and 002 were documented in Factsheet and Executive Director's Preliminary Decision prepared for the permit issued on November 27, 2019 and acknowledged in Other Requirement No. 5 in the draft permit.

b. PERMIT ACTION

Analytical data reported in the application was screened against calculated water quality-based effluent limitations for the protection of aquatic life. Reported analytical data except free available cyanide does not exceed 70 percent of the calculated daily average water quality-based effluent limitations for aquatic life protection.

Analytical effluent results for cyanide for both Outfalls 001 and 002 were all reported at <10 ug/L. water quality-based calculations for cyanide at Outfall 001 - daily average limit 9.6 ug/L and Outfall 002 - 70% screening level 8.48 ug/L that would indicate limits are needed at Outfall 001 and monitoring/reporting are needed at Outfall 002. There are 2 MALs established in the IP's and in the permit application for cyanide (10 ug/l and 2 ug/L). This more sensitive MAL comes into play when calculated water quality-based limits require effluent testing down to this more sensitive level to demonstrate compliance with water quality-based limits/screening levels below the 10 ug/L level which is the case for both Outfalls 001 and 002. Therefore, a retesting requirement for free available cyanide has been proposed in Other Requirement No. 19 with a MAL of 2 ug/L.

3. WHOLE EFFLUENT TOXICITY (BIOMONITORING) CRITERIA

a. SCREENING AND REASONABLE POTENTIAL ANALYSIS

The existing permit includes chronic freshwater biomonitoring requirements at Outfall 001. Chronic biomonitoring requirements are not applicable to Outfall 002. The discharges from Outfall 002 that do not meet the threshold established in IP's and are not established in the existing permit.

In the past three years, the permittee has performed fifteen chronic tests, with zero demonstrations of significant toxicity (i.e., zero failures).

A reasonable potential determination was performed in accordance with 40 CFR §122.44(d)(1)(ii) to determine whether the discharge will reasonably be expected to cause or contribute to an exceedance of a state water quality standard or criterion within that standard. Each test species is evaluated separately. The RP determination is based on representative data from the previous three years of WET testing. This determination was performed in accordance with the methodology outlined in the TCEQ letter to the EPA dated December 28, 2015 and approved by the EPA in a letter dated December 28, 2015.

With no demonstrations of significant toxicity by either species, a determination of no reasonable potential was found. WET limits are not required and the permittee may be eligible for the testing frequency reduction after one year of quarterly testing occurs.

b. PERMIT ACTION

The provisions of this section apply to Outfall 001.

Based on information contained in the permit application, the TCEQ has determined that there may be pollutants present in the effluent that may have the potential to cause toxic conditions in the receiving stream.

Whole effluent toxicity testing (biomonitoring) is the most direct measure of potential toxicity, which incorporates the effects of synergism of effluent components and receiving stream water quality characteristics. Biomonitoring of the effluent is, therefore, required as a condition of this permit to assess potential toxicity. The biomonitoring procedures stipulated as a condition of this permit are as follows:

i) Chronic static renewal survival and reproduction test using the water flea (*Ceriodaphnia dubia*). The frequency of the testing shall be once per quarter.

ii) Chronic static renewal 7-day larval survival and growth test using the fathead minnow (*Pimephales promelas*). The frequency of testing shall be once per quarter.

Toxicity tests shall be performed in accordance with protocols described in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms,* Fourth Edition (EPA-821-R-02-013) or the latest revision. The stipulated test species are appropriate to measure the toxicity of the effluent consistent with the requirements of the state water quality standards. The biomonitoring frequency has been established to reflect the likelihood of ambient toxicity and to provide data representative of the toxic potential of the facility's discharge.

This permit may be reopened to require effluent limits, additional testing, or other appropriate actions to address toxicity if biomonitoring data show actual or potential ambient toxicity to be the result of the permittee's discharge to the receiving stream or water body.

If none of the first four consecutive quarterly tests demonstrates significant lethal or sublethal effects, the permittee may submit this information in writing and, upon approval, reduce the testing frequency to once per six months for the invertebrate test species and once per year for the vertebrate test species. If one or more of the first four consecutive quarterly tests demonstrates significant sublethal effects, the permittee is required by the permit to continue quarterly testing for that species until four consecutive quarterly tests demonstrate no significant sublethal effects. At that time, the permittee may apply for the appropriate testing frequency reduction for that species. If one or more of the first four consecutive quarterly tests demonstrates significant lethal effects, the permittee is required by the permit to continue quarterly testing for that species until the permit is reissued.

c. DILUTION SERIES

The permit requires five (5) dilutions in addition to the control (0% effluent) to be used in the toxicity tests. These additional effluent concentrations shall be 32%, 42%, 56%, 75%, and 100%. The low-flow effluent concentration (critical dilution) is defined as 100% effluent.

The dilution series outlined above was calculated using a 0.75 factor applied to the critical dilution. The critical dilution is the estimated effluent dilution at the edge of the aquatic life mixing zone, which is discussed in Section X.D.2.a. of this fact sheet.

4. AQUATIC ORGANISM TOXICITY CRITERIA (24-HOUR ACUTE)

a. SCREENING

The existing permit includes 24-hour acute freshwater biomonitoring requirements for Outfalls 001 and 002. In the past three years, the permittee performed ten 24-houur acute tests, with zero demonstrations of significant mortality (i.e., failures). Minimum 24-hour acute freshwater biomonitoring requirements are proposed in the permit draft as outlined below.

b. PERMIT ACTION

Twenty-four-hour 100% acute biomonitoring tests are required at Outfalls 001 and 002 at a frequency of once per six months for the life of the permit.

The biomonitoring procedures stipulated as a condition of this permit are as follows:

i) Acute 24-hour static toxicity test using the water flea (*Ceriodaphnia dubia* or *Daphnia pulex*). A minimum of five (5) replicates with eight (8) organisms per replicate shall be used for this test.

ii) Acute 24-hour static toxicity test using the fathead minnow (*Pimephales promelas*). A minimum of five (5) replicates with eight (8) organisms per replicate shall be used for this test.

Toxicity tests shall be performed in accordance with protocols described in *Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms*, Fifth Edition (EPA-821-R-02-012) or the latest revision.

5. AQUATIC ORGANISM BIOACCUMULATION CRITERIA

a. SCREENING

Water quality-based effluent limitations for the protection of human health are calculated using criteria for the consumption of fish tissue found in Table 2 of the *Texas Surface Water Quality Standards* (30 TAC Chapter 307).

Outfall 001

Fish tissue bioaccumulation criteria are applied at the edge of the human health mixing zone for discharges into lakes and reservoirs. The human health mixing zone for this discharge is defined as a volume within a radius of 200 feet from the point where the discharge enters Lake Eddleman portion of Graham Lake. TCEQ uses the EPA horizontal jet plume model to estimate dilution at the edge of the human health mixing zone for discharges greater than 10 MGD into lakes or reservoirs. General assumptions used in the horizontal jet plume model are a non-buoyant discharge, a submersed pipe, and no cross flow. Based on this analysis, the following critical effluent percentage is calculated based on the two-year average monthly average flow of 285.16 MGD:

Human health Effluent %: 100%

Outfall 002

The discharge point is to Salt Creek, an intermittent stream with perennial pools. Human health screening using incidental fish only criteria (= 10 × fish only criteria) is applicable due to the perennial pools that support incidental fisheries. TCEQ uses the mass balance equation to estimate dilution in the intermittent stream with perennial pools during average flow conditions. The estimated dilution for human health protection is calculated using the two-year average monthly average flow of 0.012 MGD and the harmonic mean flow of 0.1 cfs for Salt Creek. The following effluent percentage is being used:

Human Health Effluent %: 15.695%

Water quality-based effluent limitations for human health protection against the consumption of fish tissue are calculated using the same procedure as outlined for calculation of water quality-based effluent limitations for aquatic life protection. A 99th percentile confidence level in the long-term average calculation is used, with only one long-term average value being calculated.

Significant potential is again determined by comparing reported analytical data against 70 percent and 85 percent of the calculated daily average water quality-based effluent limitation.

b. PERMIT ACTION

Analytical data reported in the application was screened against calculated water quality-based effluent limitations for the protection of human health. Reported analytical data does not exceed 70 percent of the calculated daily average water quality-based effluent limitation for human health protection. No additional limits or monitoring and reporting requirements have been added to the draft permit.

6. DRINKING WATER SUPPLY PROTECTION

a. SCREENING

Outfall 001

Segment No. 1231, which receives the discharge from Outfall 001 from this facility, is designated as a public water supply source. The screening procedure used to calculate water quality-based effluent limitations and determine the need for effluent limitations or monitoring requirements is identical to the procedure outlined in Section X.D.5.a of this fact sheet. Criteria used in the calculation of water quality-based effluent limitations for the protection of a drinking water supply are outlined in Table 2 (Water and Fish) of the Texas Surface Water Quality Standards (30 TAC

Chapter 307). These criteria are developed from either drinking water maximum contaminant level (MCL) criteria outlined in 30 TAC Chapter 290 or from the combined human health effects of exposure to consumption of fish tissue and ingestion of drinking water.

Outfall 002

Segment No. 1208, which receives the discharge from Outfall 002 from this facility, is not designated as a public water supply. Screening reported analytical data of the effluent against water quality-based effluent limitations calculated for the protection of a drinking water supply is not applicable.

b. PERMIT ACTION

Outfall 001

Criteria in the "Water and Fish" section of Table 2 do not distinguish if the criteria are based on drinking water standard or the combined effects of ingestion of drinking water and fish tissue. Effluent limitations or monitoring requirements to protect the drinking water supply (and other human health effects) were previously calculated and outlined in section X.D.5.b of this fact sheet.

Outfall 002

None.

7. TOTAL DISSOLVED SOLIDS, CHLORIDE, AND SULFATE STANDARDS PROTECTION

a. SCREENING

Outfall 001

Average concentrations of total dissolved solids, chloride, and sulfate reported in the application are all less than the respective criteria for Segment No. 1231; therefore, no further screening is necessary.

Outfall 002

Average concentrations of total dissolved solids, chloride, and sulfate reported in the application are all less than the respective criteria for Segment No. 1208. A screening was not conducted at Outfall 002.

b. PERMIT ACTION

Outfall 001

None

Outfall 002

The existing daily maximum effluent limitation for TDS is adequate to be protective of receiving waters and has been continued in the draft permit based on EPA anti-backsliding regulations [40 CFR 122.44(l)].

8. PROTECTION OF pH STANDARDS

a. SCREENING

Outfall 001

The existing permit does not include effluent limitations for pH at Outfall 001 which discharges once-through cooling water directly into the Lake Eddleman portion of Graham Lake, Segment No. 1231. The absence of effluent limitations for pH are based on the requirements in 40 CFR §423.12(b)(1). Therefore, pH screening was not conducted for Outfall 001 based on this rule.

Outfall 002

The existing permit includes pH limits of 6.0 – 9.0 standard units at Outfall 002, which discharges into an unclassified water body. Consistent with the procedures for pH screening that were submitted to EPA with a letter dated May 28, 2014, and approved by EPA in a letter dated June 2, 2014, requiring this discharge/these discharges to unclassified water bodies to meet pH limits of 6.0 – 9.0 standard units reasonably ensures instream compliance with Texas Surface Water Quality Standards pH criteria.

b. PERMIT ACTION

Outfall 001

Consistent with the guidance in the federal guidelines, typical practice is to not impose effluent limitations for pH on the discharge of once-through cooling water, subject to 40 CFR §423.12(b)(1), into water bodies that also serve as the intake source.

Outfall 002

The existing pH limits of 6.0 – 9.0 standard units are carried forward in the draft permit at Outfall 002.

9. DISSOLVED OXYGEN PROTECTION

a. SCREENING

Due to the low concentration of oxygen demanding constituents expected in the discharge from this facility, no significant dissolved oxygen depletion is anticipated in the receiving waters.

b. PERMIT ACTION

None

10. THERMAL STANDARDS PROTECTION

a. SCREENING

Graham Reservoir that receives treated effluent (once-through cooling water) from Outfall 001 is an industrial cooling impoundment. In accordance with 30 TAC 307.4(f) temperature criteria do not apply to industrial cooling impoundments. Therefore, a thermal screening was not conducted for this facility.

b. PERMIT ACTION

Existing temperature established in the existing permit have been continued in the draft permit.

XI. PRETREATMENT REQUIREMENTS

This facility is not defined as a publicly owned treatment works. Pretreatment requirements are not proposed in the draft permit.

XII. VARIANCE REQUESTS

No variance requests have been received.

XIII. PROCEDURES FOR FINAL DECISION

When an application is declared administratively complete, the Chief Clerk sends a letter to the applicant advising the applicant to publish the Notice of Receipt of Application and Intent to Obtain Permit in the newspaper. In addition, the Chief Clerk instructs the applicant to place a copy of the application in a public place for reviewing and copying in the county where the facility is or will be located. This application will be in a public place throughout the comment period. The Chief Clerk also mails this notice to any interested persons and, if required, to landowners identified in the permit application. This notice informs the public about the application and provides that an interested person may file comments on the application or request a contested case hearing or a public meeting.

Once a draft permit is completed, it is sent, along with the Executive Director's preliminary decision, as contained in the technical summary or fact sheet, to the Chief Clerk. At that time, the Notice of Application and Preliminary Decision will be mailed to the same people and published in the same newspaper as the prior notice. This notice sets a deadline for making public comments. The applicant must place a copy of the Executive Director's preliminary decision and draft permit in the public place with the application.

Any interested person may request a public meeting on the application until the deadline for filing public comments. A public meeting is intended for the taking of public comment and is not a contested case proceeding.

After the public comment deadline, the Executive Director prepares a response to all significant public comments on the application or the draft permit raised during the public comment period. The Chief Clerk then mails the Executive Director's response to comments and final decision to people who have filed comments, requested a contested case hearing, or requested to be on the mailing list. This notice provides that if a person is not satisfied with the Executive

Director's response and decision, they can request a contested case hearing or file a request to reconsider the Executive Director's decision within 30 days after the notice is mailed.

The Executive Director will issue the permit unless a written hearing request or request for reconsideration is filed within 30 days after the Executive Director's response to comments and final decision is mailed. If a hearing request or request for reconsideration is filed, the Executive Director will not issue the permit and will forward the application and request to the TCEQ commissioners for their consideration at a scheduled commission meeting. If a contested case hearing is held, it will be a legal proceeding similar to a civil trial in state district court.

If the Executive Director calls a public meeting or the commission grants a contested case hearing as described above, the commission will give notice of the date, time, and place of the meeting or hearing. If a hearing request or request for reconsideration is made, the commission will consider all public comments in making its decision and shall either adopt the Executive Director's response to public comments or prepare its own response.

For additional information about this application, contact Ruiqiang Zong at (512) 239-4589.

XIV. ADMINISTRATIVE RECORD

The following section is a list of the fact sheet citations to applicable statutory or regulatory provisions and appropriate supporting references.

A. PERMIT(S)

TPDES Permit No. WQ0000551000 issued on November 27, 2019.

B. APPLICATION

TPDES wastewater permit application received on May 30, 2024 and additional information received on August 7, 2024.

C. 40 CFR CITATION(S)

40 CFR Part 423 (BPT and BAT).

D. LETTERS/MEMORANDA/RECORDS OF COMMUNICATION

Letter dated April 29, 2014, from L'Oreal W. Stepney, P.E., Deputy Director, Office of Water, TCEQ, to Bill Honker, Director, Water Quality Protection Division, EPA (TCEQ proposed development strategy for thermal evaluation procedures).

Letter dated May 12, 2014, from William K. Honker, P.E., Director, Water Quality Protection Division, EPA, to L'Oreal W. Stepney, P.E., Deputy Director, Office of Water, TCEQ (Approval of TCEQ proposed development strategy for thermal evaluation procedures).

Letter dated May 28, 2014, from L'Oreal W. Stepney, P.E., Deputy Director, Office of Water, TCEQ, to Bill Honker, Director, Water Quality Protection Division, EPA (TCEQ proposed development strategy for pH evaluation procedures).

Letter dated June 2, 2014, from William K. Honker, P.E., Director, Water Quality Protection Division, EPA, to L'Oreal W. Stepney, P.E., Deputy Director, Office of Water, TCEQ (Approval of TCEQ proposed development strategy for pH evaluation procedures).

Letter dated December 28, 2015, from L'Oreal Stepney, P.E., Deputy Director, Office of Water, TCEQ, to Bill Honker, Director, Water Quality Protection Division, EPA (TCEQ proposed development strategy for procedures to determine reasonable potential for whole effluent toxicity limitations).

Letter dated December 28, 2015, from William K. Honker, P.E., Director, Water Quality Protection Division, EPA, to L'Oreal W. Stepney, P.E., Deputy Director, Office of Water, TCEQ (Approval of TCEQ proposed development strategy for procedures to determine reasonable potential for whole effluent toxicity limitations).

TCEQ Interoffice Memorandum dated July 16, 2024, from Jenna R. Lueg of the Standards Implementation Team, Water Quality Assessment Section, to the Industrial Permits Team, Wastewater Permitting Section (Standards Memo).

TCEQ Interoffice Memorandum dated December 5, 2024, from Sarah Musgrove of the Water Quality Assessment Team, Water Quality Assessment Section, to the Industrial Permits Team, Wastewater Permitting Section (Critical Conditions Memo).

TCEQ Interoffice Memorandum dated December 18, 2024, from Orlando M. Vasquez, Jr., P.E. of the Water Quality Assessment Team, Water Quality Assessment Section, to the Industrial Permits Team, Wastewater Permitting Section (Modeling Memo).

TCEQ Interoffice Memorandum dated December 9, 2024, from Jeff Paull of the Standards Implementation Team, Water Quality Assessment Section, to the Industrial Permits Team, Wastewater Permitting Section (Biomonitoring Memo).

Electronic mail dated August 7, 2024, from Ruiqiang Zong of the Industrial Permits Team, Wastewater Permitting Section, to Mr. Ryan Bayle, P.G., Environmental Manager, for the information of analytical data.

E. <u>MISCELLANEOUS</u>

The *State of Texas 2022 Integrated Report* – Texas 303(d) List (Category 5), TCEQ, July 7, 2022.

Texas Surface Water Quality Standards, 30 TAC §§307.1 - 307.10, TCEQ, effective March 1, 2018, as approved by EPA Region 6.

Texas Surface Water Quality Standards, 30 TAC §§307.1 - 307.10, TCEQ, effective March 6, 2014, as approved by EPA Region 6, for portions of the 2018 standards not approved by EPA Region 6.

Texas Surface Water Quality Standards, 30 TAC §§307.1 - 307.10, TCEQ, effective July 22, 2010, as approved by EPA Region 6, for portions of the 2014 standards not yet approved by EPA Region 6.

Texas Surface Water Quality Standards, 30 TAC §§307.1 - 307.10, TCEQ, effective August 17, 2000, and Appendix E, effective February 27, 2002, for portions of the 2010 standards not yet approved by EPA Region 6.

Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, Fourth Edition (EPA-821-R-02-013).

Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms, Fifth Edition (EPA-821-R-02-012).

Procedures to Implement the Texas Surface Water Quality Standards, TCEQ, June 2010, as approved by EPA Region 6.

Procedures to Implement the Texas Surface Water Quality Standards, TCEQ, January 2003, for portions of the 2010 IPs not approved by EPA Region 6.

Guidance Document for Establishing Monitoring Frequencies for Domestic and Industrial Wastewater Discharge Permits, TCEQ Document No. 98-001.000-OWR-WQ, May 1998.

Appendix A
Calculated Technology-Based Effluent Limits

The draft permit authorizes the discharge of once-through cooling water via Outfall 001 at a daily average flow not to exceed 505.4 MGD, and discharge of low volume waste sources, stormwater runoff, and previously monitored effluent (metal cleaning waste via internal Outfall 102) on allow variable basis via Outfall 002.

Discharges of once-through cooling water via Outfall 001 and low volume waste sources and previously monitored effluent (metal cleaning waste) via Outfall 002 are subject to federal effluent limitation guidelines at 40 CFR Part 423. A new source determination was performed and these discharges from this facility is not new sources as defined at 40 CFR § 122.2. Therefore new source performance standards (NSPS) are not required for this discharge.

The discharge of stormwater via Outfall 002 is not subject to federal effluent limitation guidelines and any technology-based effluent limitations for that waste stream are continued from the current permit based on EPA anti-backsliding regulations [40 CFR 122.44(l)].

The Cooling Water Intake Structure (CWISs) at this facility is subject to conditions provided in Section 316(b) of the Clean Water Act (CWA). Section 316(b) of the CWA requires that the location, design, construction, and capacity of CWISs reflect the Best Technology Available (BTA) for minimizing Adverse Environmental Impact (AEI).

Outfall 001 - Once-through cooling water

Limits for Free Available Chlorine (FAC) and Total Residual Chlorine (TRC) are based on 40 CFR 423.13 (b)(1) and (c)(1) respectively.

Daily mass loading of FAC/TRC are calculated using the following equation:

$$\frac{[\text{Limit (mg/l)}] * [\text{Flow (MGD)}] * [8.345] * [\#\ (\text{Operating Units})]}{12} = \text{Limit (lbs/day)}$$

Mass limitations for FAC/TRC are calculated as follows using a flow of 505.4 MGD and 2 generating units:

$$\text{D-Avg FAC} = \frac{(0.2\ \text{mg/l}) * (505.4\ \text{MGD})*(8.345)*(2\ \text{Units})}{12} = 141\ \text{lbs/day}$$

$$\text{D-Max FAC} = \frac{(0.5\ \text{mg/l}) * (505.4\ \text{MGD})*(8.345)*(2\ \text{Units})}{12} = 352\ \text{lbs/day}$$

$$\text{D-Max TRC} = \frac{(0.2\ \text{mg/l}) * (505.4\ \text{MGD})*(8.345)*(2\ \text{Units})}{12} = 141\ \text{lbs/day}$$

Outfall 002 - Low volume wastewater

Limits for total suspended solids and oil and grease are based on 40 CFR 423.12(b)(4) and pH in accordance with 40 CFR 432.12(b)(1).

Total Suspended Solids	=	30 mg/l daily average 100 mg/l daily maximum
Oil and Grease	=	15 mg/l daily average 20 mg/l daily maximum

pH (Standard Units) Not less than 6.0, and not greater than 9.0

Internal Outfall 102 - Metal Cleaning Waste

Limits for total suspended solids, oil and grease, total copper and total iron are based on 40 CFR 423.12(b)(5). Effluent limitations for total suspended solids and oil and grease are applied at the external Outfall 002 during the discharge of metal cleaning waste.

Total Iron	=	1.0 mg/l daily average 1.0 mg/l daily maximum
Total Copper *	=	0.5 mg/l daily average 1.0 mg/l daily maximum

* Daily average total copper limitation is continued from existing TPDES permit based upon 30 TAC 319.22.

Determination of BPJ-Based Section 316(b) Permit Conditions

On July 6, 2004, EPA promulgated Phase II rule in accordance with Section 316(b) of the Clean Water Act (CWA). On January 25, 2007, the Second U.S. Circuit Court of Appeals remanded most of the provisions of the Phase rule. On March 29, 2007, EPA issued a memorandum stating that the rule should be considered suspended. On July 9, 2007, EPA published a notice in the *Federal Register* suspending all parts of the Phase II rule except *40 CFR Part 125.90 (b)* which provides for regulating existing cooling water intake structures on a case-by-case basis, using the best professional judgment (BPJ).

A TPDES permit for any new or existing facility operating a cooling water intake structure (CWIS) must contain permit conditions meeting the requirements applicable to CWISs under section 316(b) of the Clean Water Act (CWA). Section 316(b) of the CWA requires that the location, design, construction, and capacity of CWISs reflect the Best Technology Available (BTA) for minimizing Adverse Environmental Impact (AEI). In accordance with the *EPA Draft Fact Sheet for Development of BPJ-Based Section 316(b) NPDES Permit Conditions* (Draft Fact Sheet), existing facilities are subject to section 316(b) conditions that reflect BTA for minimizing AEI on a case-by-case, Best Professional Judgment (BPJ) basis.

Therefore, in accordance with the *EPA Draft Fact Sheet for Development of BPJ-Based Section 316(b) NPDES Permit Conditions* (Draft Fact Sheet, 12/07 EPA FS), this existing facility is subject to section 316(b) conditions.

The subject facility has two natural gas fired electricity generating units (with a combined rating of 615 MW) that utilize a once-through cooling water system. The CWIS has four bays (two for each unit), each with one vertical, mixed flow circulating water pump, located downstream of traveling water screens. A trash rack in front of the intake structure prevents large debris from reaching the traveling water screens. The traveling water screens are located about 13 feet downstream of the trash racks. The two screens for Unit I are 8 feet wide and the two screens for Unit II are 10 feet wide. All four screens are equipped with 3/8th inch square mesh.

The report, Graham Power Plant §316(b) §125.98(f) and §122.21(r)(6) Information to Inform the Entrainment BTA Determination and Select the Chosen Method of Compliance for Impingement BTA, which was submitted in May 2018. Based on the report, the existing facility currently meets BTA for minimizing AEI.

Appendix B
Calculated Water Quality-Based Effluent Limits

TEXTOX MENU #4 - LAKE OR RESERVOIR

The water quality-based effluent limitations developed below are calculated using:

Table 1, 2014 Texas Surface Water Quality Standards (30 TAC 307) for Freshwater Aquatic Life
Table 2, 2018 Texas Surface Water Quality Standards for Human Health
"Procedures to Implement the Texas Surface Water Quality Standards," TCEQ, June 2010

PERMIT INFORMATION

Permittee Name:	Luminant Generation Company, LLC
TPDES Permit No:	WQ0000551000
Outfall No:	001
Prepared by:	RUIQIANG ZONG
Date:	April 17, 2025

DISCHARGE INFORMATION

Receiving Waterbody:	Lake Eddleman portion of Graham Lake
Segment No.:	1231
TSS (mg/L):	5
pH (Standard Units):	7.9
Hardness (mg/L as $CaCO_3$):	196
Chloride (mg/L):	108
Effluent Flow for Aquatic Life (MGD):	437.4
% Effluent for Chronic Aquatic Life (Mixing Zone):	100
% Effluent for Acute Aquatic Life (ZID):	100
Effluent Flow for Human Health (MGD):	285.16
% Effluent for Human Health:	100
Human Health Criterion (select: PWS, FISH, or INC)	**PWS**

CALCULATE DISSOLVED FRACTION (AND ENTER WATER EFFECT RATIO IF APPLICABLE):

Lake/Reservoir Metal	*Intercept (b)*	*Slope (m)*	*Partition Coefficient (Kp)*	*Dissolved Fraction (Cd/Ct)*	*Source*	*Water Effect Ratio (WER)*	*Source*
Aluminum	N/A	N/A	N/A	0.24	Study	1.00	Assumed
Arsenic	5.68	-0.73	147826.36	0.575		1.00	Assumed
Cadmium	6.55	-0.92	807137.63	0.199		1.00	Assumed
Chromium (total)	6.34	-0.27	1416700.67	0.124		1.00	Assumed
Chromium (trivalent)	6.34	-0.27	1416700.67	0.124		1.00	Assumed
Chromium (hexavalent)	N/A	N/A	N/A	1.00	Assumed	1.00	Assumed
Copper	6.45	-0.90	662105.20	0.232		1.00	Assumed
Lead	6.31	-0.53	870053.38	0.187		1.00	Assumed
Mercury	N/A	N/A	N/A	1.00	Assumed	1.00	Assumed
Nickel	6.34	-0.76	643847.18	0.237		1.00	Assumed
Selenium	N/A	N/A	N/A	1.00	Assumed	1.00	Assumed
Silver	6.38	-1.03	457152.29	0.304		1.00	Assumed
Zinc	6.52	-0.68	1108409.90	0.153		1.00	Assumed

AQUATIC LIFE

CALCULATE DAILY AVERAGE AND DAILY MAXIMUM EFFLUENT LIMITATIONS:

Parameter	***FW Acute Criterion (µg/L)***	***FW Chronic Criterion (µg/L)***	***WLAa (µg/L)***	***WLAc (µg/L)***	***LTAa (µg/L)***	***LTAc (µg/L)***	***Daily Avg. (µg/L)***	***Daily Max. (µg/L)***
Aldrin	3.0	N/A	3.00	N/A	0.96	N/A	1.41	2.99
Aluminum	991	N/A	991	N/A	317	N/A	1942	4109
Arsenic	340	150	591	261	189	159	234	495
Cadmium	16.50	0.392	83.1	1.98	26.6	1.21	1.77	3.7
Carbaryl	2.0	N/A	2.00	N/A	0.64	N/A	0.94	1.99
Chlordane	2.4	0.004	2.40	0.004	0.77	0.002	0.004	0.008
Chlorpyrifos	0.083	0.041	0.083	0.041	0.027	0.025	0.037	0.078
Chromium (trivalent)	989	128.6	7992	1040	2557	634	932	1972
Chromium (hexavalent)	15.7	10.6	15.7	10.6	5.02	6.5	7.4	15.6
Copper	26.77	16.83	115.4	73	36.9	44	54.3	114.9
Cyanide (free)	45.8	10.7	45.8	10.7	14.7	6.5	9.6	20.3
4,4'-DDT	1.1	0.001	1.10	0.0010	0.352	0.0006	0.0009	0.0019
Demeton	N/A	0.1	N/A	0.100	N/A	0.061	0.090	0.19
Diazinon	0.17	0.17	0.17	0.17	0.054	0.104	0.080	0.169
Dicofol [Kelthane]	59.3	19.8	59.3	20	19.0	12.1	17.8	37.6
Dieldrin	0.24	0.002	0.24	0.002	0.077	0.0012	0.002	0.004
Diuron	210	70	210	70	67	43	63	133
Endosulfan I (*alpha*)	0.22	0.056	0.220	0.056	0.070	0.034	0.050	0.106
Endosulfan II (*beta*)	0.22	0.056	0.220	0.056	0.070	0.034	0.050	0.106
Endosulfan sulfate	0.22	0.056	0.220	0.056	0.070	0.034	0.050	0.106
Endrin	0.086	0.002	0.086	0.002	0.028	0.0012	0.002	0.004
Guthion [Azinphos Methyl]	N/A	0.01	N/A	0.010	N/A	0.006	0.009	0.019
Heptachlor	0.52	0.004	0.520	0.004	0.166	0.002	0.004	0.008
Hexachlorocyclohexane (*gamma*) [Lindane]	1.126	0.08	1.13	0.080	0.360	0.049	0.072	0.15
Lead	133.3	5.19	713	27.8	228	16.9	24.9	53
Malathion	N/A	0.01	N/A	0.010	N/A	0.006	0.009	0.019
Mercury	2.4	1.3	2.40	1.30	0.77	0.79	1.13	2.39
Methoxychlor	N/A	0.03	N/A	0.030	N/A	0.018	0.027	0.057
Mirex	N/A	0.001	N/A	0.0010	N/A	0.0006	0.0009	0.0019
Nickel	827	91.9	3491	388	1117	237	348	736
Nonylphenol	28	6.6	28.0	6.6	9.0	4.0	5.9	12.5
Parathion (ethyl)	0.065	0.013	0.065	0.013	0.021	0.008	0.012	0.025
Pentachlorophenol	21.6	16.54	21.6	16.5	6.90	10.1	10.14	21.4
Phenanthrene	30	30	30.0	30	9.6	18	14.1	29.9
Polychlorinated Biphenyls [PCBs]	2.0	0.014	2.00	0.014	0.64	0.009	0.013	0.027
Selenium	20	5	20.0	5.0	6.4	3.1	4.5	9.5
Silver	0.8	N/A	23.36	N/A	7.47	N/A	10.99	23.24
Toxaphene	0.78	0.0002	0.78	0.0002	0.250	0.0001	0.0002	0.0004
Tributyltin [TBT]	0.13	0.024	0.130	0.024	0.042	0.015	0.022	0.046
2,4,5 Trichlorophenol	136	64	136	64	43.5	39	57	121
Zinc	207.2	208.9	1356	1367	434	834	638	1349

HUMAN HEALTH

CALCULATE DAILY AVERAGE AND DAILY MAXIMUM EFFLUENT LIMITATIONS:

Parameter	*Water and Fish Criterion (µg/L)*	*Fish Only Criterion (µg/L)*	*Incidental Fish Criterion (µg/L)*	*WLAh (µg/L)*	*LTAh (µg/L)*	*Daily Avg. (µg/L)*	*Daily Max. (µg/L)*
Acrylonitrile	1.0	115	1150	1.0	0.9	1.4	2.9
Aldrin	1.146E-05	1.15E-05	1.147E-04	1.15E-05	1.07E-05	1.57E-05	3.31E-05
Anthracene	1109	1317	13170	1109	1031	1516	3208
Antimony	6	1071	10710	6.0	5.6	8	17
Arsenic	10	N/A	N/A	17	16	24	50
Barium	2000	N/A	N/A	2000	1860	2734	5785
Benzene	5	581	5810	5.0	4.7	6.8	14
Benzidine	0.0015	0.107	1.07	0.002	0.001	0.002	0.004
Benzo(*a*)anthracene	0.024	0.025	0.25	0.024	0.022	0.033	0.069
Benzo(*a*)pyrene	0.0025	0.0025	0.025	0.003	0.002	0.003	0.007
Bis(chloromethyl)ether	0.0024	0.2745	2.745	0.002	0.002	0.003	0.007
Bis(2-chloroethyl)ether	0.60	42.83	428.3	0.60	0.56	0.8	1.7
Bis(2-ethylhexyl) phthalate [Di(2-ethylhexyl) phthalate]	6	7.55	75.5	6.0	5.6	8	17
Bromodichloromethane [Dichlorobromomethane]	10.2	275	2750	10.20	9.49	14	30
Bromoform [Tribromomethane]	66.9	1060	10600	67	62	91	193
Cadmium	5	N/A	N/A	25	23	34	73
Carbon Tetrachloride	4.5	46	460	4.5	4.2	6.2	13
Chlordane	0.0025	0.0025	0.025	0.003	0.002	0.003	0.007
Chlorobenzene	100	2737	27370	100	93	137	289
Chlorodibromomethane [Dibromochloromethane]	7.5	183	1830	7.5	7.0	10	22
Chloroform [Trichloromethane]	70	7697	76970	70	65	96	202
Chromium (hexavalent)	62	502	5020	62	58	85	179
Chrysene	2.45	2.52	25.2	2.5	2.3	3.3	7.1
Cresols [Methylphenols]	1041	9301	93010	1041	968	1423	3011
Cyanide (free)	200	N/A	N/A	200	186	273	578
4,4'-DDD	0.002	0.002	0.02	0.002	0.002	0.003	0.006
4,4'-DDE	0.00013	0.00013	0.0013	0.0001	0.0001	0.0002	0.0004
4,4'-DDT	0.0004	0.0004	0.004	0.0004	0.0004	0.0005	0.0012
2,4'-D	70	N/A	N/A	70	65	96	202
Danitol [Fenpropathrin]	262	473	4730	262	244	358	758
1,2-Dibromoethane [Ethylene Dibromide]	0.17	4.24	42.4	0.17	0.16	0.23	0.49
m-Dichlorobenzene [1,3-Dichlorobenzene]	322	595	5950	322	299	440	931
o-Dichlorobenzene [1,2-Dichlorobenzene]	600	3299	32990	600	558	820	1735
p-Dichlorobenzene [1,4-Dichlorobenzene]	75	N/A	N/A	75	70	103	217
3,3'-Dichlorobenzidine	0.79	2.24	22.4	0.79	0.73	1.1	2.3
1,2-Dichloroethane	5	364	3640	5.0	4.7	6.8	14
1,1-Dichloroethylene [1,1-Dichloroethene]	7	55114	551140	7.0	6.5	10	20
Dichloromethane [Methylene Chloride]	5	13333	133330	5.0	4.7	6.8	14
1,2-Dichloropropane	5	259	2590	5.0	4.7	6.8	14
1,3-Dichloropropene [1,3-Dichloropropylene]	2.8	119	1190	2.8	2.6	3.8	8
Dicofol [Kelthane]	0.30	0.30	3	0.30	0.28	0.41	0.9
Dieldrin	2.0E-05	2.0E-05	2.0E-04	2.00E-05	1.86E-05	2.73E-05	5.78E-05
2,4-Dimethylphenol	444	8436	84360	444	413	607	1284
Di-*n*-Butyl Phthalate	88.9	92.4	924	89	83	122	257
Dioxins/Furans [TCDD Equivalents]	7.80E-08	7.97E-08	7.97E-07	7.80E-08	7.25E-08	1.07E-07	2.26E-07
Endrin	0.02	0.02	0.2	0.020	0.019	0.027	0.058
Epichlorohydrin	53.5	2013	20130	54	50	73	155
Ethylbenzene	700	1867	18670	700	651	957	2025
Ethylene Glycol	46744	1.68E+07	1.68E+08	46744	43472	63904	135198
Fluoride	4000	N/A	N/A	4000	3720	5468	11569

HUMAN HEALTH

CALCULATE DAILY AVERAGE AND DAILY MAXIMUM EFFLUENT LIMITATIONS:

Parameter	*Water and Fish Criterion (µg/L)*	*Fish Only Criterion (µg/L)*	*Incidental Fish Criterion (µg/L)*	*WLAh (µg/L)*	*LTAh (µg/L)*	*Daily Avg. (µg/L)*	*Daily Max. (µg/L)*
Heptachlor	8.0E-05	0.0001	0.001	0.0001	0.0001	0.0001	0.0002
Heptachlor Epoxide	0.00029	0.00029	0.0029	0.0003	0.0003	0.0004	0.0008
Hexachlorobenzene	0.00068	0.00068	0.0068	0.0007	0.0006	0.001	0.002
Hexachlorobutadiene	0.21	0.22	2.2	0.21	0.20	0.29	0.61
Hexachlorocyclohexane (*alpha*)	0.0078	0.0084	0.084	0.008	0.007	0.011	0.023
Hexachlorocyclohexane (*beta*)	0.15	0.26	2.6	0.15	0.14	0.21	0.43
Hexachlorocyclohexane (*gamma*) [Lindane]	0.2	0.341	3.41	0.20	0.19	0.27	0.58
Hexachlorocyclopentadiene	10.7	11.6	116	11	10	15	31
Hexachloroethane	1.84	2.33	23.3	1.8	1.7	2.5	5.3
Hexachlorophene	2.05	2.90	29	2.1	1.9	2.8	5.9
4,4'-Isopropylidenediphenol [Bisphenol A]	1092	15982	159820	1092	1016	1493	3158
Lead	1.15	3.83	38.3	6.2	5.7	8	18
Mercury	0.0122	0.0122	0.122	0.012	0.011	0.017	0.035
Methoxychlor	2.92	3.0	30	2.9	2.7	4.0	8
Methyl Ethyl Ketone	13865	9.92E+05	9.92E+06	13865.00	12894.45	18954.84	40102
Methyl *tert*-butyl ether [MTBE]	15	10482	104820	15	14	21	43
Nickel	332	1140	11400	1401	1303	1915	4051
Nitrate-Nitrogen (as Total Nitrogen)	10000	N/A	N/A	10000	9300	13671	28923
Nitrobenzene	45.7	1873	18730	46	43	62	132
N-Nitrosodiethylamine	0.0037	2.1	21	0.004	0.003	0.005	0.011
N-Nitroso-di-*n*-Butylamine	0.119	4.2	42	0.12	0.11	0.16	0.34
Pentachlorobenzene	0.348	0.355	3.55	0.35	0.32	0.48	1.0
Pentachlorophenol	0.22	0.29	2.9	0.22	0.20	0.30	0.64
Polychlorinated Biphenyls [PCBs]	6.4E-04	6.4E-04	6.40E-03	0.0006	0.0006	0.001	0.002
Pyridine	23	947	9470	23	21	31	67
Selenium	50	N/A	N/A	50	47	68	145
1,2,4,5-Tetrachlorobenzene	0.23	0.24	2.4	0.23	0.21	0.31	0.67
1,1,2,2-Tetrachloroethane	1.64	26.35	263.5	1.6	1.5	2.2	4.7
Tetrachloroethylene [Tetrachloroethylene]	5	280	2800	5.0	4.7	6.8	14
Thallium	0.12	0.23	2.3	0.12	0.11	0.16	0.35
Toluene	1000	N/A	N/A	1000	930	1367	2892
Toxaphene	0.011	0.011	0.11	0.011	0.010	0.015	0.032
2,4,5-TP [Silvex]	50	369	3690	50	47	68	145
1,1,1-Trichloroethane	200	784354	7843540	200	186	273	578
1,1,2-Trichloroethane	5	166	1660	5.0	4.7	6.8	14
Trichloroethylene [Trichloroethene]	5	71.9	719	5.0	4.7	6.8	14
2,4,5-Trichlorophenol	1039	1867	18670	1039	966	1420	3005
TTHM [Sum of Total Trihalomethanes]	80	N/A	N/A	80	74	109	231
Vinyl Chloride	0.23	16.5	165	0.23	0.21	0.31	0.67

CALCULATE 70% AND 85% OF DAILY AVERAGE EFFLUENT LIMITATIONS:

Aquatic Life	***70% of Daily Avg.***	***85% of Daily Avg.***
Parameter	***(µg/L)***	***(µg/L)***
Aldrin	0.99	1.20
Aluminum	1360	1651
Arsenic	164	199
Cadmium	1.24	1.51
Carbaryl	0.66	0.80
Chlordane	0.003	0.003
Chlorpyrifos	0.026	0.031
Chromium (trivalent)	653	792
Chromium (hexavalent)	5.17	6.3
Copper	38.0	46.1
Cyanide (free)	6.7	8.2
4,4'-DDT	0.0006	0.0008
Demeton	0.063	0.076
Diazinon	0.056	0.068
Dicofol [Kelthane]	12.4	15.1
Dieldrin	0.0013	0.0015
Diuron	44	53
Endosulfan I (*alpha*)	0.035	0.043
Endosulfan II (*beta*)	0.035	0.043
Endosulfan sulfate	0.035	0.043
Endrin	0.0013	0.0015
Guthion [Azinphos Methyl]	0.006	0.008
Heptachlor	0.003	0.003
Hexachlorocyclohexane (*gamma*) [Lindane]	0.050	0.061
Lead	17.4	21.2
Malathion	0.006	0.008
Mercury	0.79	0.96
Methoxychlor	0.019	0.023
Mirex	0.0006	0.0008
Nickel	243	296
Nonylphenol	4.1	5.0
Parathion (ethyl)	0.008	0.010
Pentachlorophenol	7.10	8.62
Phenanthrene	9.9	12.0
Polychlorinated Biphenyls [PCBs]	0.009	0.011
Selenium	3.1	3.8
Silver	7.69	9.34
Toxaphene	0.00013	0.00015
Tributyltin [TBT]	0.015	0.018
2,4,5 Trichlorophenol	40.2	48.8
Zinc	446	542

Human Health	***70% of Daily Avg.***	***85% of Daily Avg.***
Parameter	***(µg/L)***	***(µg/L)***
Acrylonitrile	1.0	1.2
Aldrin	1.10E-05	1.33E-05
Anthracene	1061	1289
Antimony	5.7	7.0
Arsenic	17	20
Barium	1914	2324
Benzene	4.8	5.8
Benzidine	0.001	0.002
Benzo(*a*)anthracene	0.023	0.028
Benzo(*a*)pyrene	0.002	0.003
Bis(chloromethyl)ether	0.002	0.003
Bis(2-chloroethyl)ether	0.57	0.70
Bis(2-ethylhexyl) phthalate [Di(2-ethylhexyl) phthalate]	5.7	7.0
Bromodichloromethane [Dichlorobromomethane]	10	12
Bromoform [Tribromomethane]	64	78
Cadmium	24	29
Carbon Tetrachloride	4.3	5.2
Chlordane	0.002	0.003
Chlorobenzene	96	116
Chlorodibromomethane [Dibromochloromethane]	7.2	9
Chloroform [Trichloromethane]	67	81
Chromium (hexavalent)	59	72
Chrysene	2.3	2.8
Cresols [Methylphenols]	996	1210
Cyanide (free)	191	232
4,4'-DDD	0.002	0.002
4,4'-DDE	0.0001	0.0002
4,4'-DDT	0.0004	0.0005
2,4'-D	67	81
Danitol [Fenpropathrin]	251	304
1,2-Dibromoethane [Ethylene Dibromide]	0.16	0.20
m-Dichlorobenzene [1,3-Dichlorobenzene]	308	374
o-Dichlorobenzene [1,2-Dichlorobenzene]	574	697
p-Dichlorobenzene [1,4-Dichlorobenzene]	72	87
3,3'-Dichlorobenzidine	0.76	0.9
1,2-Dichloroethane	4.8	5.8
1,1-Dichloroethylene [1,1-Dichloroethene]	6.7	8
Dichloromethane [Methylene Chloride]	4.8	5.8
1,2-Dichloropropane	4.8	5.8
1,3-Dichloropropene [1,3-Dichloropropylene]	2.7	3.3
Dicofol [Kelthane]	0.29	0.35
Dieldrin	1.91E-05	2.32E-05
2,4-Dimethylphenol	425	516
Di-*n*-Butyl Phthalate	85	103
Dioxins/Furans [TCDD Equivalents]	7.46E-08	9.06E-08
Endrin	0.019	0.023
Epichlorohydrin	51	62
Ethylbenzene	670	813
Ethylene Glycol	44733	54318
Fluoride	3828	4648
Heptachlor	0.00008	0.00009
Heptachlor Epoxide	0.0003	0.0003

Human Health	***70% of Daily Avg.***	***85% of Daily Avg.***
Parameter	***(µg/L)***	***(µg/L)***
Hexachlorobenzene	0.0007	0.0008
Hexachlorobutadiene	0.20	0.24
Hexachlorocyclohexane (*alpha*)	0.007	0.009
Hexachlorocyclohexane (*beta*)	0.14	0.17
Hexachlorocyclohexane (*gamma*) [Lindane]	0.19	0.23
Hexachlorocyclopentadiene	10	12
Hexachloroethane	1.8	2.1
Hexachlorophene	2.0	2.4
4,4'-Isopropylidenediphenol [Bisphenol A]	1045	1269
Lead	5.9	7
Mercury	0.012	0.014
Methoxychlor	2.8	3.4
Methyl Ethyl Ketone	13268	16112
Methyl *tert*-butyl ether [MTBE]	14	17
Nickel	1341	1628
Nitrate-Nitrogen (as Total Nitrogen)	9570	11620
Nitrobenzene	44	53
N-Nitrosodiethylamine	0.004	0.004
N-Nitroso-di-*n*-Butylamine	0.11	0.14
Pentachlorobenzene	0.33	0.40
Pentachlorophenol	0.21	0.26
Polychlorinated Biphenyls [PCBs]	0.0006	0.0007
Pyridine	22	27
Selenium	48	58
1,2,4,5-Tetrachlorobenzene	0.22	0.27
1,1,2,2-Tetrachloroethane	1.6	1.9
Tetrachloroethylene [Tetrachloroethylene]	4.8	5.8
Thallium	0.11	0.14
Toluene	957	1162
Toxaphene	0.011	0.013
2,4,5-TP [Silvex]	48	58
1,1,1-Trichloroethane	191	232
1,1,2-Trichloroethane	4.8	5.8
Trichloroethylene [Trichloroethene]	4.8	5.8
2,4,5-Trichlorophenol	994	1207
TTHM [Sum of Total Trihalomethanes]	77	93
Vinyl Chloride	0.22	0.27

TEXTOX MENU #7 - INTERMITTENT STREAM WITH PERENNIAL POOLS

The water quality-based effluent limitations developed below are calculated using:

Table 1, 2014 Texas Surface Water Quality Standards (30 TAC 307) for Freshwater Aquatic Life
Table 2, 2018 Texas Surface Water Quality Standards for Human Health, Incidental Fishery
"Procedures to Implement the Texas Surface Water Quality Standards," TCEQ, June 2010

PERMIT INFORMATION

Permittee Name:	Luminant Generation Company, LLC
TPDES Permit No.:	WQ0000551000
Outfall No.:	Outfall 002
Prepared by:	RUIQIANG ZONG
Date:	April 17, 2025

DISCHARGE INFORMATION

Intermittent Receiving Waterbody:	Salt Creek
Segment No.:	1208
TSS (mg/L):	12
pH (Standard Units):	7.7
Hardness (mg/L as $CaCO_3$):	493
Chloride (mg/L):	2154
Effluent Flow for Aquatic Life (MGD):	
Critical Low Flow [7Q2] (cfs):	0
% Effluent for Chronic Aquatic Life:	100
% Effluent for Acute Aquatic Life:	100
Effluent Flow for Human Health (MGD):	0.012
Harmonic Mean Flow (cfs):	0.1
% Effluent for Human Health:	15.659

CALCULATE DISSOLVED FRACTION (AND ENTER WATER EFFECT RATIO IF APPLICABLE):

Stream/River Metal	*Intercept (b)*	*Slope (m)*	*Partition Coefficient (Kp)*	*Dissolved Fraction (Cd/Ct)*	*Source*	*Water Effect Ratio (WER)*	*Source*
Aluminum	N/A	N/A	N/A	0.19	Study	1.00	Assumed
Arsenic	5.68	-0.73	78018.52	0.516		1.00	Assumed
Cadmium	6.60	-1.13	240173.56	0.258		1.00	Assumed
Chromium (total)	6.52	-0.93	328368.46	0.202		1.00	Assumed
Chromium (trivalent)	6.52	-0.93	328368.46	0.202		1.00	Assumed
Chromium (hexavalent)	N/A	N/A	N/A	1.00	Assumed	1.00	Assumed
Copper	6.02	-0.74	166496.80	0.334		1.00	Assumed
Lead	6.45	-0.80	386060.17	0.178		1.00	Assumed
Mercury	N/A	N/A	N/A	1.00	Assumed	1.00	Assumed
Nickel	5.69	-0.57	118813.75	0.412		1.00	Assumed
Selenium	N/A	N/A	N/A	1.00	Assumed	1.00	Assumed
Silver	6.38	-1.03	185542.46	0.310		1.00	Assumed
Zinc	6.10	-0.70	221092.05	0.274		1.00	Assumed

AQUATIC LIFE

CALCULATE DAILY AVERAGE AND DAILY MAXIMUM EFFLUENT LIMITATIONS:

Parameter	*FW Acute Criterion (µg/L)*	*FW Chronic Criterion (µg/L)*	*WLAa (µg/L)*	*WLAc (µg/L)*	*LTAa (µg/L)*	*LTAc (µg/L)*	*Daily Avg. (µg/L)*	*Daily Max. (µg/L)*
Aldrin	3.0	N/A	3.0	N/A	1.72	N/A	2.53	5.35
Aluminum	991	N/A	5215.7895	N/A	2989	N/A	4393	9295
Arsenic	340	150	658	290	377	224	329	696
Cadmium	40.4	0.743	156.7	2.89	89.8	2.22	3.27	6.91
Carbaryl	2.0	N/A	2.0	N/A	1.15	N/A	1.68	3.56
Chlordane	2.4	0.004	2.4	0.004	1.38	0.0031	0.0045	0.0096
Chlorpyrifos	0.083	0.041	0.083	0.041	0.048	0.032	0.046	0.098
Chromium (+3)	2104	274	10397	1352	5957	1041	1531	3239
Chromium (+6)	15.7	10.6	15.7	10.6	9.00	8.16	12.0	25.4
Copper	63.8	37.0	191.4	111.0	109.7	85.4	125.6	265.7
Cyanide (free)	45.8	10.7	45.8	10.7	26.2	8.24	12.1	25.6
4,4'-DDT	1.1	0.001	1.1	0.001	0.630	0.00077	0.0011	0.0024
Demeton	N/A	0.1	N/A	0.1	N/A	0.077	0.113	0.239
Diazinon	0.17	0.17	0.17	0.17	0.097	0.131	0.143	0.303
Dicofol	59.3	19.8	59.3	19.8	34.0	15.2	22.4	47.4
Dieldrin	0.24	0.002	0.24	0.002	0.138	0.0015	0.0023	0.0048
Diuron	210	70	210	70	120	53.9	79.2	168
Endosulfan I (alpha)	0.22	0.056	0.22	0.056	0.126	0.043	0.063	0.134
Endosulfan II (beta)	0.22	0.056	0.22	0.056	0.126	0.043	0.063	0.134
Endosulfan sulfate	0.22	0.056	0.22	0.056	0.126	0.043	0.063	0.134
Endrin	0.086	0.002	0.086	0.002	0.049	0.0015	0.0023	0.0048
Guthion	N/A	0.01	N/A	0.01	N/A	0.0077	0.011	0.024
Heptachlor	0.52	0.004	0.52	0.004	0.298	0.0031	0.0045	0.0096
Hexachlorocyclohexane (Lindane)	1.126	0.08	1.126	0.08	0.645	0.062	0.091	0.192
Lead	348	13.54	1957	76.3	1122	58.7	86.3	182.7
Malathion	N/A	0.01	N/A	0.01	N/A	0.0077	0.011	0.024
Mercury	2.4	1.3	2.4	1.3	1.38	1.00	1.47	3.11
Methoxychlor	N/A	0.03	N/A	0.03	N/A	0.023	0.034	0.072
Mirex	N/A	0.001	N/A	0.001	N/A	0.00077	0.0011	0.0024
Nickel	1806	200.5	4380	486	2510	375	551	1165
Nonylphenol	28	6.6	28	6.6	16.0	5.08	7.47	15.8
Parathion (ethyl)	0.065	0.013	0.065	0.013	0.037	0.010	0.015	0.031
Pentachlorophenol	17.6	13.5	17.6	13.5	10.1	10.4	14.8	31.4
Phenanthrene	30	30	30	30	17.2	23.1	25.3	53.5
Polychlorinated Biphenyls (PCBs)	2.0	0.014	2.0	0.014	1.15	0.011	0.016	0.034
Selenium	20	5	20	5	11.5	3.85	5.66	12.0
Silver	0.8	N/A	28.74	N/A	16.47	N/A	24.21	51.2
Toxaphene	0.78	0.0002	0.78	0.0002	0.447	0.00015	0.00023	0.00048
Tributyltin (TBT)	0.13	0.024	0.13	0.024	0.074	0.018	0.027	0.057
2,4,5 Trichlorophenol	136	64	136	64	77.9	49.3	72.4	153
Zinc	453	457	1654	1668	948	1284	1393	2948

HUMAN HEALTH (APPLIES FOR INCIDENTAL FRESHWATER FISH TISSUE)
CALCULATE DAILY AVERAGE AND DAILY MAXIMUM EFFLUENT LIMITATIONS:

Parameter	*Incidental Fish Criterion (µg/L)*	*WLAh (µg/L)*	*LTAh (µg/L)*	*Daily Avg. (µg/L)*	*Daily Max. (µg/L)*
Acrylonitrile	1150	7344	6830	10040	21241
Aldrin	1.147E-04	7.32E-04	6.81E-04	1.00E-03	2.12E-03
Anthracene	13170	84104	78216	114978	243253
Antimony	10710	68394	63606	93502	197816
Arsenic	N/A	N/A	N/A	N/A	N/A
Barium	N/A	N/A	N/A	N/A	N/A
Benzene	5810	37103	34505	50723	107312
Benzidine	1.07	6.83	6.35	9.34	19.8
Benzo(*a*)anthracene	0.25	1.597	1.485	2.18	4.62
Benzo(*a*)pyrene	0.025	0.160	0.148	0.218	0.462
Bis(chloromethyl)ether	2.745	17.53	16.30	24.0	50.7
Bis(2-chloroethyl)ether	428.3	2735	2544	3739	7911
Bis(2-ethylhexyl) phthalate [Di(2-ethylhexyl) phthalate]	75.5	482	448	659	1395
Bromodichloromethane [Dichlorobromomethane]	2750	17562	16332	24008	50793
Bromoform [Tribromomethane]	10600	67692	62953	92541	195784
Cadmium	N/A	N/A	N/A	N/A	N/A
Carbon Tetrachloride	460	2938	2732	4016	8496
Chlordane	0.025	0.160	0.148	0.218	0.462
Chlorobenzene	27370	174785	162550	238948	505530
Chlorodibromomethane [Dibromochloromethane]	1830	11686	10868	15976	33801
Chloroform [Trichloromethane]	76970	491530	457123	671971	1421653
Chromium (hexavalent)	5020	32058	29814	43826	92721
Chrysene	25.2	160.9	149.7	220	465
Cresols [Methylphenols]	93010	593962	552385	812005	1717916
Cyanide (free)	N/A	N/A	N/A	N/A	N/A
4,4'-DDD	0.02	0.128	0.119	0.175	0.369
4,4'-DDE	0.0013	0.0083	0.0077	0.0113	0.0240
4,4'-DDT	0.004	0.026	0.024	0.035	0.074
2,4'-D	N/A	N/A	N/A	N/A	N/A
Danitol [Fenpropathrin]	4730	30206	28091	41294	87364
1,2-Dibromoethane [Ethylene Dibromide]	42.4	271	252	370	783
m-Dichlorobenzene [1,3-Dichlorobenzene]	5950	37997	35337	51945	109898
o-Dichlorobenzene [1,2-Dichlorobenzene]	32990	210674	195927	288013	609333
p-Dichlorobenzene [1,4-Dichlorobenzene]	N/A	N/A	N/A	N/A	N/A
3,3'-Dichlorobenzidine	22.4	143.0	133.0	196	414
1,2-Dichloroethane	3640	23245	21618	31778	67232
1,1-Dichloroethylene [1,1-Dichloroethene]	551140	3519580	3273209	4811618	10179681
Dichloromethane [Methylene Chloride]	133330	851445	791844	1164011	2462635
1,2-Dichloropropane	2590	16540	15382	22611	47838
1,3-Dichloropropene [1,3-Dichloropropylene]	1190	7599	7067	10389	21980
Dicofol [Kelthane]	3	19.2	17.82	26.2	55.4
Dieldrin	2.0E-04	1.28E-03	1.19E-03	1.75E-03	3.69E-03
2,4-Dimethylphenol	84360	538723	501012	736488	1558148
Di-*n*-Butyl Phthalate	924	5901	5488	8067	17066
Dioxins/Furans [TCDD Equivalents]	7.97E-07	5.09E-06	4.73E-06	6.96E-06	1.47E-05
Endrin	0.2	1.277	1.188	1.746	3.69
Epichlorohydrin	20130	128550	119552	175741	371806
Ethylbenzene	18670	119227	110881	162995	344839
Ethylene Glycol	1.68E+08	1.07E+09	9.98E+08	1.47E+09	3.10E+09
Fluoride	N/A	N/A	N/A	N/A	N/A

HUMAN HEALTH (APPLIES FOR INCIDENTAL FRESHWATER FISH TISSUE)

CALCULATE DAILY AVERAGE AND DAILY MAXIMUM EFFLUENT LIMITATIONS:

Parameter	*Incidental Fish Criterion (µg/L)*	*WLAh (µg/L)*	*LTAh (µg/L)*	*Daily Avg. (µg/L)*	*Daily Max. (µg/L)*
Heptachlor	0.001	0.0064	0.0059	0.0087	0.0185
Heptachlor Epoxide	0.0029	0.0185	0.0172	0.025	0.054
Hexachlorobenzene	0.0068	0.043	0.040	0.059	0.126
Hexachlorobutadiene	2.2	14.05	13.07	19.2	40.6
Hexachlorocyclohexane (*alpha*)	0.084	0.536	0.499	0.733	1.551
Hexachlorocyclohexane (*beta*)	2.6	16.60	15.44	22.7	48.0
Hexachlorocyclohexane (*gamma*) [Lindane]	3.41	21.8	20.3	29.8	63.0
Hexachlorocyclopentadiene	116	741	689	1013	2143
Hexachloroethane	23.3	148.8	138.4	203	430
Hexachlorophene	29	185.2	172.2	253	536
4,4'-Isopropylidenediphenol [Bisphenol A]	159820	1020611	949168	1395277	2951912
Lead	38.3	1378	1281	1883	3985
Mercury	0.122	0.779	0.725	1.065	2.25
Methoxychlor	30	192	178	262	554
Methyl Ethyl Ketone	9.92E+06	6.33E+07	5.89E+07	8.66E+07	1.83E+08
Methyl *tert*-butyl ether [MTBE]	104820	669381	622524	915110	1936049
Nickel	11400	176597	164235	241425	510771
Nitrate-Nitrogen (as Total Nitrogen)	N/A	N/A	N/A	N/A	N/A
Nitrobenzene	18730	119610	111237	163519	345947
N-Nitrosodiethylamine	21	134.1	124.7	183.3	388
N-Nitroso-di-*n*-Butylamine	42	268	249	367	776
Pentachlorobenzene	3.55	22.7	21.1	31.0	65.6
Pentachlorophenol	2.9	18.52	17.22	25.3	53.6
Polychlorinated Biphenyls [PCBs]	6.40E-03	0.041	0.038	0.056	0.118
Pyridine	9470	60475	56242	82676	174913
Selenium	N/A	N/A	N/A	N/A	N/A
1,2,4,5-Tetrachlorobenzene	2.4	15.33	14.25	21.0	44.3
1,1,2,2-Tetrachloroethane	263.5	1683	1565	2300	4867
Tetrachloroethylene [Tetrachloroethylene]	2800	17881	16629	24445	51717
Thallium	2.3	14.69	13.66	20.1	42.5
Toluene	N/A	N/A	N/A	N/A	N/A
Toxaphene	0.11	0.702	0.653	0.960	2.03
2,4,5-TP [Silvex]	3690	23564	21915	32215	68155
1,1,1-Trichloroethane	7843540	50088846	46582627	68476462	144871971
1,1,2-Trichloroethane	1660	10601	9859	14492	30661
Trichloroethylene [Trichloroethene]	719	4592	4270	6277	13280
2,4,5-Trichlorophenol	18670	119227	110881	162995	344839
TTHM [Sum of Total Trihalomethanes]	N/A	N/A	N/A	N/A	N/A
Vinyl Chloride	165	1054	980	1440	3048

CALCULATE 70% AND 85% OF DAILY AVERAGE EFFLUENT LIMITATIONS:

Aquatic Life	***70% of Daily Avg.***	***85% of Daily Avg.***
Parameter	***(µg/L)***	***(µg/L)***
Aldrin	1.77	2.15
Aluminum	3075	3734
Arsenic	230	279
Cadmium	2.29	2.78
Carbaryl	1.18	1.43
Chlordane	0.0032	0.0038
Chlorpyrifos	0.032	0.039
Chromium (+3)	1072	1301
Chromium (+6)	8.40	10.2
Copper	87.9	106.8
Cyanide (free)	8.48	10.3
4,4'-DDT	0.00079	0.00096
Demeton	0.079	0.096
Diazinon	0.100	0.122
Dicofol	15.7	19.0
Dieldrin	0.0016	0.0019
Diuron	55.5	67.3
Endosulfan (alpha)	0.044	0.054
Endosulfan (beta)	0.044	0.054
Endosulfan sulfate	0.044	0.054
Endrin	0.0016	0.0019
Guthion	0.0079	0.0096
Heptachlor	0.0032	0.0038
Hexachlorocyclohexane (Lindane)	0.063	0.077
Lead	60.4	73.4
Malathion	0.0079	0.0096
Mercury	1.03	1.25
Methoxychlor	0.024	0.029
Mirex	0.00079	0.00096
Nickel	385	468
Nonylphenol	5.23	6.35
Parathion (ethyl)	0.010	0.013
Pentachlorophenol	10.4	12.6
Phenanthrene	17.7	21.5
Polychlorinated Biphenyls (PCBs)	0.011	0.013
Selenium	3.96	4.81
Silver	16.95	20.58
Toxaphene	0.00016	0.00019
Tributyltin (TBT)	0.019	0.023
2,4,5 Trichlorophenol	50.7	61.6
Zinc	975	1184

Human Health	***70% of Daily Avg.***	***85% of Daily Avg.***
Parameter	***(µg/L)***	***(µg/L)***
Acrylonitrile	7028	8534
Aldrin	7.01E-04	8.51E-04
Anthracene	80485	97731
Antimony	65451	79476
Arsenic	N/A	N/A
Barium	N/A	N/A
Benzene	35506	43115
Benzidine	6.54	7.94
Benzo(*a*)anthracene	1.528	1.855
Benzo(*a*)pyrene	0.153	0.186
Bis(chloromethyl)ether	16.78	20.4
Bis(2-chloroethyl)ether	2617	3178
Bis(2-ethylhexyl) phthalate [Di(2-ethylhexyl) phthalate]	461	560
Bromodichloromethane [Dichlorobromomethane]	16806	20407
Bromoform [Tribromomethane]	64779	78660
Cadmium	N/A	N/A
Carbon Tetrachloride	2811	3414
Chlordane	0.153	0.186
Chlorobenzene	167264	203106
Chlorodibromomethane [Dibromochloromethane]	11184	13580
Chloroform [Trichloromethane]	470380	571176
Chromium (hexavalent)	30678	37252
Chrysene	154.0	187
Cresols [Methylphenols]	568404	690204
Cyanide (free)	N/A	N/A
4,4'-DDD	0.122	0.148
4,4'-DDE	0.0079	0.0096
4,4'-DDT	0.024	0.030
2,4'-D	N/A	N/A
Danitol [Fenpropathrin]	28906	35100
1,2-Dibromoethane [Ethylene Dibromide]	259	315
m-Dichlorobenzene [1,3-Dichlorobenzene]	36362	44153
o-Dichlorobenzene [1,2-Dichlorobenzene]	201609	244811
p-Dichlorobenzene [1,4-Dichlorobenzene]	N/A	N/A
3,3'-Dichlorobenzidine	136.9	166.2
1,2-Dichloroethane	22245	27012
1,1-Dichloroethylene [1,1-Dichloroethene]	3368133	4089875
Dichloromethane [Methylene Chloride]	814808	989409
1,2-Dichloropropane	15828	19220
1,3-Dichloropropene [1,3-Dichloropropylene]	7272	8831
Dicofol [Kelthane]	18.33	22.3
Dieldrin	1.22E-03	1.48E-03
2,4-Dimethylphenol	515542	626015
Di-*n*-Butyl Phthalate	5647	6857
Dioxins/Furans [TCDD Equivalents]	4.87E-06	5.91E-06
Endrin	1.222	1.484
Epichlorohydrin	123019	149380
Ethylbenzene	114096	138546
Ethylene Glycol	1.03E+09	1.25E+09
Fluoride	N/A	N/A
Heptachlor	0.0061	0.0074
Heptachlor Epoxide	0.0177	0.0215
Hexachlorobenzene	0.042	0.050

Human Health	***70% of Daily Avg.***	***85% of Daily Avg.***
Parameter	***(µg/L)***	***(µg/L)***
Hexachlorobutadiene	13.44	16.33
Hexachlorocyclohexane (*alpha*)	0.513	0.623
Hexachlorocyclohexane (*beta*)	15.89	19.3
Hexachlorocyclohexane (*gamma*) [Lindane]	20.8	25.3
Hexachlorocyclopentadiene	709	861
Hexachloroethane	142.4	172.9
Hexachlorophene	177.2	215
4,4'-Isopropylidenediphenol [Bisphenol A]	976694	1185985
Lead	1318	1601
Mercury	0.746	0.905
Methoxychlor	183.3	223
Methyl Ethyl Ketone	6.06E+07	7.36E+07
Methyl *tert*-butyl ether [MTBE]	640577	777844
Nickel	168998	205211
Nitrate-Nitrogen (as Total Nitrogen)	N/A	N/A
Nitrobenzene	114463	138991
N-Nitrosodiethylamine	128.3	155.8
N-Nitroso-di-*n*-Butylamine	257	312
Pentachlorobenzene	21.7	26.3
Pentachlorophenol	17.72	21.5
Polychlorinated Biphenyls [PCBs]	0.039	0.047
Pyridine	57873	70275
Selenium	N/A	N/A
1,2,4,5-Tetrachlorobenzene	14.67	17.81
1,1,2,2-Tetrachloroethane	1610	1955
Tetrachloroethylene [Tetrachloroethylene]	17111	20778
Thallium	14.06	17.07
Toluene	N/A	N/A
Toxaphene	0.672	0.816
2,4,5-TP [Silvex]	22550	27383
1,1,1-Trichloroethane	4.79E+07	5.82E+07
1,1,2-Trichloroethane	10145	12318
Trichloroethylene [Trichloroethene]	4394	5336
2,4,5-Trichlorophenol	114096	138546
TTHM [Sum of Total Trihalomethanes]	N/A	N/A
Vinyl Chloride	1008	1224

Appendix C
Comparison of Effluent Limits

The following table is a summary of technology-based effluent limitations calculated/assessed in the draft permit (Technology-Based), calculated/ assessed water quality-based effluent limitations (Water Quality-Based), and effluent limitations in the existing permit (Existing Permit). Effluent limitations appearing in bold are the most stringent of the three and are included in the draft permit.

Outfall	*Pollutant*	*Technology-Based*		*Water Quality-Based*		*Existing Permit*	
		Daily Avg	*Daily Max*	*Daily Avg*	*Daily Max*	*Daily Avg*	*Daily Max*
001	Flow	505.4 MGD	505.4 MGD	-	-	**505.4 MGD**	**505.4 MGD**
	Temperature	108 ^{0}F	110 ^{0}F			**108 ^{0}F**	**110 ^{0}F**
	Free Available Chlorine	0.2 mg/L 141 lbs/day	0.5 mg/L 352 lbs/day	-	-	**0.2 mg/L 70 lbs/day**	**0.5 mg/L 176 lbs/day**
	Total Residual Chlorine	N/A	0.2 mg/L 141 lbs/day	-	-	N/A	**0.2 mg/L 140 lbs/day**
002	Flow	Report, MGD	Report, MGD	-	-	**Report, MGD**	**Report, MGD**
	Total Suspended Solids	30 mg/L	100 mg/L	-	-	**30 mg/L**	**100 mg/L**
	Oil and Grease	15 mg/L	20 mg/L	-	-	**15 mg/L**	**20 mg/L**
	Total Dissolved Solids	-	-	-	12,000 mg/L	N/A	**1500 mg/L**
	pH	6.0 SU (minimum)	9.0 SU (maximum)			**6.0 SU, min**	**9.0 SU**
102	Flow	Report, MGD	Report, MGD	-	-	**Report, MGD**	**Report, MGD**
	Total Copper	0.5 mg/L	1.0 mg/L	-	-	**0.5 mg/L**	**1.0 mg/L**
	Total Iron	1.0 mg/L	1.0 mg/L	-	-	**1.0 mg/L**	**1.0 mg/L**
	pH	6.0 SU (minimum)	9.0 SU (maximum)	-	-	**6.0 SU, min**	**9.0 SU**