Administrative Package Cover Page

This file contains the following documents:

1. Summary of application (in plain language)
2. First Notice (NORI-Notice of Receipt of Application and Intent to Obtain a Permit)
3. Application Materials

Trinidad Steam Electric Station
WQ0000947000
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 Trinidad Steam Electric Station (RN101943868), located at 1320 McEntire Rd., Trinidad, Henderson County, Texas 75163. The facility currently consists of one natural gas-fired steam electric generating unit.

This application is for the renewal of Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000947000 (EPA I.D. No. TX001031) which authorizes the discharge of wastewaters (once-through cooling and auxiliary cooling water) and previously monitored effluent (floor/equipment drains, equipment blowdown, water treatment wastes, low volume waste, metal cleaning waste and storm water) at a daily average flow not to exceed 425 million gallons per day via Outfall 001.

The discharge of once-through cooling water via Outfall 001 and previously monitored effluent via Outfalls 101, 201 and 301 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.

The raw water supply for the facility's cooling water and service water systems is from Trinidad Reservoir. 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. Domestic wastes are routed to an on-site septic system.

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

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

PERMIT NO. WQ0000947000

APPLICATION. Luminant Generation Company LLC, 6555 Sierra Drive, Irving, Texas 75039, which owns a steam electric generation facility, has applied to the Texas Commission on Environmental Quality (TCEQ) to renew Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000947000 (EPA I.D. No. TX0001031) to authorize the discharge of treated wastewater at a volume not to exceed a daily average flow of 425,000,000 gallons per day. The facility is located at 1320 McEntire Road, near the city of Trinidad, in Henderson County, Texas 75163. The discharge route is from the plant site via Outfall 001 to Trinidad Lake, thence to a ditch, thence to the Trinity River Above Lake Livingston. TCEQ received this application on February 11, 2025. The permit application will be available for viewing and copying at Henderson County Clerk's Office, Room 101, 125 North Prairieville Street, Athens, 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=-96.101388,32.126388&level=18

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., Environmental Manager, at 214-875-8294.

Issuance Date: March 19, 2025

Abesha Michael

From: Manthei, Dustin <Dustin.Manthei@luminant.com>
Sent: Thursday, March 13, 2025 8:42 AM
To: Abesha Michael
Cc: Bayle, Ryan
Subject: RE: Application to Renew Permit No. WQ0000947000- Notice of Deficiency Letter
Attachments: WQ0000947000-NOD1.pdf

Ms. Michael,

Luminant offers the following response to your emailed letter dated February 14, 2025:

1. The following is a portion of the NORI which contains information relevant to your application. Please read it carefully and indicate if it contains any errors or omissions. The complete notice will be sent to you once the application is declared administratively complete.

   APPLICATION. Luminant Generation Company LLC, 6555 Sierra Drive, Irving, Texas 75039, which owns a steam electric generation facility, has applied to the Texas Commission on Environmental Quality (TCEQ) to renew Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000947000 (EPA I.D. No. TX0001031) to authorize the discharge of treated wastewater at a volume not to exceed a daily average flow of 425,000,000 gallons per day. The facility is located at 1320 McEntire Road, near the city of Trinidad, in Henderson County, Texas 75163. The discharge route is from the plant site to via Outfall 001 to Trinidad Lake, thence to a ditch, thence to the Trinity River Above Lake Livingston. TCEQ received this application on February 11, 2025. The permit application will be available for viewing and copying at Henderson County Clerk's Office, Room 101, 125 North Prairieville Street, Athens, in Henderson 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/tpdesapplications. 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=-96.101388,32.126388&level=18

   Further information may also be obtained from Luminant Generation Company LLC at the address stated above or by calling Mr. Dustin Manthei, Environmental Coordinator, at 214-295-7334.

Thank you,
Dustin Manthei
Environmental Coordinator
Luminant Environmental Services
O 214-295-7334 | C 979-906-1079
dustin.manthei@luminant.com

From: Manthei, Dustin
Sent: Wednesday, March 12, 2025 10:06 AM
To: Abesha Michael <Abesha.Michael@tceq.texas.gov>; Bayle, Ryan <Ryan.Bayle@luminant.com>
Subject: RE: Application to Renew Permit No. WQ0000947000- Notice of Deficiency Letter

Good morning, Abesha. I apologize for the delay. Ryan is currently out of the office for a personal medical issue and I am out in the field today. I will try to work on this for you this afternoon, but it may be tomorrow before I can respond with the required information.

Thank you,
Dustin Manthei
Environmental Coordinator
Luminant Environmental Services
O 214-295-7334 | C 979-906-1079
dustin.manthei@luminant.com

From: Abesha Michael <Abesha.Michael@tceq.texas.gov>
Sent: Wednesday, March 12, 2025 9:58 AM
To: Bayle, Ryan <Ryan.Bayle@luminant.com>
Cc: Manthei, Dustin <Dustin.Manthei@luminant.com>
Subject: FW: Application to Renew Permit No. WQ0000947000- Notice of Deficiency Letter

EXTERNAL EMAIL

Good morning,

This email is to remind you that the attached notice of deficiency letter was sent on February 14, 2025 with no response yet. Please response asap.
Thank you,

Abesha H. Michael
Applications Review & Processing Team
Water Quality Division Support Section
Water Quality Division, MC 148
PO Box 13087
Austin, Texas 78711
Phone: o: 512-239-4912
Email: abesha.michael@tceq.texas.gov

How is our customer service? Fill out our online customer satisfaction survey at
www.tceq.texas.gov/customersurvey

From: Abesha Michael
Sent: Friday, February 14, 2025 2:30 PM
To: ryan.bayle@vistracorp.com
Cc: dustin.manthei@vistracorp.com
Subject: Application to Renew Permit No. WQ0000947000- Notice of Deficiency Letter

Dear Mr. Bayle:

The attached Notice of Deficiency letter sent on February 14, 2025, requests additional information needed to declare the application administratively complete. Please send the complete response to my attention by February 28, 2025.

Thank you,

Abesha H. Michael
Applications Review & Processing Team
Water Quality Division Support Section
Water Quality Division, MC 148
PO Box 13087
Austin, Texas 78711
Phone: o: 512-239-4912
Email: abesha.michael@tceq.texas.gov

How is our customer service? Fill out our online customer satisfaction survey at www.tceq.texas.gov/customersurvey

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

Delivered Via FedEx
FTP File Upload

February 10, 2025

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
Trinidad Steam Electric Station
TPDES Industrial Wastewater Permit Renewal Application
TPDES Permit No. WQ0000947000

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

Luminant Generation Company LLC
Trinidad Steam Electric Station

TPDES Industrial Wastewater Permit Renewal Application

Permit No. WQ0000947000

February 2025

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 00947000

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

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

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 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.: WQ00000947000

EPA ID No.: TX0001031

Expiration Date: 08/10/2025

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

☒ Industrial Wastewater (wastewater and stormwater)

☐ Industrial Stormwater (stormwater only)

☐ Reverse Osmosis Water Treatment (reverse osmosis water treatment wastewaters 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: Click to enter text.

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: 748033/748034

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?

☒ Yes ☐ No

[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

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 and attach one Core Data Form (TCEQ Form 10400) for each customer (applicant and co-applicant(s)). 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 contacted about this application. Indicate if the individual can be contacted about administrative or technical information, or both.

a. ☒ Administrative Contact ☒ Technical Contact

Prefix: Mr. 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: Mr. 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: Mr. Full Name (Last/First Name): Bayle, Ryan

Title: Environmental Manager Credential: P.G.

Organization Name: Luminant Generation Company

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

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

b. Prefix: Mr. 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

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: Mr. 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

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: Mr. 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: Mr. 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; dustin.manthei@vistracorp.com

☐ Fax: Click to enter text.

☒ Regular Mail (USPS)

Mailing Address: 6555 Sierra Drive

City/State/Zip Code: Irving

c. Contact in the Notice

Prefix: Mr. 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: Henderson County Clerk's Office Location within the building: Room 101

Physical Address of Building: 125 N. Prairieville St.

City: Athens County: Henderson

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? Click to enter text.

f. Summary of Application in Plain Language Template - Complete and attach the Summary of Application in Plain Language Template (TCEQ Form 20972), also known as the plain language summary or PLS. Attachment: C

g. Complete and attach one Public Involvement Plan (PIP) Form (TCEQ Form 20960) for each application for a new permit or major amendment. Attachment: Click to enter text.

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

a. TCEQ issued Regulated Entity Number (RN), if available: RN101943868

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 (name known by the community where located): Trinidad 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: 214-875-8294 Email: ryan.bayle@vistracorp.com

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

f. Owner of land where treatment facility is or will be: Luminant Generation Company LLC

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): Click to enter text.

or Organization Name: N/A

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. TPDES 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

☒ Applicant's property boundaries

☒ Labeled point(s) of discharge

☐ Effluent disposal site boundaries

☐ Sewage sludge disposal site

☒ Three-miles downstream information

☒ Treatment facility boundaries

☒ Highlighted discharge route(s)

☒ All wastewater ponds

☐ New and future construction

Attachment: Click to enter text.

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): Athens, TX

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

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: Anderson, Freestone, Henderson, Houston, Leon, Madison & Navarro

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

☐ Yes No or New Permit ☐ Click to enter text.

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

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: WQ0000947000

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: _____ Date: 2/10/2025
(Use blue ink)

Subscribed and Sworn to before me by the said Renee Collins

on this 10th day of February, 2025.

My commission expires on the 29th day of August, 2025.

Notary Public

NOTARY PUBLIC STATE OF TEXAS
T[illegible]DSPEED
My Notary ID # 129536082
Expires August 29, 2025

Dallas
County, Texas

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

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: Ennis Power Company LLC, Hays Energy, LLC and Midlothian Energy, 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: 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: Wise County Power Company, LLC.

This delegation of authority is effective as of April 22, 2022, 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 4/26/2022

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 Labels and Cross Reference List
(See instructions for landowner requirements.)

☒ Electronic Application Submittal
(See application submittal requirements on page 23 of the instructions.)

☒ 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.)

☒ Summary of Application (in Plain Language)

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: D and G: USGS Map and 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, Henderson County, Texas, Map Nos. 48213C0300E/48213C0450E, April 05, 2010

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 / DIMENSIONS	OUTFALL
1. pH control	Neutralization basin	105,000 gallons	301
2. capture oil waste	Equipment drain sump	250 gallons	off-site
3. Pond No. 1	Precipitation/Sedimentation	9.6 acre-feet	201
4. Pond No. 2	Precipitation/Sedimentation	9.6 acre-feet	201

For Additional Information,

See Attachment F - Description of Wastewater Generating Processes

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 Use 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)	TDCE	TDCE	T	
Associated Outfall Number	201	201	301	
Liner Type (C) (I) (S) or (A)	C	C	Concrete	
Alt. Liner Attachment Reference	N	N	N	
Leak Detection System, Y/N	N	N	N	
Groundwater Monitoring Wells, Y/N	N	N	N	
Groundwater Monitoring Data Attachment	N/A	N/A	N/A	
Pond Bottom Located Above The Seasonal High-Water Table, Y/N	Y	Y	Y	
Length (ft)	420	420	52	
Width (ft)	200	200	35	
Max Depth From Water Surface (ft), Not Including Freeboard	5	5	7.7	
Freeboard (ft)	2	2	2	
Surface Area (acres)	1.9	1.9	0.04	
Storage Capacity (gallons)	3,141,818	3,141,818	105,000	
40 CFR Part 257, Subpart D, Y/N	N	N	N	
Date of Construction				

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/Or 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	32.116708	-96.082347
101	See Attached Page 6a for Additional Information	
201	32.125317	-96.097014
301	32.125478	-96.101197

Outfall Location Description

Outfall No.	Location Description
001	From the Once-Through Cooling Discharge Canal to Trinidad Reservoir
101	See Attached Page 6a for List of Discharge Location Descriptions
201	From the Evaporation Ponds to the Discharge Canal
301	From the Neutralization Tank to the Discharge Canal

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	425	425	425	425	425
101	Report	Report	Report	Report	Report
201	Report	Report	Report	Report	Report
301	Report	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
101	N	Y	Estimate
201	N	Y	Estimate
301	N	Y	Estimate

Trinidad Steam Electric Station
Outfall 101 Discharge Locations
And Contributing Waste Streams

Latitude	Longitude	Discharge Duration	Contributing Waste Streams	Location Description
32.124872°	-96.100567°	Intermittent	Low Volume Waste, Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	At the wastewater treatment plant discharge pipe prior to entering the discharge canal.
32.124722°	-96.100500°	Intermittent	Boiler Blowdown	At the Unit 6 boiler blowdown discharge line prior to entering the discharge canal.
32.124792°	-96.100461°	Intermittent	Floor and Equipment Drains, Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	From the floor and equipment drain pipe prior to entering the discharge canal.
32.125783°	-96.100961°	Intermittent	Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	From the storm water drainage pipe prior to entering the discharge canal.
32.125872°	-96.101269°	Intermittent	Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	From the storm water drainage pipe prior to entering the discharge canal.
32.125867°	-96.101361°	Intermittent	Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	From the storm water drainage pipe prior to entering the discharge canal.
32.125703°	-96.102017°	Intermittent	Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	From the storm water drainage pipe prior to entering the intake canal.
32.125158°	-96.101833°	Intermittent	Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	From the storm water drainage pipe prior to entering the intake canal.
32.124775°	-96.102122°	Intermittent	Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	From the storm water drainage pipe prior to entering the intake canal.
32.128003°	-96.098586°	Intermittent	Diked Fuel Oil Storage Areas, Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	At the diked fuel oil storage area discharge pipe prior to entering the reservoir makeup water supply ditch, thence to the discharge canal.
32.130117°	-96.100569°	Intermittent	Diked Fuel Oil Storage Areas, Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	At the diked fuel oil storage area discharge pipe prior to entering the reservoir makeup water supply ditch, thence to the discharge canal.
32.128619°	-96.100564°	Intermittent	Diked Fuel Oil Storage Areas, Storm Water Runoff and Storm Water Runoff from Small Construction Projects.	At the diked fuel oil storage area discharge pipe prior to entering the reservoir makeup water supply ditch, thence to the discharge canal.

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	N	Y	24	30/31	12
101	Y	N	N	Variable	Variable	Variable
201	Y	N	N	Variable	Variable	Variable
301	Y	N	N	Variable	Variable	Variable

Outfall Wastestream Contributions

Outfall No. **001**

Contributing Wastestream	Volume (MGD)	Percent (%) of Total Flow
Once-Through cooling	425	100
Previously monitored effluent from Outfalls 101, 201 and 301		

Outfall No. **101**

Contributing Wastestream	Volume (MGD)	Percent (%) of Total Flow
Diked Fuel Oil Storage Areas	Variable	Variable
Floor and Equipment Drains	Variable	Variable
Low Volume Waste	Variable	Variable
Boiler Blowdown	Variable	Variable
Storm Water Runoff	Variable	Variable
Storm Water Runoff from Construction Projects	Variable	Variable
See Attached Page 6a for Additional Information		

Outfall No. **201**

Contributing Wastestream	Volume (MGD)	Percent (%) of Total Flow
Commingled Low Volume Wastes	Variable	Variable
Metal Cleaning Wastes	Variable	Variable

Outfall No. 301

Low Volume Wastes (Water Treatment Wastes)	Variable	Variable

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 and J: Boiler Chemical Additives & 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	0	N/A	N/A
Boilers	2	20,000	170,000

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: See attachment F: General Description

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.
Domestic waste is sent to an on-site evapotranspiration system. Domestic sewage sludge is not removed from the facility.	

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: Click to enter text.

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	TR 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.

Click to enter text.

Item 14. Laboratory Accreditation (Instructions, Page 49)

All laboratory tests performed must meet the requirements of *30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification*, which includes the following general exemptions from National Environmental Laboratory Accreditation Program (NELAP) certification requirements:

- The laboratory is an in-house laboratory and is:
  - periodically inspected by the TCEQ; or
  - located in another state and is accredited or inspected by that state; or
  - performing work for another company with a unit located in the same site; or
  - performing pro bono work for a governmental agency or charitable organization.
- The laboratory is accredited under federal law.
- The data are needed for emergency-response activities, and a laboratory accredited under the Texas Laboratory Accreditation Program is not available.
- The laboratory supplies data for which the TCEQ does not offer accreditation.

The applicant should review *30 TAC Chapter 25* for specific requirements.

The following certification statement shall be signed and submitted with every application. See the *Signature Page* section in the Instructions, for a list of designated representatives who may sign the certification.

CERTIFICATION:

I certify that all laboratory tests submitted with this application meet the requirements of *30 TAC Chapter 25, Environmental Testing Laboratory Accreditation and Certification.*

Printed Name: Renee Collins

Title: Sr. Director Environmental Services

Signature: _____

Date: 2/10/2025

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	NON-PROCESS WASTEWATER
low volume waste sources	once-through cooling water
chemical metal cleaning wastes	
non-chemical metal cleaning wastes	
Boiler Blowdown	

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	1965
chemical metal cleaning wastes	423	N/A	1965
non-chemical metal cleaning wastes	423	N/A	1965
once-through cooling water	423	N/A	1965
Boiler Blowdown	423	N/A	1965

INDUSTRIAL WASTEWATER PERMIT APPLICATION
WORKSHEET 2.0: POLLUTANT ANALYSIS

Worksheet 2.0 **is required** for all applications submitted for a TPDES permit. Worksheet 2.0 is not required for applications for a permit to dispose of all wastewater by land disposal or for discharges solely of stormwater associated with industrial activities.

Item 1. General Testing Requirements (Instructions, Page 55)

a. Provide the date range of all sampling events conducted to obtain the analytical data submitted with this application (e.g., 05/01/2018-05/30/2018): 12/06/2024-12/26/2024

b. ☒ Check the box to confirm all samples were collected no more than 12 months prior to the date of application submittal.

c. Read the general testing requirements in the instructions for important information about sampling, test methods, and MALs. If a contact laboratory was used, attach a list which includes the name, contact information, and pollutants analyzed for each laboratory/firm. **Attachment:** K

Item 2. Specific Testing Requirements (Instructions, Page 56)

Attach correspondence from TCEQ approving submittal of less than the required number of samples, if applicable. **Attachment:** Click to enter text.

TABLE 1 and TABLE 2 (Instructions, Page 58)

Completion of Tables 1 and 2 is required for all external outfalls for all TPDES permit applications.

Table 1 for Outfall No.: 001 **Samples are (check one):** ☐ **Composite** ☒ **Grab**

Pollutant	Sample 1 (mg/L)	Sample 2 (mg/L)	Sample 3 (mg/L)	Sample 4 (mg/L)
BOD (5-day)	6.0	7.0	4.4	3.9
CBOD (5-day)	4.8	3.9	3.7	3.0
Chemical oxygen demand	98	338	61.2	64.5
Total organic carbon	9.12	8.09	9.49	9.75
Dissolved oxygen	9.4	11.4	11.4	12.2
Ammonia nitrogen	<0.2	<0.2	<0.2	<0.2
Total suspended solids	65.8	105	49.4	196
Nitrate nitrogen	<0.1	<0.1	<0.1	<0.1
Total organic nitrogen	1.68	2.28	2.14	1.78
Total phosphorus	0.21	1.57	0.17	0.15
Oil and grease	<10	<10	<10	<10
Total residual chlorine	0	0	0	0

Pollutant	Sample 1 (mg/L)	Sample 2 (mg/L)	Sample 3 (mg/L)	Sample 4 (mg/L)
Total dissolved solids	395	305	305	315
Sulfate	31.7	32.6	34.4	33.4
Chloride	74.6	74.8	75.9	74.8
Fluoride	0.67	0.64	0.66	0.62
Total alkalinity (mg/L as CaCO3)	140	130	124	160
Temperature (°F)	54	54	59	57
pH (standard units)	6.8	6.8	6.8	6.8

Table 2 for Outfall No.: 001 **Samples are (check one):** ☐ **Composite** ☒ **Grab**

Pollutant	Sample 1 (µg/L)	Sample 2 (µg/L)	Sample 3 (µg/L)	Sample 4 (µg/L)	MAL (µg/L)
Aluminum, total	1980	3770	1480	1830	2.5
Antimony, total	<5	<5	<5	<5	5
Arsenic, total	5.5	5.2	4.2	4.2	0.5
Barium, total	93	95	78	83	3
Beryllium, total	<0.5	<0.5	<0.5	<0.5	0.5
Cadmium, total	<0.5	<0.5	<0.5	<0.5	1
Chromium, total	<3	5.0	<3	<3	3
Chromium, hexavalent	<3	<3	<3	<3	3
Chromium, trivalent	<3	5.0	<3	<3	N/A
Copper, total	8.3	25.3	9.3	11.1	2
Cyanide, available	<10	<10	<10	<10	2/10
Lead, total	4.4	5.8	1.5	2.4	0.5
Mercury, total	<0.005	<0.005	<0.005	<0.005	0.005/0.0005
Nickel, total	3.7	5.0	2.7	2.8	2
Selenium, total	<5	<5	<5	<5	5
Silver, total	<0.5	<0.5	<0.5	<0.5	0.5
Thallium, total	<0.5	<0.5	<0.5	<0.5	0.5
Zinc, total	37	27	6	10	5.0

TABLE 3 (Instructions, Page 58)

Completion of Table 3 **is required** for all **external outfalls** which discharge process wastewater.

Partial completion of Table 3 **is required** for all **external outfalls** which discharge non-process wastewater and stormwater associated with industrial activities commingled with other wastestreams (see instructions for additional guidance).

Table 3 for Outfall No.: 001 **Samples are (check one): ☐ Composite ☒ Grab**

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)*
Acrylonitrile	<50	<50	<50	<50	50
Anthracene	NA	NA	NA	NA	10
Benzene	<10	<10	<10	<10	10
Benzidine	NA	NA	NA	NA	50
Benzo(a)anthracene	NA	NA	NA	NA	5
Benzo(a)pyrene	NA	NA	NA	NA	5
Bis(2-chloroethyl)ether	NA	NA	NA	NA	10
Bis(2-ethylhexyl)phthalate	<10	<10	<10	<10	10
Bromodichloromethane [Dichlorobromomethane]	<10	<10	<10	<10	10
Bromoform	<10	<10	<10	<10	10
Carbon tetrachloride	<2	<2	<2	<2	2
Chlorobenzene	<10	<10	<10	<10	10
Chlorodibromomethane [Dibromochloromethane]	<10	<10	<10	<10	10
Chloroform	<10	<10	<10	<10	10
Chrysene	NA	NA	NA	NA	5
m-Cresol [3-Methylphenol]	NA	NA	NA	NA	10
o-Cresol [2-Methylphenol]	NA	NA	NA	NA	10
p-Cresol [4-Methylphenol]	NA	NA	NA	NA	10
1,2-Dibromoethane	NA	NA	NA	NA	10
m-Dichlorobenzene [1,3-Dichlorobenzene]	NA	NA	NA	NA	10
o-Dichlorobenzene [1,2-Dichlorobenzene]	NA	NA	NA	NA	10
p-Dichlorobenzene [1,4-Dichlorobenzene]	NA	NA	NA	NA	10
3,3'-Dichlorobenzidine	NA	NA	NA	NA	5
1,2-Dichloroethane	<10	<10	<10	<10	10

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)*
1,1-Dichloroethene [1,1-Dichloroethylene]	<10	<10	<10	<10	10
Dichloromethane [Methylene chloride]	NA	NA	NA	NA	20
1,2-Dichloropropane	<10	<10	<10	<10	10
1,3-Dichloropropene [1,3-Dichloropropylene]	<10	<10	<10	<10	10
2,4-Dimethylphenol	NA	NA	NA	NA	10
Di-n-Butyl phthalate	NA	NA	NA	NA	10
Ethylbenzene	<10	<10	<10	<10	10
Fluoride	670	640	660	620	500
Hexachlorobenzene	NA	NA	NA	NA	5
Hexachlorobutadiene	NA	NA	NA	NA	10
Hexachlorocyclopentadiene	NA	NA	NA	NA	10
Hexachloroethane	NA	NA	NA	NA	20
Methyl ethyl ketone	<50	<50	<50	<50	50
Nitrobenzene	NA	NA	NA	NA	10
N-Nitrosodiethylamine	NA	NA	NA	NA	20
N-Nitroso-di-n-butylamine	NA	NA	NA	NA	20
Nonylphenol	NA	NA	NA	NA	333
Pentachlorobenzene	NA	NA	NA	NA	20
Pentachlorophenol	NA	NA	NA	NA	5
Phenanthrene	NA	NA	NA	NA	10
Polychlorinated biphenyls (PCBs) (**)	<0.2	<0.2	<0.2	<0.2	0.2
Pyridine	<20	<20	<20	<20	20
1,2,4,5-Tetrachlorobenzene	NA	NA	NA	NA	20
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	10
Tetrachloroethene [Tetrachloroethylene]	<10	<10	<10	<10	10
Toluene	<10	<10	<10	<10	10
1,1,1-Trichloroethane	<10	<10	<10	<10	10
1,1,2-Trichloroethane	<10	<10	<10	<10	10
Trichloroethene [Trichloroethylene]	<10	<10	<10	<10	10

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)*
2,4,5-Trichlorophenol	NA	NA	NA	NA	50
TTHM (Total trihalomethanes)	<10	<10	<10	<10	10
Vinyl chloride	<10	<10	<10	<10	10

(*) Indicate units if different from µg/L.

(**) Total of detects for PCB-1242, PCB-1254, PCB-1221, PCB-1232, PCB-1248, PCB-1260, and PCB-1016. If all non-detects, enter the highest non-detect preceded by a "<".

TABLE 4 (Instructions, Pages 58-59)

Partial completion of Table 4 **is required** for each **external outfall** based on the conditions below.

a. **Tributyltin**

Is this facility an industrial/commercial facility which currently or proposes to directly dispose of wastewater from the types of operations listed below or a domestic facility which currently or proposes to receive wastewater from the types of industrial/commercial operations listed below?

☐ Yes ☒ No

If **yes**, check the box next to each of the following criteria which apply and provide the appropriate testing results in Table 4 below (check all that apply).

☐ Manufacturers and formulators of tributyltin or related compounds.

☐ Painting of ships, boats and marine structures.

☐ Ship and boat building and repairing.

☐ Ship and boat cleaning, salvage, wrecking and scaling.

☐ Operation and maintenance of marine cargo handling facilities and marinas.

☐ Facilities engaged in wood preserving.

☐ Any other industrial/commercial facility for which tributyltin is known to be present, or for which there is any reason to believe that tributyltin may be present in the effluent.

b. **Enterococci (discharge to saltwater)**

This facility discharges/proposes to discharge directly into saltwater receiving waters **and** Enterococci bacteria are expected to be present in the discharge based on facility processes.

☐ Yes ☒ No

Domestic wastewater is/will be discharged.

☐ Yes ☒ No

If **yes to either** question, provide the appropriate testing results in Table 4 below.

c. E. coli (discharge to freshwater)

This facility discharges/proposes to discharge directly into freshwater receiving waters **and** *E. coli* bacteria are expected to be present in the discharge based on facility processes.

☐ Yes ☒ No

Domestic wastewater is/will be discharged.

☐ Yes ☒ No

If **yes to either** question, provide the appropriate testing results in Table 4 below.

Table 4 for Outfall No.: 001 **Samples are (check one):** ☐ **Composite** ☐ **Grab**

Pollutant	Sample 1	Sample 2	Sample 3	Sample 4	MAL
Tributyltin (µg/L)	N/A	N/A	N/A	N/A	0.010
Enterococci (cfu or MPN/100 mL)	N/A	N/A	N/A	N/A	N/A
E. coli (cfu or MPN/100 mL)	N/A	N/A	N/A	N/A	N/A

TABLE 5 (Instructions, Page 59)

Completion of Table 5 **is required** for all **external outfalls** which discharge process wastewater from a facility which manufactures or formulates pesticides or herbicides or other wastewaters which may contain pesticides or herbicides.

If this facility does not/will not manufacture or formulate pesticides or herbicides and does not/will not discharge other wastewaters that may contain pesticides or herbicides, check N/A.

☒ N/A

Table 5 for Outfall No.: N/A **Samples are (check one):** ☐ **Composite** ☐ **Grab**

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)*
Aldrin	N/A	N/A	N/A	N/A	0.01
Carbaryl	N/A	N/A	N/A	N/A	5
Chlordane	N/A	N/A	N/A	N/A	0.2
Chlorpyrifos	N/A	N/A	N/A	N/A	0.05
4,4'-DDD	N/A	N/A	N/A	N/A	0.1
4,4'-DDE	N/A	N/A	N/A	N/A	0.1
4,4'-DDT	N/A	N/A	N/A	N/A	0.02
2,4-D	N/A	N/A	N/A	N/A	0.7
Danitol [Fenpropathrin]	N/A	N/A	N/A	N/A	—
Demeton	N/A	N/A	N/A	N/A	0.20
Diazinon	N/A	N/A	N/A	N/A	0.5/0.1
Dicofol [Kelthane]	N/A	N/A	N/A	N/A	1
Dieldrin	N/A	N/A	N/A	N/A	0.02
Diuron	N/A	N/A	N/A	N/A	0.090

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)*
Endosulfan I (*alpha*)	N/A	N/A	N/A	N/A	0.01
Endosulfan II (*beta*)	N/A	N/A	N/A	N/A	0.02
Endosulfan sulfate	N/A	N/A	N/A	N/A	0.1
Endrin	N/A	N/A	N/A	N/A	0.02
Guthion [Azinphos methyl]	N/A	N/A	N/A	N/A	0.1
Heptachlor	N/A	N/A	N/A	N/A	0.01
Heptachlor epoxide	N/A	N/A	N/A	N/A	0.01
Hexachlorocyclohexane (*alpha*)	N/A	N/A	N/A	N/A	0.05
Hexachlorocyclohexane (*beta*)	N/A	N/A	N/A	N/A	0.05
Hexachlorocyclohexane (*gamma*) [Lindane]	N/A	N/A	N/A	N/A	0.05
Hexachlorophene	N/A	N/A	N/A	N/A	10
Malathion	N/A	N/A	N/A	N/A	0.1
Methoxychlor	N/A	N/A	N/A	N/A	2.0
Mirex	N/A	N/A	N/A	N/A	0.02
Parathion (ethyl)	N/A	N/A	N/A	N/A	0.1
Toxaphene	N/A	N/A	N/A	N/A	0.3
2,4,5-TP [Silvex]	N/A	N/A	N/A	N/A	0.3

* Indicate units if different from µg/L.

TABLE 6 (Instructions, Page 59)

Completion of Table 6 **is required** for all **external outfalls.**

Table 6 for Outfall No.: 001 **Samples are (check one): ☐ Composite ☒ Grab**

Pollutants	Believed Present	Believed Absent	Sample 1 (mg/L)	Sample 2 (mg/L)	Sample 3 (mg/L)	Sample 4 (mg/L)	MAL (µg/L)*
Bromide	☐	☒	<0.2				400
Color (PCU)	☒	☐	45				—
Nitrate-Nitrite (as N)	☐	☒	<0.1				—
Sulfide (as S)	☐	☒	<0.1				—
Sulfite (as SO3)	☐	☒	<2				—
Surfactants	☒	☐	<0.05				—
Boron, total	☐	☒	<20				20
Cobalt, total	☒	☐	0.0013				0.3
Iron, total	☒	☐	1.98				7
Magnesium, total	☒	☐	6.32				20
Manganese, total	☒	☐	0.1674				0.5
Molybdenum, total	☒	☐	0.0052				1
Tin, total	☒	☐	0.041				5
Titanium, total	☒	☐	0.016				30

TABLE 7 (Instructions, Page 60)

Check the box next to any of the industrial categories applicable to this facility. If no categories are applicable, check N/A. If GC/MS testing is required, check the box provided to confirm the testing results for the appropriate parameters are provided with the application.

☐ N/A

Table 7 for Applicable Industrial Categories

Industrial Category	40 CFR Part	Volatiles Table 8	Acids Table 9	Bases/ Neutrals Table 10	Pesticides Table 11
☐ Adhesives and Sealants		☐ Yes	☐ Yes	☐ Yes	No
☐ Aluminum Forming	467	☐ Yes	☐ Yes	☐ Yes	No
☐ Auto and Other Laundries		☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Battery Manufacturing	461	☐ Yes	No	☐ Yes	No
☐ Coal Mining	434	No	No	No	No
☐ Coil Coating	465	☐ Yes	☐ Yes	☐ Yes	No
☐ Copper Forming	468	☐ Yes	☐ Yes	☐ Yes	No
☐ Electric and Electronic Components	469	☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Electroplating	413	☐ Yes	☐ Yes	☐ Yes	No
☐ Explosives Manufacturing	457	No	☐ Yes	☐ Yes	No
☐ Foundries		☐ Yes	☐ Yes	☐ Yes	No
☐ Gum and Wood Chemicals - Subparts A,B,C,E	454	☐ Yes	☐ Yes	No	No
☐ Gum and Wood Chemicals - Subparts D,F	454	☐ Yes	☐ Yes	☐ Yes	No
☐ Inorganic Chemicals Manufacturing	415	☐ Yes	☐ Yes	☐ Yes	No
☐ Iron and Steel Manufacturing	420	☐ Yes	☐ Yes	☐ Yes	No
☐ Leather Tanning and Finishing	425	☐ Yes	☐ Yes	☐ Yes	No
☐ Mechanical Products Manufacturing		☐ Yes	☐ Yes	☐ Yes	No
☐ Nonferrous Metals Manufacturing	421,471	☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Oil and Gas Extraction - Subparts A, D, E, F, G, H	435	☐ Yes	☐ Yes	☐ Yes	No
☐ Ore Mining - Subpart B	440	No	☐ Yes	No	No
☐ Organic Chemicals Manufacturing	414	☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Paint and Ink Formulation	446,447	☐ Yes	☐ Yes	☐ Yes	No
☐ Pesticides	455	☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Petroleum Refining	419	☐ Yes	No	No	No
☐ Pharmaceutical Preparations	439	☐ Yes	☐ Yes	☐ Yes	No
☐ Photographic Equipment and Supplies	459	☐ Yes	☐ Yes	☐ Yes	No
☐ Plastic and Synthetic Materials Manufacturing	414	☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Plastic Processing	463	☐ Yes	No	No	No
☐ Porcelain Enameling	466	No	No	No	No
☐ Printing and Publishing		☐ Yes	☐ Yes	☐ Yes	☐ Yes
☐ Pulp and Paperboard Mills - Subpart C	430	☐ *	☐ Yes	☐ *	☐ Yes
☐ Pulp and Paperboard Mills - Subparts F, K	430	☐ *	☐ Yes	☐ *	☐ *
☐ Pulp and Paperboard Mills - Subparts A, B, D, G, H	430	☐ Yes	☐ Yes	☐ *	☐ *
☐ Pulp and Paperboard Mills - Subparts I, J, L	430	☐ Yes	☐ Yes	☐ *	☐ Yes
☐ Pulp and Paperboard Mills - Subpart E	430	☐ Yes	☐ Yes	☐ Yes	☐ *
☐ Rubber Processing	428	☐ Yes	☐ Yes	☐ Yes	No
☐ Soap and Detergent Manufacturing	417	☐ Yes	☐ Yes	☐ Yes	No
☒ Steam Electric Power Plants	423	☒ Yes	☒ Yes	No	No
☐ Textile Mills (Not Subpart C)	410	☐ Yes	☐ Yes	☐ Yes	No
☐ Timber Products Processing	429	☐ Yes	☐ Yes	☐ Yes	☐ Yes

* Test if believed present.

TABLES 8, 9, 10, and 11 (Instructions, Page 60)

Completion of Tables 8, 9, 10, and 11 **is required** as specified in Table 7 for all **external outfalls** that contain process wastewater.

Completion of Tables 8, 9, 10, and 11 **may be required** for types of industry not specified in Table 7 for specific parameters that are believed to be present in the wastewater.

Table 8 for Outfall No.: 001 **Samples are (check one):** ☐ **Composite** ☒ **Grab**

Pollutant	**Sample 1 (µg/L)***	**Sample 2 (µg/L)***	**Sample 3 (µg/L)***	**Sample 4 (µg/L)***	**MAL (µg/L)**
Acrolein	<50				50
Acrylonitrile	<50				50
Benzene	<10				10
Bromoform	<10				10
Carbon tetrachloride	<2				2
Chlorobenzene	<10				10
Chlorodibromomethane	<10				10
Chloroethane	<50				50
2-Chloroethylvinyl ether	<10				10
Chloroform	<10				10
Dichlorobromomethane [Bromodichloromethane]	<10				10
1,1-Dichloroethane	<10				10
1,2-Dichloroethane	<10				10
1,1-Dichloroethylene [1,1-Dichloroethene]	<10				10
1,2-Dichloropropane	<10				10
1,3-Dichloropropylene [1,3-Dichloropropene]	<10				10
Ethylbenzene	<10				10
Methyl bromide [Bromomethane]	<50				50
Methyl chloride [Chloromethane]	<50				50
Methylene chloride [Dichloromethane]	<20				20
1,1,2,2-Tetrachloroethane	<10				10
Tetrachloroethylene [Tetrachloroethene]	<10				10
Toluene	<10				10
1,2-Trans-dichloroethylene [1,2-Trans-dichloroethene]	<10				10

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
1,1,1-Trichloroethane	<10				10
1,1,2-Trichloroethane	<10				10
Trichloroethylene [Trichloroethene]	<10				10
Vinyl chloride	<10				10

* Indicate units if different from µg/L.

Table 9 for Outfall No.: 001 Samples are (check one): ☐ Composite ☒ Grab

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
2-Chlorophenol	<10				10
2,4-Dichlorophenol	<10				10
2,4-Dimethylphenol	<10				10
4,6-Dinitro-o-cresol	<50				50
2,4-Dinitrophenol	<50				50
2-Nitrophenol	<20				20
4-Nitrophenol	<50				50
p-Chloro-m-cresol	<10				10
Pentachlorophenol	<5				5
Phenol	<10				10
2,4,6-Trichlorophenol	<10				10

* Indicate units if different from µg/L.

Table 10 for Outfall No.: N/A Samples are (check one): ☒ Composite ☐ Grab

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
Acenaphthene	N/A	N/A	N/A	N/A	10
Acenaphthylene	N/A	N/A	N/A	N/A	10
Anthracene	N/A	N/A	N/A	N/A	10
Benzidine	N/A	N/A	N/A	N/A	50
Benzo(a)anthracene	N/A	N/A	N/A	N/A	5
Benzo(a)pyrene	N/A	N/A	N/A	N/A	5
3,4-Benzofluoranthene [Benzo(b)fluoranthene]	N/A	N/A	N/A	N/A	10
Benzo(ghi)perylene	N/A	N/A	N/A	N/A	20
Benzo(k)fluoranthene	N/A	N/A	N/A	N/A	5
Bis(2-chloroethoxy)methane	N/A	N/A	N/A	N/A	10

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
Bis(2-chloroethyl)ether	N/A	N/A	N/A	N/A	10
Bis(2-chloroisopropyl)ether	N/A	N/A	N/A	N/A	10
Bis(2-ethylhexyl)phthalate	N/A	N/A	N/A	N/A	10
4-Bromophenyl phenyl ether	N/A	N/A	N/A	N/A	10
Butylbenzyl phthalate	N/A	N/A	N/A	N/A	10
2-Chloronaphthalene	N/A	N/A	N/A	N/A	10
4-Chlorophenyl phenyl ether	N/A	N/A	N/A	N/A	10
Chrysene	N/A	N/A	N/A	N/A	5
Dibenzo(a,h)anthracene	N/A	N/A	N/A	N/A	5
1,2-Dichlorobenzene [o-Dichlorobenzene]	N/A	N/A	N/A	N/A	10
1,3-Dichlorobenzene [m-Dichlorobenzene]	N/A	N/A	N/A	N/A	10
1,4-Dichlorobenzene [p-Dichlorobenzene]	N/A	N/A	N/A	N/A	10
3,3'-Dichlorobenzidine	N/A	N/A	N/A	N/A	5
Diethyl phthalate	N/A	N/A	N/A	N/A	10
Dimethyl phthalate	N/A	N/A	N/A	N/A	10
Di-n-butyl phthalate	N/A	N/A	N/A	N/A	10
2,4-Dinitrotoluene	N/A	N/A	N/A	N/A	10
2,6-Dinitrotoluene	N/A	N/A	N/A	N/A	10
Di-n-octyl phthalate	N/A	N/A	N/A	N/A	10
1,2-Diphenylhydrazine (as Azobenzene)	N/A	N/A	N/A	N/A	20
Fluoranthene	N/A	N/A	N/A	N/A	10
Fluorene	N/A	N/A	N/A	N/A	10
Hexachlorobenzene	N/A	N/A	N/A	N/A	5
Hexachlorobutadiene	N/A	N/A	N/A	N/A	10
Hexachlorocyclopentadiene	N/A	N/A	N/A	N/A	10
Hexachloroethane	N/A	N/A	N/A	N/A	20
Indeno(1,2,3-cd)pyrene	N/A	N/A	N/A	N/A	5
Isophorone	N/A	N/A	N/A	N/A	10
Naphthalene	N/A	N/A	N/A	N/A	10
Nitrobenzene	N/A	N/A	N/A	N/A	10
N-Nitrosodimethylamine	N/A	N/A	N/A	N/A	50

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
N-Nitrosodi-n-propylamine	N/A	N/A	N/A	N/A	20
N-Nitrosodiphenylamine	N/A	N/A	N/A	N/A	20
Phenanthrene	N/A	N/A	N/A	N/A	10
Pyrene	N/A	N/A	N/A	N/A	10
1,2,4-Trichlorobenzene	N/A	N/A	N/A	N/A	10

* Indicate units if different from µg/L.

Table 11 for Outfall No.: N/A **Samples are (check one):** ☐ **Composite** ☐ **Grab**

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
Aldrin	N/A	N/A	N/A	N/A	0.01
alpha-BHC [alpha-Hexachlorocyclohexane]	N/A	N/A	N/A	N/A	0.05
beta-BHC [beta-Hexachlorocyclohexane]	N/A	N/A	N/A	N/A	0.05
gamma-BHC [gamma-Hexachlorocyclohexane]	N/A	N/A	N/A	N/A	0.05
delta-BHC [delta-Hexachlorocyclohexane]	N/A	N/A	N/A	N/A	0.05
Chlordane	N/A	N/A	N/A	N/A	0.2
4,4'-DDT	N/A	N/A	N/A	N/A	0.02
4,4'-DDE	N/A	N/A	N/A	N/A	0.1
4,4'-DDD	N/A	N/A	N/A	N/A	0.1
Dieldrin	N/A	N/A	N/A	N/A	0.02
Endosulfan I (alpha)	N/A	N/A	N/A	N/A	0.01
Endosulfan II (beta)	N/A	N/A	N/A	N/A	0.02
Endosulfan sulfate	N/A	N/A	N/A	N/A	0.1
Endrin	N/A	N/A	N/A	N/A	0.02
Endrin aldehyde	N/A	N/A	N/A	N/A	0.1
Heptachlor	N/A	N/A	N/A	N/A	0.01
Heptachlor epoxide	N/A	N/A	N/A	N/A	0.01
PCB 1242	N/A	N/A	N/A	N/A	0.2
PCB 1254	N/A	N/A	N/A	N/A	0.2
PCB 1221	N/A	N/A	N/A	N/A	0.2
PCB 1232	N/A	N/A	N/A	N/A	0.2
PCB 1248	N/A	N/A	N/A	N/A	0.2

Pollutant	Sample 1 (µg/L)*	Sample 2 (µg/L)*	Sample 3 (µg/L)*	Sample 4 (µg/L)*	MAL (µg/L)
PCB 1260	N/A	N/A	N/A	N/A	0.2
PCB 1016	N/A	N/A	N/A	N/A	0.2
Toxaphene	N/A	N/A	N/A	N/A	0.3

* Indicate units if different from µg/L.

Attachment: Click to enter text.

TABLE 12 (DIOXINS/FURAN COMPOUNDS)

Complete of Table 12 **is required** for **external outfalls**, as directed below. (Instructions, Pages 59-60)

Indicate which compound(s) are manufactured or used at the facility and provide a brief description of the conditions of its/their presence at the facility (check all that apply).

- ☐ 2,4,5-trichlorophenoxy acetic acid (2,4,5-T) CASRN 93-76-5
- ☐ 2-(2,4,5-trichlorophenoxy) propanoic acid (Silvex, 2,4,5-TP) CASRN 93-72-1
- ☐ 2-(2,4,5-trichlorophenoxy) ethyl 2,2-dichloropropionate (Erbon) CASRN 136-25-4
- ☐ 0,0-dimethyl 0-(2,4,5-trichlorophenyl) phosphorothioate (Ronnel) CASRN 299-84-3
- ☐ 2,4,5-trichlorophenol (TCP) CASRN 95-95-4
- ☐ hexachlorophene (HCP) CASRN 70-30-4
- ☒ None of the above

Description: N/A

Does the applicant or anyone at the facility know or have any reason to believe that 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) or any congeners of TCDD may be present in the effluent proposed for discharge?

☐ Yes ☒ No

Description: N/A

If **yes** to either Items a **or** b, complete Table 12 as instructed.

Table 12 for Outfall No.: N/A **Samples are (check one):** ☐ **Composite** ☐ **Grab**

Compound	Toxicity Equivalent Factors	Wastewater Concentration (ppq)	Wastewater Toxicity Equivalents (ppq)	Sludge Concentration (ppt)	Sludge Toxicity Equivalents (ppt)	MAL (ppq)
2,3,7,8-TCDD	1	N/A	N/A	N/A	N/A	10
1,2,3,7,8-PeCDD	1.0	N/A	N/A	N/A	N/A	50
2,3,7,8-HxCDDs	0.1	N/A	N/A	N/A	N/A	50
1,2,3,4,6,7,8-HpCDD	0.01	N/A	N/A	N/A	N/A	50

Compound	Toxicity Equivalent Factors	Wastewater Concentration (ppq)	Wastewater Toxicity Equivalents (ppq)	Sludge Concentration (ppt)	Sludge Toxicity Equivalents (ppt)	MAL (ppq)
2,3,7,8-TCDF	0.1	N/A	N/A	N/A	N/A	10
1,2,3,7,8-PeCDF	0.03	N/A	N/A	N/A	N/A	50
2,3,4,7,8-PeCDF	0.3	N/A	N/A	N/A	N/A	50
2,3,7,8-HxCDFs	0.1	N/A	N/A	N/A	N/A	50
2,3,4,7,8-HpCDFs	0.01	N/A	N/A	N/A	N/A	50
OCDD	0.0003	N/A	N/A	N/A	N/A	100
OCDF	0.0003	N/A	N/A	N/A	N/A	100
PCB 77	0.0001	N/A	N/A	N/A	N/A	500
PCB 81	0.0003	N/A	N/A	N/A	N/A	500
PCB 126	0.1	N/A	N/A	N/A	N/A	500
PCB 169	0.03	N/A	N/A	N/A	N/A	500
Total		N/A	N/A	N/A	N/A	

TABLE 13 (HAZARDOUS SUBSTANCES)

Complete Table 13 **is required** for all **external outfalls** as directed below. (Instructions, Pages 60-61)

Are there any pollutants listed in the instructions (pages 55-62) believed present in the discharge?

☐ Yes ☒ No

Are there pollutants listed in Item 1.c. of Technical Report 1.0 which are believed present in the discharge and have not been analytically quantified elsewhere in this application?

☐ Yes ☒ No

If **yes** to either Items a **or** b, complete Table 13 as instructed.

Table 13 for Outfall No.: N/A **Samples are (check one):** ☐ **Composite** ☐ **Grab**

Pollutant	CASRN	Sample 1 (µg/L)	Sample 2 (µg/L)	Sample 3 (µg/L)	Sample 4 (µg/L)	Analytical Method
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A	N/A	N/A	N/A

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: Trinidad Reservoir

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

☒ Lake or Pond

- Surface area (acres): 740
- Average depth of the entire water body (feet): ~20
- Average depth of water body within a 500-foot radius of the discharge point (feet): ~20

☐ 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	425 MGD
Total AIF	55 MGD
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: Trinidad Steam Electric Station § 316(b) Information 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	**LH CWIS #1**			
DIF (include units)	870 MGD			
AIF (include units)	55 MGD			
Intake Flow Use(s) (%)				
Contact cooling	0			
Non-contact cooling	>99			
Process Wastewater	<1			
Other	<1			
Latitude (decimal degrees)	32.835746			
Longitude (decimal degrees)	-96.544863			

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: Trinidad Steam Electric Station § 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	**TR CWIS #1**			
Source Waterbody	Trinidad Reservoir			
Mean Annual Flow	N/A			
Source	Trinity River			

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: Trinidad 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: I: Trinidad Steam Electric Station § 316(b) Information and J: 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: TR 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: Trinidad Reservoir

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

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: TR 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
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

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:	582EA000650246
Date:	02/09/2025 01:46 PM
Payment Method:	CC - Authorization 0000092584
ePay Actor:	RYAN BAYLE
Actor Email:	ryan.bayle@luminant.com
IP:	165.225.33.17
TCEQ Amount:	$1,215.00
Texas.gov Price:	$1,242.59*

* 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
748033	WW PERMIT - MINOR FACILITY SUBJECT TO 40 CFR 400-471 - RENEWAL		$1,200.00
748034	30 TAC 305.53B WQ RENEWAL NOTIFICATION FEE		$15.00
		TCEQ Amount:	$1,215.00

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
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

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 101943868

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	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*
800881216	17529678207	752967820	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**	

16. Country Mailing Information *(If outside USA)*	17. E-Mail Address *(If applicable)*
	renee.collins@vistracorp.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.)*

Trinidad Steam Electric Station

23. Street Address of the Regulated Entity: *(No PO Boxes)*	1320 McEntire Rd.							
	City	Trinidad	**State**	TX	**ZIP**	75163	**ZIP + 4**	
24. County								

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

25. Description to Physical Location:					
26. Nearest City			**State**		**Nearest ZIP Code**
Trinidad			TX		75163

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:	32.124722°		**28. Longitude (W) In Decimal:**	-96.101258°	
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.)*

34. Mailing Address:	6555 Sierra Drive							
	City	Irving	**State**	TX	**ZIP**	75039	**ZIP + 4**	
35. E-Mail Address:	renee.colllins@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:
	WQ0000947000			

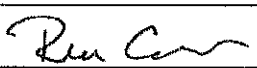
SECTION IV: Preparer Information

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 Environmental Services
Name *(In Print)*:	Renee Collins	Phone:	(214) 875- 8338
Signature:		Date:	2/9/2025

Attachment C

Plain Language Summary

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Trinidad Steam Electric Station
WQ0000947000
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 Trinidad Steam Electric Station (RN101943868), located at 1320 McEntire Rd., Trinidad, Henderson County, Texas 75163. The facility currently consists of one natural gas-fired steam electric generating unit.

This application is for the renewal of Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000947000 (EPA I.D. No. TX001031) which authorizes the discharge of wastewaters (once-through cooling and auxiliary cooling water) and previously monitored effluent (floor/equipment drains, equipment blowdown, water treatment wastes, low volume waste, metal cleaning waste and storm water) at a daily average flow not to exceed 425 million gallons per day via Outfall 001.

The discharge of once-through cooling water via Outfall 001 and previously monitored effluent via Outfalls 101, 201 and 301 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.

The raw water supply for the facility's cooling water and service water systems is from Trinidad Reservoir. 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. Domestic wastes are routed to an on-site septic system.

Attachment D

USGS TOPO MAPS

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

MALAKOFF QUADRANGLE
TEXAS
7.5-MINUTE SERIES

APPROXIMATE APPLICANT PROPERTY BOUNDARY

OUTFALL 301

OUTFALL 201

OUTFALL 101

1 Mile Radius

OUTFALL 101

EVAPORATION PONDS

APPROXIMATE APPLICANT PROPERTY BOUNDARY

APPROXIMATE TREATMENT FACILITY BOUNDARY

OUTFALL 001

Trinidad

Trinidad Lake

Cedar Creek

McAllister Branch

Walnut Cr

Antioch Cem

CO RD 1301

CO RD 1300

OIL FIELD RD

BIRDSONG AVE

JAY ST

FRONT ST

FM 1667

LAWRENCE ST

FM 764

EATON ST

WEST ST

E CARPENTER ST

TEMPIE RD

PLANT RD

PARKS LANE RD

AIRHEART RD

CRESLENN RANCH RD

NAVARRO CO

HENDERSON CO

Brushy River

Rush Cr

Cresle Ranch

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MN
GN
2°41'
48 MILS
1°34'
28 MILS

U.S. National Grid
100,000 - m Square ID
QA
Grid Zone Designation

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

ROAD CLASSIFICATION

Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

CRESLENN RANCH, TX
2019

TEXAS
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

1 Kerens
2 Malakoff
3 Mallard Hill
4 Goodlow Park
5 Cross Roads
6 Winkler
7 Roustabout Camp
8 Cayuga

ADJOINING QUADRANGLES

Attachment E

Supplemental Permit Information Form

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

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 00947000 EPA ID No. TX 0001031

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

   1320 McEntire Rd., Trinidad, TX 75163

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): Mr.

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.: [redacted] Fax No.: [redacted]

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

2. List the county in which the facility is located: Henderson
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 Trinidad Lake, thence to a ditch, thence to the Trinity River above Lake Livingston in Segment No. 0804 of the Trinity 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 the 1920's.

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

Power plant with 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:

N/A

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

N/A

MALAKOFF QUADRANGLE
TEXAS
7.5-MINUTE SERIES

APPROXIMATE APPLICANT PROPERTY BOUNDARY

OUTFALL 301

OUTFALL 201

OUTFALL 101

1 Mile Radius

OUTFALL 101

APPROXIMATE APPLICANT PROPERTY BOUNDARY

EVAPORATION PONDS

APPROXIMATE TREATMENT FACILITY BOUNDARY

OUTFALL 001

HENDERSON CO
NAVARRO CO
BIROSONG AVE
JAY ST
FRONT ST
FM 1667
LAWRENCE ST
FM 1764
WEST ST
EATON ST
E CARPENTER ST
VIELL LAKE RD
TEMPIE RD
PLANT RD
PARKS LANE RD
Trinidad Lake
Trinidad
PLANT RD
AIRHEART RD
CRESLENN RANCH RD
FM 1991
Creste Ranch
Rush Cr
Trinidad Lake
Cedar Creek
McAllister Slough
Walnut Cr
OIL FIELD RD
CO RD 1300
Antioch Cem
CO RD 1301
Cedar Creek
Walnut Cr

UTM GRID AND 2019 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MN
GN
2°41′
48 MILS
1°34′
28 MILS

U.S. National Grid
100,000 - m Square ID
QA
Grid Zone Designation

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 MILES 1
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 FEET

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the
National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

ROAD CLASSIFICATION

Expressway	Local Connector
Secondary Hwy	Local Road
Ramp	4WD

Interstate Route | US Route | State Route

CRESLENN RANCH, TX
2019

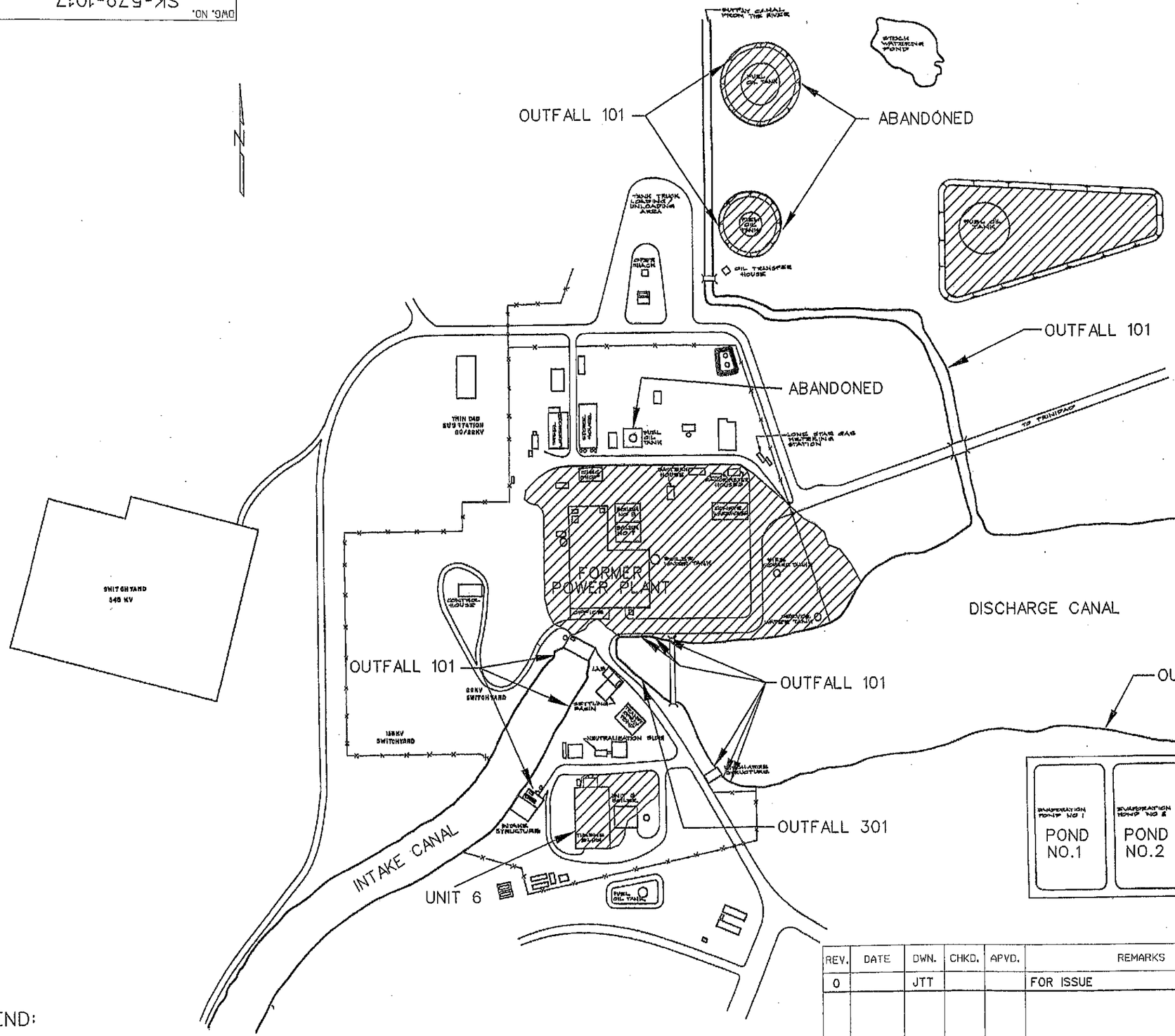
TEXAS
QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

ADJOINING QUADRANGLES

1 Kerens
2 Malakoff
3 Mallard Hill
4 Goodlow Park
5 Cross Roads
6 Winkler
7 Roustabout Camp
8 Cayuga

DWG. NO. SK-579-1017 SH. NO. 01



NOTES:

OUTFALL 001
COOLING POND DISCHARGE
NOT SHOWN DUE TO MAP SCALE

LEGEND:

OUTFALL 101
APPROXIMATE DRAINAGE AREA

PLAN
SCALE: 1"=300'

REV.	DATE	DWN.	CHKD.	APVD.	REMARKS
0		JTT			FOR ISSUE

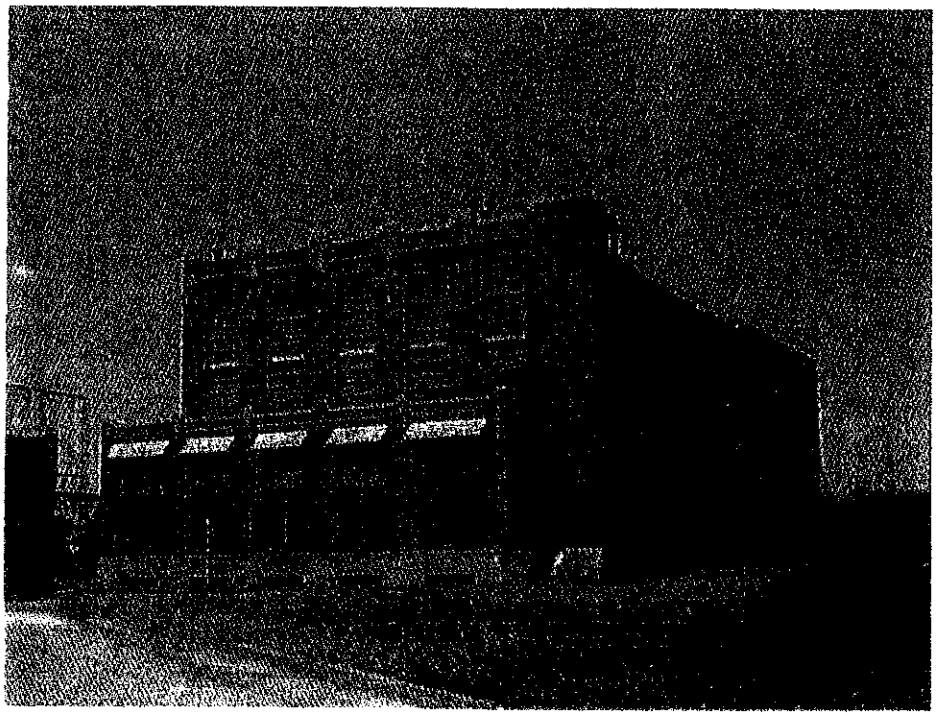
LUMINANT GENERATION COMPANY LLC

TRINIDAD SES

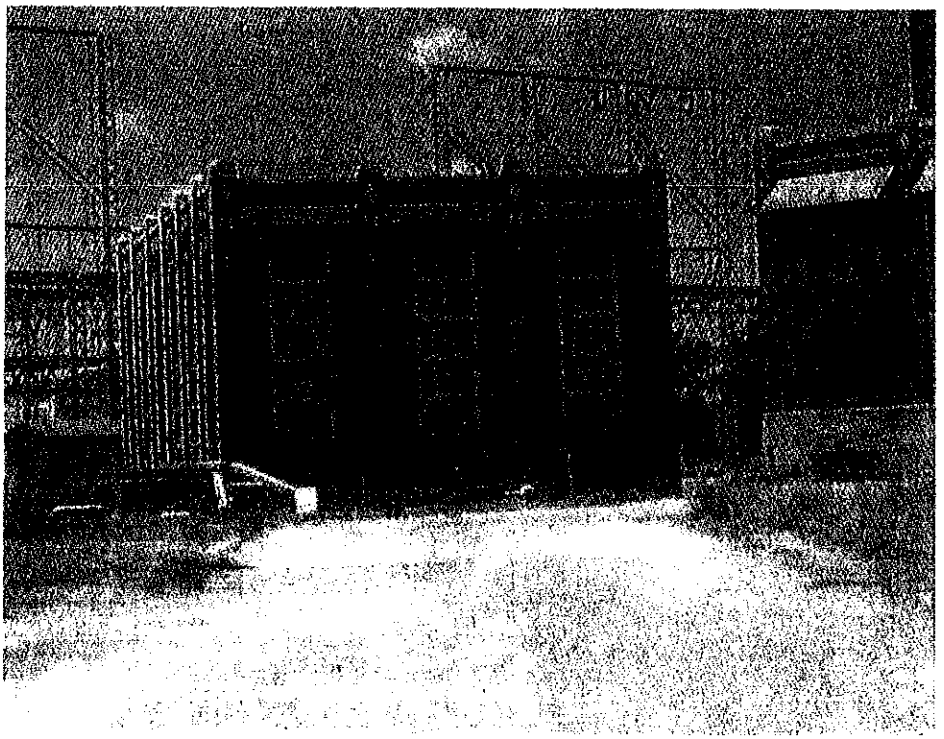
WASTEWATER DISCHARGE FACILITY MAP

DWG. NO. SK-579-1017 | SH.NO. 01 | REV. 0

Luminant Generation Company LLC
Trinidad Steam Electric Station
Photographs of Structures More than 50 years old



Photograph 1. View of the former power plant built in the 1920s.



Photograph 2. View of the former cooling water intake structure built in the 1920's.

Attachment F

General Description

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

TRINIDAD STEAM ELECTRIC STATION
GENERAL DESCRIPTION

The Trinidad Steam Electric Station is a single-unit natural gas-fired steam electric generating facility owned and operated by Luminant Generation Company LLC. The facility is located at 1320 McEntire Road, on the north shore of Trinidad Lake off FM 764, approximately one mile south of the City of Trinidad, Henderson County, Texas. Wastewater discharges are authorized by TPDES Permit No. WQ0000947000. Wastewaters are discharged to Trinidad Lake, thence to a ditch, thence to the Trinity River above Lake Livingston in Segment No. 0804 of the Trinity River Basin. All cooling water is supplied by Trinidad Lake. Water for other industrial purposes and potable water is supplied by the City of Trinidad municipal water supply.

The generating capacity and dates of initial commercial operation for the facility's one unit is as follows:

Unit	Capacity (Mw)	Date
6	240	1965

Wastewaters produced at the plant site consist of once-through and auxiliary cooling water, low volume wastewater (floor/equipment drains, boiler blowdown and water treatment wastes), metal cleaning wastes, storm water runoff and domestic wastes. Oily waste from equipment drains flow into a 250-gallon sump, which is pumped out periodically and placed into drums for disposal. Wastewaters generated by the facility are collected, treated and discharged via four (4) permitted outfalls. Domestic wastes are disposed in an on-site septic system. Luminant Generation'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. In the event of such occurrence, the Company is prepared to treat its water on a static or flow through basis with a non-oxidizing biocide (e.g. Spectrus CT-1300) or by supplementing chlorination with ammonia to create chloramines.

The four 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 and previously monitored effluents
101	Low volume wastes and storm water runoff
201	Metal cleaning wastes and/or low volume wastes
301	Low volume wastes (water treatment wastes)

Outfall 001(Once-through Cooling Water and Previously Monitored Effluents)

Water from Trinidad Lake 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 and/or sodium bromide as a chlorine enhancer to improve efficacy and thereby reduce chlorine feed rates; application of these substances is intermittent and does not exceed the regulatory maximum frequency of two (2) hours/unit/day. Once-through cooling water is also treated with various chemicals to prevent scale and corrosion of the cooling water system equipment. Safety Data Sheets of the current Once-through cooling chemicals are included in Attachment H of the permit application. The once-through and auxiliary cooling wastewater streams are commingled and discharged via an approximately 9,500-foot discharge canal to Trinidad Lake via Outfall 001.

Outfall 101 (Low Volume Wastewater and Storm Water Runoff

Low volume wastes, consisting of boiler blowdown and floor/equipment drains, are discharged to either the intake or Discharge Canal via Outfall 101. The equipment/floor drainage is commingled with storm water runoff from the plant yard drain system (the immediate area surrounding the plant) prior to discharge. Storm water runoff from the diked oil storage areas is also a component of this outfall. The occasional discharge of water from a raw water batch storage tank into the plant's Intake Canal is also a component of this outfall.

Outfall 201 (Metal Cleaning Waste and Low Volume Wastewater)

Metal cleaning wastes generated by boiler cleanings and the cleaning of other large pieces of equipment are either disposed off-site by a contractor or routed to two (2) evaporation/retention ponds for disposal by evaporation or, as needed, for treatment and discharged to the Discharge Canal via Outfall 201. Occasionally, particularly during periods of high wastewater volumes or equipment outages, low volume wastes are also routed to the ponds for evaporation and/or discharge. Low volume wastes handled in this manner usually, but not exclusively, involve water treatment wastes.

Outfall 301 (Low Volume Wastes (Water Treatment Wastes))

Water treatment wastes (low volume wastes) consist primarily of reverse osmosis reject water, demineralizer regeneration wastes and filter backwashes. These wastes, as well as those generated from any other waste/water treatment units, are collected in an elementary neutralization tank for pH adjustment and suspended solids control and are then discharged to the cooling water system via Outfall 301.

Storm Water Management

Storm water runoff from the turbine-generator area and immediately surrounding the generating unit is routed to yard drains and discharged via Outfall 101. Emergency boiler drains are commingled with Water Treatment Wastes and sent to the Neutralization Tank, which goes through Outfall 301, then to the discharge canal.

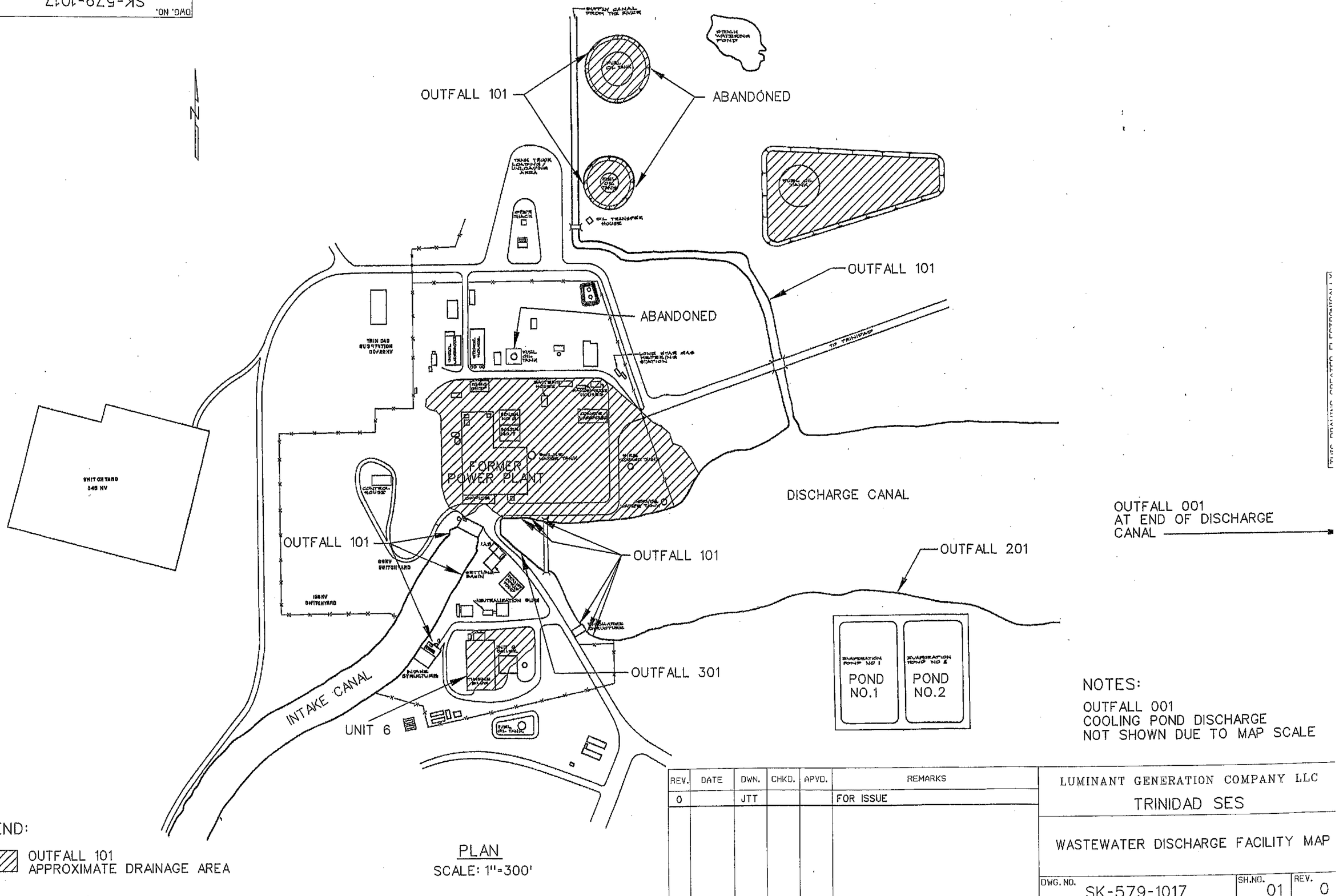
Other areas in which storm water runoff may be exposed to industrial processes are permitted under the TCEQ's Multi-Sector General Permit (Permit No. TXR05W663).

Attachment G

Facility Map

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

SH. NO. 01 | DWG. NO. SK-579-1017



NOTES:

OUTFALL 001
COOLING POND DISCHARGE
NOT SHOWN DUE TO MAP SCALE

LEGEND:

OUTFALL 101
APPROXIMATE DRAINAGE AREA

PLAN
SCALE: 1"=300'

REV.	DATE	DWN.	CHKD.	APVD.	REMARKS
0		JTT			FOR ISSUE

LUMINANT GENERATION COMPANY LLC

TRINIDAD SES

WASTEWATER DISCHARGE FACILITY MAP

DWG. NO.	SH. NO.	REV.
SK-579-1017	01	0

Attachment H

Water balance Diagram

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Water Balance Diagram
Trinidad Steam Electric Station
All flows in MGD unless stated otherwise

Trinity River
597 MGY When Needed
Trinidad Reservoir
Once-Through Cooling
Auxiliary Cooling
URE
0.02
Misc. Service Water
0.2
Floor Drains
0.2
Outfall 101
A
0.226 + runoff
Discharge Canal
425
Outfall 001
SW
Trinidad Reservoir
0.025
A
Raw Water Storage Tank
0.0539
Water Treatment Plant
0.0279
Boiler (Unit 6)
0.026
Emergency Boiler Drains
B
Equipment Cleaning
Metal Cleaning Wastes
Off-Site Disposal
0.0019
0.04376
0.026
0.001
City of Trinidad Municipal Water
Water Treatment Waste
0.026
Neutralization Tank
Evaporation Ponds (POND-1/POND-2)
B
B
Outfall 201
0.002
EVAP
0.00024
Domestic Uses
0.00024
OSSF
0.025
Outfall 301
Yard Drains
Annual Precipitation
23.0 MGY 38"/yr avg.
Diked Oil Storage Area
GR 23.0 MGY
Equipment Drains
URE
Collection Sump
Offsite Disposal

Normal Flow
Intermittent Flow
Infrequent Discharge
URE Unable to Reasonably Estimate

Attachment I

Boiler Chemical Additivies

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Boiler Chemical Additives

- Manufacturers Product Identification Number: **Ammonium hydroxide**
- Product Use: **pH adjustment**
- Chemical Composition: **NH_4OH**
- Classification (non-persistent, persistent or bioaccumulative): **Not Available**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Continuous low-concentration feed during operation**
- Product toxicity data: **Not Available**
- Concentration of whole product or active ingredient in wastestream: **<0.5 mg/L**
- Outfall: **101**

Section 1. Identification

GHS product identifier	: Aqua Ammonia (20-30%)
her means of identification	: Aqua Ammonia, Ammonium Hydroxide
Product type	: Liquid.
Product use	: Synthetic/Analytical chemistry.
Synonym	: Aqua Ammonia, Ammonium Hydroxide
SDS #	: 001195
Supplier's details	: Airgas USA, LLC and its affiliates 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253
24-hour telephone	: 1-866-734-3438

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	: SKIN CORROSION - Category 1B SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3 AQUATIC HAZARD (ACUTE) - Category 1

GHS label elements

Hazard pictograms :

Signal word	: Danger
Hazard statements	: May displace oxygen and cause rapid suffocation. Causes severe skin burns and eye damage. May cause respiratory irritation. Very toxic to aquatic life.

Precautionary statements

General	: Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.
Prevention	: Wear protective gloves. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Avoid breathing vapor. Wash hands thoroughly after handling.
Response	: Collect spillage. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician.
Storage	: Store locked up.
Disposal	: Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Other means of identification : Aqua Ammonia, Ammonium Hydroxide

Product code : 001195

Ingredient name	%	CAS number
Aqua Ammonia	100	1336-21-6
WATER	70 - 80	7732-18-5
ammonia	20 - 30	7664-41-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

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.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

Inhalation : Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact : Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Get medical attention immediately. Call a poison center or physician. Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Chemical burns must be treated promptly by a physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : May cause respiratory irritation.

Skin contact : Causes severe burns.

Frostbite	:	Try to warm up the frozen tissues and seek medical attention.
Ingestion	:	No known significant effects or critical hazards.

Over-exposure signs/symptoms

Eye contact	:	Adverse symptoms may include the following:, pain, watering, redness
Inhalation	:	Adverse symptoms may include the following:, respiratory tract irritation, coughing
Skin contact	:	Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur
Ingestion	:	Adverse symptoms may include the following:, stomach pains

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	:	In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
Specific treatments	:	No specific treatment.
Protection of first-aiders	:	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

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. This material is very toxic to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
Hazardous thermal decomposition products	:	Decomposition products may include the following materials: nitrogen oxides
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. Do not breathe 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). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

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 get in eyes or on skin or clothing. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Avoid release to the environment. Do not ingest. Empty containers retain product residue and can be hazardous. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Do not reuse container. Do not breathe vapor or mist.
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.
›nditions for safe storage, ...cluding 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. Store locked up. 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. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Aqua Ammonia WATER ammonia	None. None. **California PEL for Chemical Contaminants (*Table AC-1*) (United States).** PEL: 25 ppm 8 hours. STEL: 35 ppm 15 minutes. **ACGIH TLV (United States, 3/2017).** 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. **NIOSH REL (United States, 10/2016).** TWA: 25 ppm 10 hours. TWA: 18 mg/m³ 10 hours.

	STEL: 35 ppm 15 minutes. STEL: 27 mg/m³ 15 minutes. **OSHA PEL (United States, 6/2016).** TWA: 50 ppm 8 hours. TWA: 35 mg/m³ 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, 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 and/ or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

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.

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 : Pungent.

Odor threshold : 5 ppm

pH : Approx. 11.6 for 1 N Sol'n. in water

Melting point : -35°F (20% solution) to -115°F(30% solution)

Boiling point : Lowest known value: 38°C (100.4°F) (ammonia). Weighted average: 65.56°C (150°F)

Critical temperature : Not available.

Flash point : Not available.

Section 9. Physical and chemical properties

Evaporation rate	:	Not available.
Flammability (solid, gas)	:	Extremely flammable in the presence of the following materials or conditions: Oxidizing
Lower and upper explosive (flammable) limits	:	Lower: 16% Upper: 25%
Vapor pressure	:	3-10 PSI @ 16 •C
Vapor density	:	Vapor density 0.6 (Air = 1) (ammonia)
Specific Volume (ft ^{3}/lb)	:	20.79
Gas Density (lb/ft ^{3})	:	0.0481
Relative density	:	0.6
Solubility	:	Soluble in water. Soluble in alcohol and ether.
Solubility in water	:	Complete 540 g/l
Partition coefficient: n-octanol/water	:	Not available.
Auto-ignition temperature	:	651°C (1203.8°F)
Decomposition temperature	:	Not available.
Viscosity	:	Not available.
Flow time (ISO 2431)	:	Not available.

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	:	Yellow Metals (brass & copper)
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Aqua Ammonia ammonia	LD50 Oral LC50 Inhalation Gas.	Rat Rat	350 mg/kg 7338 ppm	- 1 hours

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
Aqua Ammonia	Eyes - Severe irritant	Rabbit	-	250 Micrograms	-
	Eyes - Severe irritant	Rabbit	-	0.5 minutes 1 milligrams	-

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Aqua Ammonia	Category 3	Not applicable.	Respiratory tract irritation

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : May cause respiratory irritation.

Skin contact : Causes severe burns.

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, watering, redness

Inhalation : Adverse symptoms may include the following:, respiratory tract irritation, coughing

Skin contact : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur

Ingestion : Adverse symptoms may include the following:, stomach pains

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
Aqua Ammonia ammonia	Acute LC50 37 ppm Fresh water Acute EC50 29.2 mg/l Marine water Acute LC50 2080 µg/l Fresh water Acute LC50 0.53 ppm Fresh water Acute LC50 300 µg/l Fresh water Chronic NOEC 0.204 mg/l Marine water	Fish - Gambusia affinis - Adult Algae - Ulva fasciata - Zoea Crustaceans - Gammarus pulex Daphnia - Daphnia magna Fish - Hypophthalmichthys nobilis Fish - Dicentrarchus labrax	96 hours 96 hours 48 hours 48 hours 96 hours 62 days

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
WATER	-1.38	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

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 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	TDG	Mexico	IMDG	IATA
UN number	UN2672	UN2672	UN2672	UN2672	UN2672
UN proper shipping name	Ammonium Hydroxide or Ammonia solutions	AMMONIA SOLUTION	AMMONIA SOLUTION	AMMONIA SOLUTION	Ammonia solution
Transport hazard class(es)	8 	8 	8 	8 	8 
Packing group	III	III	III	III	III
Environmental hazards	Yes.	Yes.	Yes. The environmentally hazardous substance mark is not required.	Yes.	Yes. The environmentally hazardous substance mark is not required.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : This product is not regulated as a marine pollutant when transported on inland waterways in sizes of ≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes, provided the packagings meet the general provisions of §§ 173.24 and 173.24a. Reportable quantity 1000 lbs / 454 kg [2493.4 gal / 9438.7 L]. Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.40-2.42 (Class 8), 2.7 (Marine pollutant mark). The marine pollutant mark is not required when transported by road or rail.

IMDG : The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg.

IATA : The environmentally hazardous substance mark may appear if required by other transportation regulations.

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

U.S. Federal regulations : TSCA 8(a) CDR Exempt/Partial exemption: Not determined

Clean Water Act (CWA) 311: ammonia; ammonia

Clean Air Act (CAA) 112 regulated toxic substances: ammonia

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

Name	%	EHS	SARA 302 TPQ		SARA 304 RQ	
			(lbs)	(gallons)	(lbs)	(gallons)
ammonia	20 - 30	Yes.	500	-	100	-

SARA 304 RQ : 333.3 lbs / 151.3 kg [831.1 gal / 3146.2 L]

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	ammonia ammonia	1336-21-6 7664-41-7	100 20 - 30
Supplier notification	ammonia ammonia	1336-21-6 7664-41-7	100 20 - 30

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.

State regulations

Massachusetts : The following components are listed: AMMONIUM HYDROXIDE; AMMONIUM WATER; AMMONIA; AMMONIA, ANHYDROUS

New York : The following components are listed: Ammonium hydroxide; Ammonia

New Jersey : The following components are listed: AMMONIUM HYDROXIDE; AMMONIA

Pennsylvania : The following components are listed: AMMONIUM HYDROXIDE; AMMONIA

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

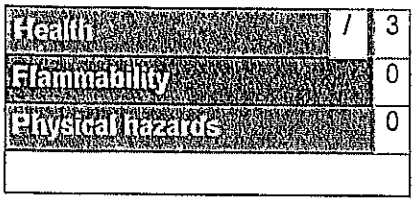
Europe : All components are listed or exempted.

Japan : Japan inventory (ENCS): All components are listed or exempted.
Japan inventory (ISHL): Not determined.

Malaysia	:	All components are listed or exempted.
New Zealand	:	All components are listed or exempted.
Philippines	:	All components are listed or exempted.
Republic of Korea	:	All components are listed or exempted.
Taiwan	:	All components are listed or exempted.
Thailand	:	Not determined.
Turkey	:	Not determined.
United States	:	All components are listed or exempted.
Viet Nam	:	Not determined.

Section 16. Other information

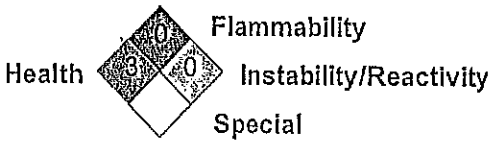
Hazardous Material Information System (U.S.A.)



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 and the associated label are not required on SDSs or products leaving a facility 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 trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)



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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.

Procedure used to derive the classification

Classification	Justification
SKIN CORROSION - Category 1B	Expert judgment
SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Respiratory tract irritation) - Category 3	Calculation method
AQUATIC HAZARD (ACUTE) - Category 1	Calculation method

History

Date of printing	:	2/15/2018
Date of issue/Date of revision	:	2/15/2018
Date of previous issue	:	2/15/2018
Version	:	0.09

Section 16: Other information

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
References	:	Not available.

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.

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Boiler Chemical Additives

- Manufacturers Product Identification Number: **Disodium Phosphate**
- Product Use: **Anti-scalant**
- Chemical Composition: **Na_2HPO_4**
- Classification (non-persistent, persistent or bioaccumulative): **Not Available**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Continuous low-concentration feed during operation**
- Product toxicity data: **Not Available**
- Concentration of whole product or active ingredient in wastestream: **Not Available**
- Outfall: **101**

SAFETY DATA SHEET

1. Identification

Product identifier: SODIUM PHOSPHATE DIBASIC ANHYDROUS

Other means of identification
Synonyms: Disodium phosphate, DSP, Disodium hydrogen phosphate
Product No.: 4062, 3830, 3827, 3826, 3804, 3828, 7920, 7917, 7771, 73815

Recommended use and restriction on use

Recommended use: Not available.
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company Name:	Avantor Performance Materials, Inc.
Address:	3477 Corporate Parkway, Suite 200 Center Valley, PA 18034
Telephone:	Customer Service: 855-282-6867
Fax:	
Contact Person:	Environmental Health & Safety
e-mail:	info@avantormaterials.com

Emergency telephone number:
24 Hour Emergency: 908-859-2151

Chemtrec: 800-424-9300

2. Hazard(s) identification

Hazard classification

Health hazards

Serious eye damage/eye irritation — Category 2B

Label elements

Hazard symbol: No symbol

Signal word: Warning

Hazard statement: Causes eye irritation.

Precautionary statement

Prevention: Wash hands thoroughly after handling.

Response: 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 advice/attention.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Substances

Chemical identity	Common name and synonyms	CAS number	Content in percent (%)*
SODIUM PHOSPHATE, DIBASIC		7558-79-4	98 - 100%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. If medical advice is needed, have product container or label at hand. Show this safety data sheet to the doctor in attendance.

Ingestion: Rinse mouth thoroughly. Call a POISON CENTER or doctor/physician if you feel unwell.

Inhalation: Move to fresh air. Get medical attention if symptoms persist.

Skin contact: Wash skin thoroughly with soap and water. Get medical attention if irritation persists after washing. Wash contaminated clothing before reuse.

Eye contact: Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. If eye irritation persists: Get medical advice/attention.

Most important symptoms/effects, acute and delayed

Symptoms: May cause irritation to skin, eyes, and respiratory tract.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General fire hazards: The product is non-combustible.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	Keep unauthorized personnel away. Use personal protective equipment. See Section 8 of the MSDS for Personal Protective Equipment.
Methods and material for containment and cleaning up:	Sweep up and place in a clearly labeled container for chemical waste. Clean surface thoroughly to remove residual contamination.
Notification Procedures:	Prevent entry into waterways, sewer, basements or confined areas. Inform authorities if large amounts are involved.
Environmental precautions:	Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling:	Use personal protective equipment as required. Avoid contact with eyes, skin, and clothing. Avoid inhalation of dust. Wash thoroughly after handling.
Conditions for safe storage, including any incompatibilities:	Keep container tightly closed. Store in cool, dry place. Store in a well-ventilated place.

8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

None of the components have assigned exposure limits.

Appropriate engineering controls	No data available.

Individual protection measures, such as personal protective equipment

General information:	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.
Eye/face protection:	Use tight fitting goggles if dust is generated.
Skin protection	
Hand protection:	Wear protective gloves.
Other:	Wear suitable protective clothing.
Respiratory protection:	In case of inadequate ventilation use suitable respirator.
Hygiene measures:	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Provide eyewash station and safety shower.

9. Physical and chemical properties

Appearance	
Physical state:	Solid
Form:	Granules
Color:	White
Odor:	Odorless
Odor threshold:	No data available.
pH:	9.1 (25 °C) (1% solution)
Melting point/freezing point:	No data available.
Initial boiling point and boiling range:	No data available.
Flash Point:	Not applicable
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	No data available.
Vapor density:	No data available.
Relative density:	2.07 (20 °C)
Solubility(ies)	
Solubility in water:	Soluble
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.
Other information	
Molecular weight:	141.98 g/mol (H3O4P.2Na)

10. Stability and reactivity

Reactivity:	No dangerous reaction known under conditions of normal use.
Chemical stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Hazardous polymerization does not occur.
Conditions to avoid:	Contact with incompatible materials. The substance is hygroscopic and will absorb water by contact with the moisture in the air.
Incompatible materials:	Acids.
Hazardous decomposition products:	oxides of phosphorus Sodium oxides

11. Toxicological information

Information on likely routes of exposure

Ingestion:	May cause irritation of the gastrointestinal tract.
Inhalation:	Dust may irritate respiratory system or lungs.

Skin contact: Causes mild skin irritation.

Eye contact: Causes eye irritation.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral
Product: LD 50 (Rat): 17 g/kg

Dermal
Product:
No data available.

Inhalation
Product: No data available.

Repeated dose toxicity
Product: No data available.

Skin corrosion/irritation
Product: May cause skin irritation.

Serious eye damage/eye irritation
Product: May irritate eyes.

Respiratory or skin sensitization
Product: Not a skin sensitizer.

Carcinogenicity
Product: This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ cell mutagenicity

In vitro
Product: No mutagenic components identified

In vivo
Product: No mutagenic components identified

Reproductive toxicity
Product: No components toxic to reproduction

Specific target organ toxicity - single exposure
Product: None known.

Specific target organ toxicity - repeated exposure
Product: None known.

Aspiration hazard
Product: Not classified

Other effects: None known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic invertebrates
Product: No data available.

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and degradability

Biodegradation
Product: There are no data on the degradability of this product.

BOD/COD ratio
Product: No data available.

Bioaccumulative potential

Bioconcentration factor (BCF)
Product: No data available on bioaccumulation.

Partition coefficient n-octanol / water (log Kow)
Product: No data available.

Mobility in soil: No data available.

Other adverse effects: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT
Not regulated.

IMDG
Not regulated.

IATA

Not regulated.

15. Regulatory information

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

SODIUM PHOSPHATE, DIBASIC — Reportable quantity: 5000 lbs.

Superfund amendments and reauthorization act of 1986 (SARA)

Hazard categories

[X] Acute (Immediate) [ ] Chronic (Delayed) [ ] Fire [ ] Reactive [ ] Pressure Generating

SARA 302 Extremely hazardous substance

None present or none present in regulated quantities.

SARA 304 Emergency release notification

Chemical identity	RQ
SODIUM PHOSPHATE, DIBASIC	5000 lbs.

SARA 311/312 Hazardous chemical

Chemical identity	Threshold Planning Quantity
SODIUM PHOSPHATE, DIBASIC	500 lbs

SARA 313 (TRI reporting)

None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

SODIUM PHOSPHATE, DIBASIC — Reportable quantity: 5000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

None present or none present in regulated quantities.

US state regulations

US. California Proposition 65

No ingredient regulated by CA Prop 65 present.

US. New Jersey Worker and Community Right-to-Know Act

SODIUM PHOSPHATE, DIBASIC — Listed

US. Massachusetts RTK - Substance List

SODIUM PHOSPHATE, DIBASIC — Listed

US. Pennsylvania RTK - Hazardous Substances

SODIUM PHOSPHATE, DIBASIC — Listed

US. Rhode Island RTK

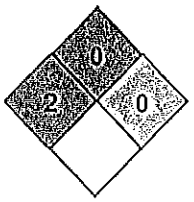
No ingredient regulated by RI Right-to-Know Law present.

Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EINECS, ELINCS or NLP:	On or in compliance with the inventory
Japan (ENCS) List:	On or in compliance with the inventory
China Inv. Existing Chemical Substances:	Not in compliance with the inventory.
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Japan ISHL Listing:	On or in compliance with the inventory
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16.Other information, including date of preparation or last revision

NFPA Hazard ID



Flammability
Health
Reactivity
Special hazard.

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue date:	05-27-2014
Revision date:	No data available.
Version #:	1.1
Further information:	No data available.

Disclaimer:

THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED "AS IS," AND AVANTOR PERFORMANCE MATERIALS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION, WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NON-INFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE. THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, AVANTOR PERFORMANCE MATERIALS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. AVANTOR PERFORMANCE MATERIALS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES.

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Boiler Chemical Additives

- Manufacturers Product Identification Number: **Trisodium Phosphate**
- Product Use: **Anti-scalant**
- Chemical Composition: **Na_3PO_4**
- Classification (non-persistent, persistent or bioaccumulative): **Not Available**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Continuous low-concentration feed during operation**
- Product toxicity data: **Not Available**
- Concentration of whole product or active ingredient in wastestream: **Not Available**
- Outfall: **101**

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300
National Response In Canada
CANUTEC: 613-996-6666
Outside U.S. And Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

Sodium Phosphate, Tribasic, 12-Hydrate

1. Product Identification

Synonyms: Trisodium Phosphate, 12-Hydrate; Phosphoric Acid, Trisodium Salt, Dodecahydrate
CAS No.: 7601-54-9 (Anhydrous) 10101-89-0 (Dodecahydrate)
Molecular Weight: 380.12
Chemical Formula: Na3PO4 . 12H2O
Product Codes: 3836, 3840

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Sodium Phosphate, Tribasic	7601-54-9	98 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Green (General Storage)

Potential Health Effects

Inhalation:
Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Behaves as a moderately strong alkali; intense exposure may result in the destruction of mucous membranes. May cause asthmatic bronchitis, chemical pneumonitis, or pulmonary edema.
Ingestion:
Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea. May cause mild burning of mouth, throat, and stomach. Its alkaline nature may injure the esophagus and digestive tract. Aqueous, highly alkaline solutions may produce caustic burns.
Skin Contact:
Causes irritation to skin. Symptoms include redness, itching, and pain. Extent of damage depends on duration of contact. More serious effects may occur if the skin is moist. Aqueous, highly alkaline solutions may produce caustic burns.
Eye Contact:
Causes irritation to eyes, may be severe with possible corneal damage. Aqueous, highly alkaline solutions may produce caustic burns.
Chronic Exposure:
Repeated exposure may cause symptoms similar to those listed for acute effects. May cause permanent tissue damage to the skin and eyes.
Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
Ingestion:
Do NOT induce vomiting. Give large amounts of water. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust

dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Trisodium phosphate:
-AIHA Workplace Environmental Exposure Limit:
5 mg/m3 (15-minute STEL)
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, a full facepiece respirator with high efficiency particulate filter (NIOSH type N100 filter) may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type Ror P filter. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White crystalline solid.
Odor:
Odorless.
Solubility:
Appreciable (> 10%)
Specific Gravity:
1.62
pH:
Strongly alkaline.
% Volatiles by volume @ 21C (70F):
0
Boiling Point:
Decomposes.
Melting Point:

73.3 - 76.7C (163 - 171F)
Vapor Density (Air=1):
Not applicable.
Vapor Pressure (mm Hg):
Not applicable.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
Sodium and phosphorus oxides may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Reacts violently with water and acids to liberate heat.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Trisodium Phosphate: Investigated as a mutagen. Trisodium Phosphate, Dodecahydrate: 7400 mg/kg oral rat LD50.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Sodium Phosphate, Tribasic (7601-54-9)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Sodium Phosphate, Tribasic (7601-54-9)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Sodium Phosphate, Tribasic (7601-54-9)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Sodium Phosphate, Tribasic (7601-54-9)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Sodium Phosphate, Tribasic (7601-54-9)	5000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: 2 Flammability: 0 Reactivity: 1
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.
Label Precautions:
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Avoid breathing dust.
Keep container closed.
Use only with adequate ventilation.
Label First Aid:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Boiler Chemical Additives

- Manufacturers Product Identification Number: **Cortrol OS5035 (Hydrazine)**
- Product Use: **Oxygen Scavenger**
- Chemical Composition: **N_2H_4**
- Classification (non-persistent, persistent or bioaccumulative): **Not Available**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Continuous low-concentration feed during operation**
- Product toxicity data: **See attached data sheets**
- Concentration of whole product or active ingredient in wastestream: **Not Available**
- Outfall: **101**

MSDS Material Safety Data Sheet

From: Avantor Performance Materials, Inc.
Saucon Valley Plaza
3477 Corporate Parkway
Suite #200
Center Valley, PA 18034

J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response In Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service, 1-855-AVANTOR (855-292-6867) for assistance.

HYDRAZINE DIHYDROCHLORIDE

1. Product Identification

Synonyms: None
CAS No.: 5341-61-7
Molecular Weight: 104.98
Chemical Formula: H4N2.2HCL
Product Codes: N368

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrazine Dihydrochloride	5341-61-7	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

DANGER! CORROSIVE. CAUSES SEVERE BURNS TO EVERY AREA OF CONTACT. EXPOSURE MAY CREATE CANCER RISK. MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. VAPORS CAUSE SEVERE IRRITATION TO EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 4 - Extreme (Cancer Causing)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

POISON. Exposure may create a cancer risk, based on animal testing. Information on the human health effects from exposure is limited.

Inhalation:
Harmful or fatal if inhaled. Vapors highly irritating to eyes and respiratory tract. Systemic poisoning may occur with symptoms similar to those of ingestion.
Ingestion:
Harmful or fatal if swallowed. Corrosive. Swallowing can cause severe burns of the mouth, throat, and stomach, leading to death. Can cause sore throat, vomiting, diarrhea. May cause injury to lungs, liver and kidneys.
Skin Contact:
Corrosive. Symptoms of redness, pain, and severe burn can occur. May be harmful or fatal if absorbed through skin. Systemic poisoning may occur with symptoms similar to those of ingestion. May cause allergic skin reaction.
Eye Contact:
Corrosive. Can cause blurred vision, redness, pain, severe tissue burns and eye damage.
Chronic Exposure:
Exposure may cause damage to the liver, kidneys, and lungs. Carcinogenic potential based on animal tests with hydrazine.
Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention immediately. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard.
Explosion:
Not considered to be an explosion hazard. Sealed containers may rupture when heated.
Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal.

7. Handling and Storage

Keep in a tightly closed container. Store in a cool, dry, corrosion-proof, ventilated area away from moisture, sources of heat or ignition, combustibles and oxidizers. Protect against physical damage. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- For Hydrazine (CAS 302-01-2) -
OSHA (PEL): 1 ppm (TWA), skin.
ACGIH (TLV): 0.01 ppm (TWA), skin, A3 - animal carcinogen.
NIOSH (REL): 0.03 ppm (2-hour), ceiling, potential occupational carcinogen.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134).

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White crystalline powder.
Odor:
No information found.
Solubility:
Freely soluble.
Density:
1.420
pH:
No information found.

% Volatiles by volume @ 21C (70F):
0
Boiling Point:
200C (392F) Decomposes.
Melting Point:
198C (388F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
No information found.
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Can decompose violently at elevated temperatures.
Hazardous Decomposition Products:
May produce carbon monoxide, carbon dioxide, nitrogen oxides and hydrogen chloride when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents, strong bases, most common metals and organic materials.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Toxicological Data:
No LD50/LC50 information found relating to normal routes of occupational exposure. Investigated as a mutagen.
Carcinogenicity:
For Hydrazine: NTP classification: Group 2 - Reasonably anticipated to be carcinogen.
IARC classification: Group 2B - Possibly carcinogenic to humans.
EPA / IRIS classification: Group B2 - Probable human carcinogen, sufficient animal evidence.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Hydrazine Dihydrochloride (5341-61-7)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.
Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S. (HYDRAZINE DIHYDROCHLORIDE)
Hazard Class: 8
UN/NA: UN3260
Packing Group: III
Information reported for product/size: 500G

International (Water, I.M.O.)

Proper Shipping Name: CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S. (HYDRAZINE DIHYDROCHLORIDE)
Hazard Class: 8
UN/NA: UN3260
Packing Group: III
Information reported for product/size: 500G

International (Air, I.C.A.O.)

Proper Shipping Name: CORROSIVE SOLID, ACIDIC, INORGANIC, N.O.S. (HYDRAZINE DIHYDROCHLORIDE)
Hazard Class: 8
UN/NA: UN3260
Packing Group: III
Information reported for product/size: 500G

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Hydrazine Dihydrochloride (5341-61-7)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Hydrazine Dihydrochloride (5341-61-7)	No	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.

Hydrazine Dihydrochloride (5341-61-7)	No	No	No	No

\Federal, State & International Regulations - Part 2\

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Hydrazine Dihydrochloride (5341-61-7)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: None allocated.
Poison Schedule: None allocated.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 4 Flammability: 0 Reactivity: 2
Label Hazard Warning:
DANGER! CORROSIVE. CAUSES SEVERE BURNS TO EVERY AREA OF CONTACT. EXPOSURE MAY CREATE CANCER RISK. MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. VAPORS CAUSE SEVERE IRRITATION TO EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION.
Label Precautions:
Do not get in eyes, on skin, or on clothing. Do not breathe dust, mist or vapor. Keep container closed.
Use only with adequate ventilation. Wash thoroughly after handling.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases get medical attention immediately.
Product Use: Laboratory Reagent.
Revision Information: No Changes.

Disclaimer:
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THE INFORMATION PRESENTED IN THIS MATERIAL SAFETY DATA SHEET (MSDS/SDS) WAS PREPARED BY TECHNICAL PERSONNEL BASED ON DATA THAT THEY BELIEVE IN THEIR GOOD FAITH JUDGMENT IS ACCURATE. HOWEVER, THE INFORMATION PROVIDED HEREIN IS PROVIDED "AS IS," AND AVANTOR PERFORMANCE MATERIALS MAKES AND GIVES NO REPRESENTATIONS OR WARRANTIES WHATSOEVER, AND EXPRESSLY DISCLAIMS ALL WARRANTIES REGARDING SUCH INFORMATION AND THE PRODUCT TO WHICH IT RELATES, WHETHER EXPRESS, IMPLIED, OR STATUTORY, INCLUDING WITHOUT LIMITATION, WARRANTIES OF ACCURACY, COMPLETENESS, MERCHANTABILITY, NON-INFRINGEMENT, PERFORMANCE, SAFETY, SUITABILITY, STABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, AND ANY WARRANTIES ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE, OR USAGE OF TRADE.
continued

THIS MSDS/SDS IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PROPERLY TRAINED PERSON USING THIS PRODUCT, AND IS NOT INTENDED TO BE COMPREHENSIVE AS TO THE MANNER AND CONDITIONS OF USE, HANDLING, STORAGE, OR DISPOSAL OF THE PRODUCT. INDIVIDUALS RECEIVING THIS MSDS/SDS MUST ALWAYS EXERCISE THEIR OWN INDEPENDENT JUDGMENT IN DETERMINING THE APPROPRIATENESS OF SUCH ISSUES. ACCORDINGLY, AVANTOR PERFORMANCE MATERIALS ASSUMES NO LIABILITY WHATSOEVER FOR THE USE OF OR RELIANCE UPON THIS INFORMATION. NO SUGGESTIONS FOR USE ARE INTENDED AS, AND NOTHING HEREIN SHALL BE CONSTRUED AS, A RECOMMENDATION TO INFRINGE ANY EXISTING PATENTS OR TO VIOLATE ANY FEDERAL, STATE, LOCAL, OR FOREIGN LAWS. AVANTOR PERFORMANCE MATERIALS REMINDS YOU THAT IT IS YOUR LEGAL DUTY TO MAKE ALL INFORMATION IN THIS MSDS/SDS AVAILABLE TO YOUR EMPLOYEES.

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Prepared by: Environmental Health & Safety

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Boiler Chemical Additives

- Manufacturers Product Identification Number: **Sodium Hydroxide**
- Product Use: **pH adjustment**
- Chemical Composition: **NaOH**
- Classification (non-persistent, persistent or bioaccumulative): **Not Available**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Continuous low-concentration feed during operation**
- Product toxicity data: **Not Available**
- Concentration of whole product or active ingredient in wastestream: **Not Available**
- Outfall: **101**

cp2451
R001809

MATERIAL SAFETY DATA SHEET

Vulcan CHEMICALS
A Division of Vulcan Materials Company
P O Box 530390
Birmingham, AL 35253-0390

24 Hour Emergency Phone 316/524-5751

SECTION 1 PRODUCT IDENTIFICATION

CHEMICAL NAME
Sodium Hydroxide Solution

CHEMICAL FORMULA
NaOH

MOLECULAR WEIGHT
40.00

PRODUCT NAME
Caustic Soda, 50% and Weaker Solutions

SYNONYMS
Liquid Caustic, Lye Solution, Caustic, Lye, Soda Lye

DOT IDENTIFICATION NO.
UN 1824

SECTION 2 COMPONENT DATA

CHEMICAL NAME	CAS NUMBER	% (wt.) Approx	OSHA PEL
Sodium Hydroxide	1310-73-2	50 and less	2 mg/m^3 Ceiling

Note: This Material Safety Data Sheet is also valid for caustic soda solutions weaker than 50%. The boiling point, vapor pressure, and specific gravity will be different from those listed.

SECTION 3 PHYSICAL DATA

APPEARANCE AND ODOR
Colorless or slightly colored, clear or opaque; odorless

SPECIFIC GRAVITY
50% Solution: 1.53 @ 60°F/60°F

BOILING POINT
50% Solution: 293°F (145°C)

VAPOR DENSITY IN AIR (Air = 1)
N/A

VAPOR PRESSURE
50% Solution: 6.3 mm Hg @ 104°F

% VOLATILE BY VOLUME
0

EVAPORATION RATE
0

SOLUBILITY IN WATER
100%

SECTION 4 REACTIVITY INFORMATION

STABILITY
Stable

CONDITIONS TO AVOID:
Mixture with water, acid or incompatible materials can cause splattering and release of large amounts of heat (Refer to Section 7). Will react with some metals forming flammable hydrogen gas.

INCOMPATIBLE MATERIALS
Chlorinated and fluorinated hydrocarbons (i.e. chloroform, difluoroethane), acetaldehyde, acrolein, aluminum, chlorine trifluoride, hydroquinone, maleic anhydride, phosphorous pentoxide and tetrahydrofuran.

HAZARDOUS DECOMPOSITION PRODUCTS
Will not decompose

HAZARDOUS POLYMERIZATION
Will not occur

SECTION 5 FIRE AND EXPLOSION HAZARD INFORMATION

FLASH POINT
None

FLAMMABLE LIMITS IN AIR
None

EXTINGUISHING MEDIA
N/A

NFPA RATINGS
Health 3; Flammability 0; Reactivity 1

UNUSUAL FIRE AND EXPLOSION HAZARDS
Firefighters should wear self-contained positive pressure breathing apparatus, and avoid skin contact. Refer to Reactivity Data, Section 4.

SECTION 6 TOXICITY AND FIRST AID

EXPOSURE STANDARDS

ACGIH: 2 mg/m^3 Ceiling
OSHA 2 mg/m^3 Ceiling

IMMEDIATELY DANGEROUS TO LIFE OR HEALTH:

IDLH: 250 mg/m^3

When exposure to this product and other chemicals is concurrent, the exposure limit must be defined in the workplace. Effects described in this section are believed not to occur if exposures are maintained at or below the appropriate ceiling limits, however because of the wide variation in individual susceptibility, these exposure limits may not be applicable to all persons and those with the medical conditions listed below.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
May aggravate existing skin and/or eye conditions on contact.

ACUTE TOXICITY

PRIMARY ROUTES OF EXPOSURE
Inhalation, skin and eye contact

INHALATION
Inhalation of solution mist can cause mild irritation at 2 mg/m^3. More severe burns and tissue damage in the upper respiratory tract can occur at higher concentrations. Pneumonitis can result from severe exposures.

SKIN
Major potential hazard - contact with the skin can cause severe burns with deep ulcerations. Contact with solution or mist can cause multiple burns with temporary loss of hair at burn site. Solutions of 4% may not cause irritation and burning for several hours, while 25% to 50% solutions can cause these effects in less than 3 minutes.

EYE
Major potential hazard - Liquid in the eye can cause severe eye tissue destruction and blindness. These effects can occur rapidly affecting all parts of the eye. Mist or dust can cause irritation, with high concentrations causing destructive burns.

INGESTION
Ingestion of sodium hydroxide can cause severe burning and pain in lips, mouth, tongue, throat and stomach. Severe scarring of the throat can occur after swallowing. Death can result from ingestion.

FIRST AID

INHALATION
Move person to fresh air. If breathing stops, administer artificial respiration. Get medical attention immediately.

SKIN

Remove contaminated clothing immediately and wash skin thoroughly for a minimum of 15 minutes with large quantities of water (preferably a safety shower). Get medical attention immediately.

EYES

Wash eyes immediately with large amounts of water (preferably eye wash fountain), lifting the upper and lower eyelids and rotating eyeball. Continue washing for a minimum of 15 minutes. Get medical attention immediately.

INGESTION

If person is conscious, give large quantities of water to dilute caustic. Do not induce vomiting. Get medical attention immediately. Do not give anything by mouth to an unconscious person.

CHRONIC TOXICITY

No known chronic effects

CARCINOGENICITY

No studies were identified relative to sodium hydroxide and carcinogenicity. Sodium hydroxide is not listed on the IARC, NTP or OSHA carcinogen lists.

REPRODUCTIVE TOXICITY

No studies were identified relative to sodium hydroxide and reproductive toxicity.

SECTION 7 PERSONAL PROTECTION AND CONTROLS

RESPIRATORY PROTECTION

Where concentrations exceed or are likely to exceed 2 mg/m^3 use a NIOSH/MSHA approved high-efficiency particulate filter with full facepiece or self-contained breathing apparatus. Follow any applicable respirator use standards and regulations.

VENTILATION

As necessary to maintain concentration in air below 2 mg/m^3 at all times.

SKIN PROTECTION

Wear neoprene, PVC, or rubber gloves; PVC rain suit; rubber boots with pant legs over boots.

EYE PROTECTION

Splashproof chemical goggles and faceshield.

HYGIENE

Avoid contact with skin and avoid breathing mist. Do not eat, drink, or smoke in work area. Wash hands prior to eating, drinking, or using restroom. Any protective clothing or shoes which become contaminated with caustic should be removed immediately and thoroughly laundered before any reuse.

OTHER CONTROL MEASURES

Safety shower and eyewash station must be located in immediate work area. To determine the exposure level(s), monitoring should be performed regularly.

NOTE: Protective equipment and clothing should be selected, used, and maintained according to applicable standards and regulations. For further information, contact the clothing or equipment manufacturer or the Vulcan Chemicals Technical Service Department.

SECTION 8 HANDLING AND STORAGE

Follow protective controls set forth in Section 7 when handling this product.

Store in closed, properly labeled tanks or containers. Do not remove or deface labels or tags.

When diluting with water, slowly add caustic solution to the water. Heat will be produced during dilution. Full protective clothing, goggles and faceshield should be worn. Do not add water to caustic because excessive heat formation will cause boiling and spattering.

Contact of caustic soda cleaning solutions with food and beverage products (in enclosed vessels or spaces) can produce lethal concentrations of carbon monoxide gas. Do not enter confined spaces such as tanks or pits without following proper entry procedures as required by 29 CFR 1910.146.

SARA Title III Hazard Categories: Immediate Health.

SECTION 9 SPILL, LEAK AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Cleanup personnel must wear proper protective equipment (refer to Section VII). Completely contain spilled material with dikes, sandbags, etc., and prevent run-off into ground or surface waters or sewers. Recover as much material as possible into containers for disposal. Remaining material may be diluted with water and neutralized with dilute hydrochloric acid. Neutralization products, both liquid and solid, must be recovered for disposal. Reportable Quantity (RQ) is 1000 lbs. Notify National Response Center (800/424-8802) of uncontained releases to the environment in excess of the RQ.

WASTE DISPOSAL METHOD

Recovered solids or liquids may be sent to a licensed reclaimer or disposed of in a permitted waste management facility. Consult federal, state, or local disposal authorities for approved procedures.

SECTION 10 TRANSPORTATION INFORMATION

DOT SHIPPING DESCRIPTION (49 CFR 172.101)

Sodium Hydroxide Solution, 8, UN 1824, PG II, RQ

PLACARD REQUIRED

Corrosive, 1824, Class 8

LABEL REQUIRED

Corrosive, Class 8. Label as required by OSHA Hazard Communication Standard, and any applicable state and local regulations.

Medical Emergencies:
Call collect 24 hours a day for emergency toxicological information 415/821-3182

Other Emergency Information:
Call 316/524-5751 (24 Hours)

For any other information contact:
Vulcan Chemicals
Technical and Environmental Services
P O Box 530390
Birmingham, AL 35253-0390
800/873-4898
8 AM - 5 PM, Central Time
Monday through Friday

Date of Preparation: January 15, 1996

FORM 3239-210

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Boiler Chemical Additives

- Manufacturers Product Identification Number: **Anodamine HPFG +**
- Product Use: **Anti-scalant and corrosion inhibitor**
- Chemical Composition: **Proprietary**
- Classification (non-persistent, persistent or bioaccumulative): **Not Available**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Continuous low-concentration feed during operation**
- Product toxicity data: **See attached data sheets**
- Concentration of whole product or active ingredient in wastestream: **Not Available**
- Outfall: **101**

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.

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 amodamine 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 amodamine™ 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 amodamine™ 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 [redacted] 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.

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

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

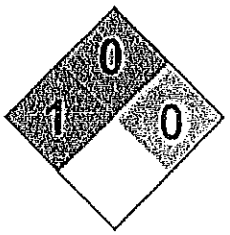
15. REGULATORY INFORMATION

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

Attachment J

Once–Through Cooling Chemical Additives

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Once-Through Cooling Chemical Additives

- Manufacturers Product Identification Number: **Sodium Hypochlorite**
- Product Use: **Biocide (oxidizing)**
- Chemical Composition: **NaOCl**
- Classification (non-persistent, persistent or bioaccumulative): **Not Available**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Intermittent use; not exceeding 2 hours/day/unit**
- Product toxicity data: **See attached data sheets**
- Concentration of whole product or active ingredient in wastestream: **Not Detectable**
- Outfall: **001**

Safety Data Sheet

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identifier: DIXICHLOR
Synonyms: Bleach, Sodium Hypochlorite, Sodium Hypochlorite 10%
Intended use: Swimming pool chlorinator, Hard surface cleaner, Water treatment chemical, Biocides
Uses Advised Against: None identified. This is a pesticide product, do not use in a pesticide application that is not included on the label.

Company Identification
DPC Industries, Inc.
DPC Enterprises, LP
DXI Industries, Inc.
DX Terminals
PO Box 24600
Houston , TX 77229-4600

Emergency
CHEMTREC (USA) (800) 424-9300
24 hour Emergency Telephone No. (281) 457-4888
www.dxgroup.com

2. Hazard identification of the product

Physical hazards	Corrosive to metals	Category 1
Health hazards	Skin corrosion/irritation	Category 1
	Serious eye damage/eye irritation	Category 1
	Specific target organ toxicity, single exposure	Category 3 respiratory tract irritation
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 1
	Hazardous to the aquatic environment, long-term hazard	Category 2

Label elements
Using the Toxicity Data listed in section 11 and 12 the product is labeled as follows.

Signal Word	Danger
Hazard Statements	Harmful in contact with skin. Causes severe skin burns and eye damage. Causes serious eye damage. Very toxic to aquatic life. Toxic to aquatic life with long lasting effects. May be corrosive to metals
Precautionary Statements	
Prevention	Do not breathe mist / vapors / spray. Wash thoroughly after handling. Avoid release to the environment. Wear protective gloves / eye protection / face protection. Use in well ventilated area.
Response	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN: Remove / Take off immediately all contaminated clothing. Wash with plenty of soap and water. IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor / physician if you feel unwell. IF IN EYES: Rinse continuously with water for several minutes. Remove contact lenses if present and easy to do - continue rinsing. Immediately call a POISON CENTER or doctor / physician. Wash contaminated clothing before reuse. Collect spillage.
Storage	Store in a well-ventilated place. Keep container tightly closed. Store locked up. Protect from sunlight.
Disposal	Dispose of contents / container in accordance with local / national regulations.

3. Composition/information on ingredients

Synonyms: Bleach, Sodium Hypochlorite, Sodium Hypochlorite 10%

Ingredient	CAS Number	Percent (%)	NOTES
Sodium hypochlorite	7681-52-9	10 – 12.49	Substance classified with a health or environmental hazard.
Sodium chloride	7647-14-5	7 - 8	Substance classified with a health or environmental hazard.
Sodium hydroxide	1310-73-2	.1 - 5	Substance classified with a health or environmental hazard. Substance with a workplace exposure limit.

4. First aid measures

General	Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.
Inhalation	Move victim to fresh air. Call emergency medical care. Apply artificial respiration if victim is not breathing. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult.
Eyes	Irrigate copiously with clean fresh water for at least 10 minutes, holding the eyelids apart. Get medical attention. Remove contact lenses if present and easy to do - continue rinsing.
Skin	Remove contaminated clothing. Wash skin thoroughly with soap and water or use a recognized skin cleanser. Do NOT use solvents or thinners.
Ingestion	If accidentally swallowed obtain immediate medical attention. Rinse mouth. Keep at rest. Do NOT induce vomiting. If vomiting occurs, keep head low so that stomach content does not get into lungs.
Most important symptoms and effects, both acute and delayed	
Overview	Corrosive effects. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result.
Indication of immediate medical attention and special treatment needed	Treat symptomatically. Chemical burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital
General Information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Show this safety data sheet to the doctor in attendance.

5. Fire-fighting measures

Recommended Extinguishing media	Alcohol resistant foam, CO^2, dry chemical powder, water spray. Do not use water jet.
Special hazards arising from the substance or mixture	Hydrogen chloride and chlorine. Chlorine gas rate of decomposition increases with the concentration with temperatures above 85 °F (30 °C). Do not breathe mist / vapors / spray.
Advice for fire-fighters	Wear positive pressure self-contained breathing apparatus (SCBA). Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations where direct contact with the substance is possible. Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.). Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. TOXIC; inhalation, ingestion or skin contact with material may cause severe injury or death. Avoid any skin contact. Contact with molten substance may cause severe burns to skin and eyes. Effects of contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution. ERG Guide No. 154

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Local authorities should be contacted if significant spill cannot be contained.
Environmental precautions	Do not allow spills to enter drains or watercourses.
Methods and material for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills in original containers for re-use. For waste disposal, see Section 13 of the SDS.

7. Handling and storage

Precautions for safe handling	Wear appropriate personal protective equipment. Do not get in eyes, on skin, on clothing. Chemical attack increases with solution strength. Use with adequate ventilation. Observe good industrial hygiene practices. Do not apply heat or direct sunlight. Temperature and product concentration affect product quality and decomposition rates.
Conditions for safe storage, including any incompatibilities	Handle containers carefully to prevent damage and spillage. Keep container tightly closed. Store in a cool and well-ventilated place. Store in a corrosive resistant container. Consult container manufacturer for additional guidance. Store away from and do not mix with incompatible materials such as acids, ammonia, urea, oxidizers, organics and metals such as nickel, copper, tin, aluminum and iron.

8. Exposure controls and personal protection

Exposure Control parameters

CAS No.	Ingestion	Source	Value
1310-73-2	Sodium hydroxide	OSHA	TWA 2 mg/m3
		ACGIH	Ceiling: 2 mg/m3
		NIOSH	C 2 mg/m3
7647-14-5	Sodium chloride	OSHA	No Established Limit
		ACGIH	No Established Limit
		NIOSH	No Established Limit
7681-52-9	Sodium hypochlorite.	OSHA	No Established Limit
		ACGIH	No Established Limit
		NIOSH	No Established Limit

Individual protection measures, such as personal protective equipment

Respiratory	Use NIOSH/MSHA approved respirator, following manufacturer's recommendations when concentrations exceed permissible exposure limits.
Eyes	Wear face shield with safety glasses with side shields and/or safety goggles.
Skin	Chemical resistant clothing such as coveralls/apron boots should be worn. Chemical impervious gloves.
Engineering Controls	Provide adequate ventilation. Where reasonably practicable this should be achieved by the use of local exhaust ventilation and good general extraction. If these are not sufficient to maintain concentrations of particulates and any vapor below occupational exposure limits suitable respiratory protection must be worn. Eye wash and safety shower must be available when handling this product
Other Work Practices	Use good personal hygiene practices. Wash hands before eating, drinking, smoking or using toilet. Promptly remove soiled clothing and wash thoroughly before reuse.

9. Physical and chemical properties

Appearance	Clear, pale yellow, or greenish Liquid
Odor	Pungent, chlorine odor
Odor threshold	0.9 mg/m^3
pH	12 - 13
Melting point / freezing point	7 °F (-13.9 °C)
Initial boiling point and boiling range	Decomposes above 230 °F (110 °C)
Flash Point	Nonflammable
Evaporation rate (Ether = 1)	Not Established
Flammability (solid, gas)	Not Applicable
Upper/lower flammability or explosive limits	**Lower Explosive Limit:** Not Measured **Upper Explosive Limit:** Not Measured
Vapor pressure (mmHg)	17.5 (@ 20 °C)
Vapor Density	Not Established
Specific Gravity	1.20 - 1.40
Solubility in Water	Complete
Partition coefficient n-octanol/water (Log Kow)	Not Measured
Auto-ignition temperature (°C)	Not Measured
Decomposition temperature	Not Measured
Viscosity (cSt)	Not Measured
VOC %	Not Measured
Other information	No other relevant information.

10. Stability and reactivity

Reactivity:	Hazardous Polymerization will not occur.
Chemical stability:	Stable under normal circumstances.
Possibility of hazardous reactions:	No data available.
Conditions to avoid:	Contact with incompatible materials. Acid contact will produce chlorine gas.
Incompatible materials:	Any acidic material, ammonia, urea, oxidizers, organics and metals such as nickel, copper, tin, aluminum and iron.
Hazardous decomposition products:	No hazardous decomposition products are known.

11. Toxicological information

Acute toxicity

Ingredient	Oral LD50, mg/kg	Skin LD50, mg/kg	Inhalation Vapor LC50, mg/L/4hr	Inhalation Dust/Mist LC50, mg/L/4hr	Inhalation Gas LC50, ppm
Sodium hypochlorite (7681-52-9)	5,000.00, Rat - Category: 5	10,000.00, Rabbit - Category: NA	10.50, Rat - Category: 4	No data available	No data available
Sodium chloride (7647-14-5)	1,350.00, Rabbit - Category: 4	100.00, Rat - Category: 2	40.00, Mouse - Category: NA	10,500.00, Rat - Category: NA	No data available
Sodium hydroxide (1310-73-2)	6,600.00, Mouse - Category: NA	1,350.00, Rabbit - Category: 4	600.00, Mouse - Category: NA	No data available	No data available

11. Toxicological information

Acute toxicity (cont.)

Item	Hazard
Acute Toxicity (mouth)	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.
Acute Toxicity (skin)	Harmful in contact with skin.
Acute Toxicity (inhalation)	Vapors and spray mist may irritate throat and respiratory system and cause coughing.
Skin corrosion/irritation	Causes severe skin burns and eye damage
Eye damage/irritation	Causes serious eye damage.
Sensitization (respiratory)	No data available.
Sensitization (skin)	No data available.
Germ toxicity	No data available.
Carcinogenicity	Not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA.
Reproductive Toxicity	No data available.
Specific target organ systemic toxicity (single exposure)	May cause respiratory irritation.
Specific target organ systemic Toxicity (repeated exposure)	Not Applicable.
Aspiration hazard	Not classified; however droplets of product may be aspirated into lungs, through ingestion or vomiting and may cause serious chemical pneumonia.

12. Ecological information

Toxicity: Very toxic to aquatic life. Toxic to aquatic life with long lasting effects.

Aquatic Ecotoxicity

Ingredient	96 hr LC50 fish, mg/l	48 hr EC50 crustacea, mg/l	ErC50 algae, mg/l
Sodium hypochlorite (7681-52-9)	0.08, Pimephales promelas	0.032, Daphnia magna	0.40 (72 hr),Dunaliella primolecta
Sodium chloride (7647-14-5)	1,100.00, Freshwater Fish	3,310.00, Daphnia magna	Not Available
Sodium hydroxide (1310-73-2)	196.00, Poecilia reticulata	40.38, Ceriodaphnia dubia	Not Available

Persistence and degradability	There is no data available on the preparation itself.
Bioaccumulative potential	Not Measured
Mobility in soil	No data available.
Results of PBT and vPvB assessment	This product contains no PBT/vPvB chemicals.
Other adverse effects	No other effects are expected.

13. Disposal considerations

Waste treatment methods:	Do not allow into drains or water courses. Wastes and emptied containers should be disposed of in accordance with regulations made under the Control of Pollution Act and the Environmental Protection Act. Using information provided in this data sheet, advice should be obtained from the Waste Regulation Authority, whether the special waste regulations apply.
Waste from material:	The waste determination should be made in discussion between the user and the waste disposal company.
Container Management:	Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

UN number:	UN1791
UN proper shipping name:	Hypochlorite solutions
Transport hazard class(es)	
DOT (Domestic Surface Transportation)	
DOT Proper Shipping Name:	Hypochlorite solutions
DOT Hazard Class DOT Label:	8 8
UN / NA Number:	UN1791
DOT Packing Group:	III
CERCLA/DOT RQ:	100 lbs.
Environmental hazards:	IMDG Marine Pollutant: Yes (Sodium hypochlorite)
Special precautions for user:	Not Applicable

15. Regulatory information

Regulatory Overview:	The regulatory data in Section 15 is not intended to be all-inclusive, only selected regulations are represented. All ingredients of this product are listed on the TSCA (Toxic Substance Control Act) Inventory.	
WHMIS Classification	D2B E	
US EPA Tier II Hazards:	Fire:	No
	Sudden Release of Pressure:	No
	Reactive:	No
	Immediate (Acute):	Yes
	Delayed (Chronic):	No
SARA 302 Extremely Hazardous Substance:		No
SARA 311/312 Chemicals and RQs (lbs) (>0.1%) :		100
SARA 313 (TRI)		No
CAA Section 112 Hazardous Air Pollutant		No
CAA Section 112R Risk Management Plan		No
State Regulations:	N.J. RTK Substances (>1%)	Listed
	Penn RTK Substances (>1%)	Listed
	California Prop 65	Not Listed

16. Other information:

EPA Registration Number: 813-16

NSF Maximum Use Level (STD 60): Check BOL for facility Data. (46 to 105 mg/L)

Revision Information: 5/4/2017 – Section 3: Revised EPA registration.

The information and recommendations contained herein are based upon data believed to be correct. However, no guarantee or warranty of any kind, expressed or implied, is made with respect to the information contained herein. We accept no responsibility and disclaim all liability for any harmful effects which may be caused by exposure to our products. Customers/users of this product must comply with all applicable health and safety laws, regulations, and orders.

THE USER IS CAUTIONED TO PERFORM HIS OWN HAZARD EVALUATION AND TO RELY ON HIS OWN DETERMINATIONS.

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Once-Through Cooling Chemical Additives

- Manufacturers Product Identification Number: **Spectrus CT-1300**
- Product Use: **Biocide (non-oxidizing)**
- Chemical Composition: **See attached data sheets**
- Classification (non-persistent, persistent or bioaccumulative): **Not Available**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Intermittent use as needed**
- Product toxicity data: **See attached data sheets**
- Concentration of whole product or active ingredient in wastestream: **Not Detectable**
- Outfall: **001**

SUEZ

SAFETY DATA SHEET
SPECTRUS* CT1300

1. Identification

Product identifier	SPECTRUS CT1300
Other means of identification	None.
Recommended use	Water-based microbial control agent.
Recommended restrictions	None known.

Company/undertaking identification

SUEZ WTS USA, Inc.
4636 Somerton Road
Trevose, PA 19053
T 215 355 3300, F 215 953 5524

Emergency telephone

(800) 877 1940

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 3
Health hazards	Acute toxicity, oral	Category 4
	Skin corrosion/irritation	Category 1B
	Serious eye damage/eye irritation	Category 1
	Reproductive toxicity	Category 1A
	Reproductive toxicity	Effects on or via lactation
	Specific target organ toxicity, single exposure	Category 3 narcotic effects
	Specific target organ toxicity, repeated exposure (oral)	Category 1 (liver)
OSHA defined hazards	Not classified.	

Label elements

Signal word	Danger
Hazard statement	Flammable liquid and vapor. Harmful if swallowed. Causes severe skin burns and eye damage. Causes serious eye damage. May cause drowsiness or dizziness. May damage fertility or the unborn child. May cause harm to breast-fed children. Causes damage to organs (liver) through prolonged or repeated exposure by ingestion.

Precautionary statement	
Prevention	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilating/lighting// equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe mist or vapor. Avoid contact during pregnancy/while nursing. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.
Response	If swallowed: Rinse mouth. Do NOT induce vomiting. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If inhaled: Remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center/doctor/. Specific treatment (see on this label). Wash contaminated clothing before reuse. In case of fire: Use to extinguish.
Storage	Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool. Store locked up.
Disposal	Dispose of contents/container to an approved facility.
Hazard(s) not otherwise classified (HNOC)	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

Components	CAS #	Percent
Alkyl dimethyl benzyl ammonium chloride	68424-85-1	40 - 60
Ethanol	64-17-5	10 - 20

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

Composition comments	Information for specific product ingredients as required by the U.S. OSHA HAZARD COMMUNICATION STANDARD is listed. Refer to additional sections of this SDS for our assessment of the potential hazards of this formulation.

4. First-aid measures

Inhalation	Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.
Skin contact	Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a physician or poison control center immediately. Chemical burns must be treated by a physician. Wash contaminated clothing before reuse.
Eye contact	Immediately flush eyes with plenty of low-pressure water for at least 30 minutes while removing contact lenses. Continue rinsing. Call a physician or poison control center immediately.
Ingestion	Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
Most important symptoms/effects, acute and delayed	Burning pain and severe corrosive skin damage. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Vapors have a narcotic effect and may cause headache, fatigue, dizziness and nausea. Jaundice. Prolonged exposure may cause chronic effects.
General information	Take off all contaminated clothing immediately. IF exposed or concerned: Get medical advice/attention. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media	Alcohol resistant foam. Dry chemical powder. Carbon dioxide (CO2). Avoid water if possible.
Unsuitable extinguishing media	Water.
Specific hazards arising from the chemical	Vapors may form explosive mixtures with air. Vapors may travel considerable distance to a source of ignition and flash back. During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.
Fire fighting equipment/instructions	In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials. Move containers from fire area if you can do so without risk. Cool containers / tanks with water spray.

General fire hazards	Flammable liquid and vapor.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Keep out of low areas. Wear appropriate protective equipment and clothing during clean-up. Do not breathe mist or vapor. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Keep combustibles (wood, paper, oil, etc.) away from spilled material. Take precautionary measures against static discharge. Use only non-sparking tools. Prevent entry into waterways, sewer, basements or confined areas. Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground. Do not empty into drains, dispose of this material and its container to hazardous or special waste collection point.

7. Handling and storage

Precautions for safe handling	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Vapors may form explosive mixtures with air. Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. Do not breathe mist or vapor. Do not get this material in contact with eyes. Do not get this material in contact with skin. Do not taste or swallow. Do not get this material on clothing. Avoid contact during pregnancy/while nursing. Avoid prolonged exposure. When using, do not eat, drink or smoke. Provide adequate ventilation. Wear appropriate personal protective equipment. Wash hands thoroughly after handling. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store locked up. Keep away from heat, sparks and open flame. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Store in a cool, dry place out of direct sunlight. Store in original tightly closed container. Store in a well-ventilated place. Refrigeration recommended. Keep in an area equipped with sprinklers. Store away from incompatible materials (see Section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
Ethanol (CAS 64-17-5)	PEL	1900 mg/m3 1000 ppm

US. ACGIH Threshold Limit Values

Components	Type	Value
Ethanol (CAS 64-17-5)	STEL	1000 ppm

US. NIOSH: Pocket Guide to Chemical Hazards

Components	Type	Value
Ethanol (CAS 64-17-5)	TWA	1900 mg/m3 1000 ppm

Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Explosion-proof general and local exhaust ventilation. Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. Eye wash facilities and emergency shower must be available when handling this product.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles) and a face shield.

Skin protection	
Hand protection	Chemical resistant gloves. The choice of an appropriate glove does not only depend on its material but also on other quality features and is different from one producer to the other. Glove selection must take into account any solvents and other hazards present.
Other	Wear appropriate chemical resistant clothing. Use of an impervious apron is recommended.
Respiratory protection	Chemical respirator with organic vapor cartridge and full facepiece. A RESPIRATORY PROTECTION PROGRAM THAT MEETS OSHA'S 29 CFR 1910.134 AND ANSI Z88.2 REQUIREMENTS MUST BE FOLLOWED WHENEVER WORKPLACE CONDITIONS WARRANT A RESPIRATOR'S USE.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance	
Color	Colorless to yellow
Physical state	Liquid
Odor	Mild
Odor threshold	Not available.
pH (concentrated product)	7.5 Neat
pH in aqueous solution	6.3 (10% Solution)
Melting point/freezing point	-7 °F (-22 °C)
Initial boiling point and boiling range	Not available.
Flash point	129 °F (54 °C) P-M(CC)
Evaporation rate	Slower than Ether
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
Vapor pressure	44 mmHg
Vapor pressure temp.	70 °F (21 °C)
Vapor density	< 1
Relative density	0.96
Relative density temperature	70 °F (21 °C)
Solubility(ies)	
Solubility (water)	100 %
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	73 mPa.s
Viscosity temperature	70 °F (21 °C)
Other information	
Pour point	-2 °F (-19 °C)
Specific gravity	0.965

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.

Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Thermal decomposition or combustion may produce oxides of carbon, ammonia, oxides of nitrogen and/or hydrogen chloride.

11. Toxicological information

Information on likely routes of exposure

Inhalation	May cause damage to organs by inhalation. May cause irritation to the respiratory system. Vapors have a narcotic effect and may cause headache, fatigue, dizziness and nausea. Prolonged inhalation may be harmful.
Skin contact	Causes severe skin burns.
Eye contact	Causes serious eye damage.
Ingestion	Causes digestive tract burns. Harmful if swallowed.
Symptoms related to the physical, chemical and toxicological characteristics	Burning pain and severe corrosive skin damage. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. Causes serious eye damage. Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Permanent eye damage including blindness could result. Jaundice.

Information on toxicological effects

Acute toxicity Narcotic effects.

Product	Species	Test Results
SPECTRUS CT1300 (CAS Mixture)		
Acute		
Dermal		
LD50	Rabbit	> 5000 mg/kg, (Calculated according to GHS additivity formula)
Oral		
LD50	Rat	688 mg/kg, (Calculated according to GHS additivity formula)

Components	Species	Test Results
Alkyl dimethyl benzyl ammonium chloride (CAS 68424-85-1)		
Acute		
Dermal		
LD50	Rabbit	3340 mg/kg
Oral		
LD50	Rat	344 mg/kg
Ethanol (CAS 64-17-5)		
Acute		
Dermal		
LD50	Rabbit	> 5000 mg/kg
Inhalation		
LC50	Rat	124.7 mg/l/4h
Oral		
LD50	Rat	> 5000 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Causes severe skin burns.
Serious eye damage/eye irritation	Causes serious eye damage.

Respiratory or skin sensitization

Respiratory sensitization	This product is not expected to cause respiratory sensitization.
Skin sensitization	This product is not expected to cause skin sensitization.

Germ cell mutagenicity	No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.
Carcinogenicity	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

IARC Monographs. Overall Evaluation of Carcinogenicity

Not listed.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

US. National Toxicology Program (NTP) Report on Carcinogens

Not listed.

Reproductive toxicity	Possible reproductive hazard. May cause harm to breastfed babies. May damage fertility or the unborn child.
Specific target organ toxicity - single exposure	Narcotic effects.
Specific target organ toxicity - repeated exposure	Causes damage to organs (Liver) through prolonged or repeated exposure by ingestion.
Aspiration hazard	May be harmful if swallowed and enters airways. Based on available data, the classification criteria are not met.
Chronic effects	Prolonged or repeated exposures may cause CNS depression, tissue necrosis, and/or toxicity to the liver and kidney. Causes damage to organs through prolonged or repeated exposure.

12. Ecological information

Ecotoxicity

Product		Species	Test Results
SPECTRUS CT1300 (CAS Mixture)			
	IC25	Ceriodaphnia	0.098 mg/L, Chronic Bioassay, 7 day
		Fathead Minnow	0.259 mg/L, Chronic Bioassay, 7 day
	LC10	Annelida(Lumbriculus variegatus)	0.37 mg/L, Acute Toxicity, 96 hour
	LC50	Annelida(Lumbriculus variegatus)	1.47 mg/L, Acute Toxicity, 96 hour
		Benthic Crustacean(Gammerus pseutolimnaeus)	0.07 mg/L, Acute Toxicity, 96 hour
		Ceriodaphnia	0.35 mg/L, Static Renewal Bioassay, 48 hour
		Channel Catfish	0.86 mg/L, Acute Toxicity, 96 hour
		Fathead Minnow	0.72 mg/L, Flow-Thru Bioassay, 96 hour
		Freshwater Snail(Physa sp.)	0.46 mg/L, Acute Toxicity, 96 hour
		Menidia beryllina (Silversides)	0.62 mg/L, Flow-Thru Bioassay, 96 hour
		Midge larvae (Chironomus tentans)	0.5 mg/L, Acute Toxicity, 96 hour
		Mysid Shrimp	0.16 mg/L, Flow-Thru Bioassay, 96 hour
		Sheepshead Minnow	1.76 mg/L, Flow-Thru Bioassay, 96 hour
	NOEL	Ceriodaphnia	0.15 mg/L, Static Renewal Bioassay, 48 hour
		Channel Catfish	0.54 mg/L, Acute Toxicity, 96 hour
		Fathead Minnow	0.41 mg/L, Flow-Thru Bioassay, 96 hour
		Freshwater Snail(Physa sp.)	0.36 mg/L, Acute Toxicity, 96 hour
		Menidia beryllina (Silversides)	0.35 mg/L, Flow-Thru Bioassay, 96 hour
		Midge larvae (Chironomus tentans)	0.13 mg/L, Acute Toxicity, 96 hour
		Mysid Shrimp	0.03 mg/L, Flow-Thru Bioassay, 96 hour
		Sheepshead Minnow	1 mg/L, Flow-Thru Bioassay, 96 hour
Aquatic Crustacea	LC50	Daphnia magna	0.11 mg/L, Static Acute Bioassay, 48 hour
			0.04 mg/L, Flow-Thru Bioassay, 48 hour

Product		Species	Test Results
		Daphnia pulex	0.05 mg/L, Static Renewal Bioassay, 48 hour
	NOEL	Daphnia magna	0.06 mg/L, Static Acute Bioassay, 48 hour
			0.026 mg/L, Flow-Thru Bioassay, 48 hour
		Daphnia pulex	0.031 mg/L, Static Renewal Bioassay, 48 hour
Fish	LC50	Rainbow Trout	2 mg/L, Flow-Thru Bioassay, 96 hour
	NOEL	Rainbow Trout	1.2 mg/L, Flow-Thru Bioassay, 96 hour

Components		Species	Test Results
Alkyl dimethyl benzyl ammonium chloride (CAS 68424-85-1)			
	EC50	Active Sludge	10 mg/l
		Daphnia Magna	0.016 mg/l, 48 hour
Aquatic			
Fish	LC50	Rainbow Trout	0.93 mg/l, 96 hour

Bioaccumulative potential	No data available.
Partition coefficient n-octanol / water (log Kow) Ethanol	-0.31
Mobility in soil	No data available.
Other adverse effects	Not available.
Persistence and degradability	
	66% CO_2 Evolution (Modified Sturm Test) (OECD 301B)
- COD (mgO2/g)	1470
- BOD 5 (mgO2/g)	43
- BOD 28 (mgO2/g)	156
- Closed Bottle Test (% Degradation in 28 days)	14
- Zahn-Wellens Test (% Degradation in 28 days)	0
- TOC (mg C/g)	380
- CO2 evolution (modified Sturm test)	66

13. Disposal considerations

Disposal instructions	Collect and reclaim or dispose in sealed containers at licensed waste disposal site. Incinerate the material under controlled conditions in an approved incinerator. Do not incinerate sealed containers. If discarded, this product is considered a RCRA ignitable waste, D001. Dispose of contents/container in accordance with local/regional/national/international regulations.
Hazardous waste code	D001: Waste Flammable material with a flash point <140 F The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

DOT

UN number	UN2920

UN proper shipping name	Corrosive liquids, flammable, n.o.s. (ETHANOL, QUATERNARY AMMONIUM COMPOUNDS), RQ(ETHANOL, Methanol)
Transport hazard class(es)	
Class	8
Subsidiary risk	3
Packing group	II
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
ERG number	132

Some containers may be exempt from Dangerous Goods/Hazmat Transport Regulations, please check BOL for exact container classification.

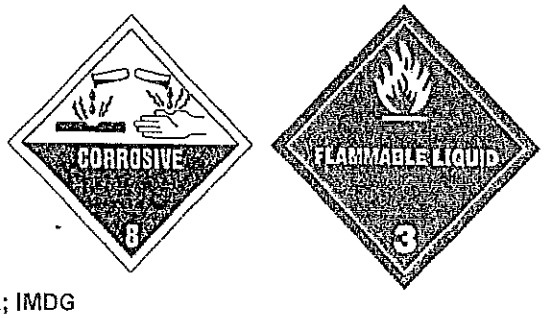
IATA

UN number	UN2920
UN proper shipping name	CORROSIVE LIQUID, FLAMMABLE, N.O.S. (Quaternary Ammonium Compounds; Ethanol)
Transport hazard class(es)	
Class	8
Subsidiary risk	3
Packing group	II
Environmental hazards	Yes
ERG Code	132
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

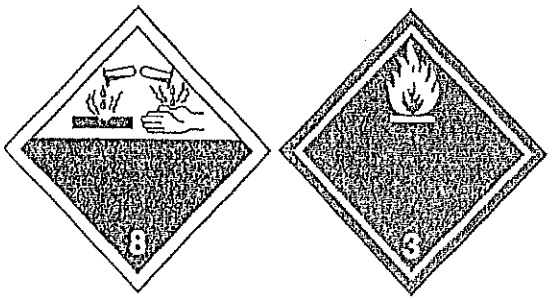
IMDG

UN number	UN2920
UN proper shipping name	CORROSIVE LIQUID, FLAMMABLE, N.O.S. (ETHANOL, QUATERNARY AMMONIUM COMPOUNDS), RQ(ETHANOL), MARINE POLLUTANT
Transport hazard class(es)	
Class	8
Subsidiary risk	3
Packing group	II
Environmental hazards	
Marine pollutant	Yes
EmS	F-E, S-C
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

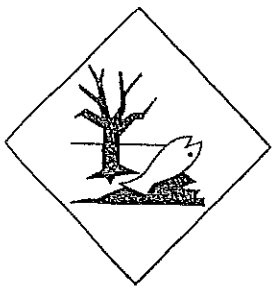
DOT



IATA; IMDG



Marine pollutant



General information IMDG Regulated Marine Pollutant.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Ethanol (CAS 64-17-5) Listed.

SARA 304 Emergency release notification

Not regulated.

OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not regulated.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

FIFRA registration number 3876-149

TSCA This is an EPA registered biocide and is exempt from TSCA inventory requirements.

FIFRA hazard statement	This chemical is a pesticide product registered by the 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, and for workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label: DANGER Corrosive Causes irreversible eye damage and skin burns May be fatal if swallowed, absorbed through the skin, or inhaled This pesticide is toxic to fish
Food and drug administration	21 CFR 176.300 (slimicides for wet end use)

US state regulations

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

Ethanol (CAS 64-17-5)	Listed: April 29, 2011 Listed: July 1, 1988

US - California Proposition 65 - CRT: Listed date/Developmental toxin

Ethanol (CAS 64-17-5)	Listed: October 1, 1987
Methanol (CAS 67-56-1)	Listed: March 16, 2012

US - California Proposition 65 - CRT: Listed date/Female reproductive toxin

No ingredient listed.

US - California Proposition 65 - CRT: Listed date/Male reproductive toxin

No ingredient listed.

US - Massachusetts RTK - Substance List

Ethanol (CAS 64-17-5)

US - Pennsylvania RTK - Hazardous Substances

Ethanol (CAS 64-17-5)	Listed.

US - Rhode Island RTK

Ethanol (CAS 64-17-5)

US. New Jersey Worker and Community Right-to-Know Act

Ethanol (CAS 64-17-5)	Listed.

US. Pennsylvania Worker and Community Right-to-Know Law

Ethanol (CAS 64-17-5)	Hazardous substance

US. California Proposition 65

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

16. Other information, including date of preparation or last revision

Issue date	Dec-18-2014
Revision date	Apr-09-2018
Version #	1.1
List of abbreviations	CAS: Chemical Abstract Service Registration Number TWA: Time Weighted Average STEL: Short Term Exposure Limit LD50: Lethal Dose, 50% LC50: Lethal Concentration, 50% NOEL: No Observed Effect Level COD: Chemical Oxygen Demand BOD: Biochemical Oxygen Demand TOC: Total Organic Carbon IATA: International Air Transport Association IMDG: International Maritime Dangerous Goods Code ACGIH: American Conference of Governmental Industrial Hygienists * TSRN indicates a Trade Secret Registry Number is used in place of the CAS number.
References:	No data available
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
Revision information	This document has undergone significant changes and should be reviewed in its entirety.

Prepared by This SDS has been prepared by SUEZ Regulatory Department (1-215-355-3300).

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Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Once-Through Cooling Chemical Additives

- Manufacturers Product Identification Number: **Nalco Thruguard THR404**
- Product Use: **Water Treatment**
- Chemical Composition: **See attached data sheets**
- Classification (non-persistent, persistent or bioaccumulative): **Not Available**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Intermittent use as needed.**
- Product toxicity data: **See attached data sheets**
- Concentration of whole product or active ingredient in wastestream: **Not Detectable**
- Outfall: **001**

NALCO
An Ecolab Company

SAFETY DATA SHEET

THRUGUARD THR404

Section: 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	THRUGUARD THR404
Other means of identification	:	Not applicable.
Recommended use	:	WATER TREATMENT
Restrictions on use	:	Refer to available product literature or ask your local Sales Representative for restrictions on use and dose limits.
Company	:	Nalco Company 1601 W. Diehl Road Naperville, Illinois 60563-1198 USA TEL: (630)305-1000
Emergency telephone number	:	(800) 424-9300 (24 Hours) CHEMTREC
Issuing date	:	10/15/2015

Section: 2. HAZARDS IDENTIFICATION

GHS Classification

Skin corrosion	:	Category 1A
Serious eye damage	:	Category 1

GHS Label element

Hazard pictograms :

Signal Word	:	Danger
Hazard Statements	:	Causes severe skin burns and eye damage.
Precautionary Statements	:	**Prevention:** Wash skin thoroughly after handling. Wear protective gloves/ protective clothing/ eye protection/ face protection. Do not mix with bleach or other chlorinated products – will cause chlorine gas. **Response:** IF SWALLOWED: rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/ physician. Wash contaminated clothing before reuse. **Storage:** Store locked up. **Disposal:**

Dispose of contents/ container to an approved waste disposal plant.

Other hazards : None known.

Section: 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance/mixture : Mixture

Mixture

Chemical Name	CAS-No.	Concentration: (%)
Hydroxyethylidenediphosphonic Acid	2809-21-4	30 - 60
Phosphonic Acid	13598-36-2	1 - 5

Section: 4. FIRST AID MEASURES

In case of eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.

In case of skin contact : Wash off immediately with plenty of water for at least 15 minutes. Use a mild soap if available. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

If swallowed : Rinse mouth with water. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Get medical attention immediately.

If inhaled : Remove to fresh air. Treat symptomatically. Get medical attention if symptoms occur.

Protection of first-aiders : In event of emergency assess the danger before taking action. Do not put yourself at risk of injury. If in doubt, contact emergency responders. Use personal protective equipment as required.

Notes to physician : Treat symptomatically.

Most important symptoms and effects, both acute and delayed : See Section 11 for more detailed information on health effects and symptoms.

Section: 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media : None known.

Specific hazards during firefighting : Not flammable or combustible.

Hazardous combustion products : Carbon oxides Oxides of phosphorus

Special protective equipment for firefighters	:	Use personal protective equipment.
Specific extinguishing methods	:	Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations. In the event of fire and/or explosion do not breathe fumes.

Section: 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Ensure adequate ventilation. Keep people away from and upwind of spill/leak. Avoid inhalation, ingestion and contact with skin and eyes. When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Ensure clean-up is conducted by trained personnel only. Refer to protective measures listed in sections 7 and 8.
Environmental precautions	:	Do not allow contact with soil, surface or ground water.
Methods and materials for containment and cleaning up	:	Stop leak if safe to do so. Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Flush away traces with water. For large spills, dike spilled material or otherwise contain material to ensure runoff does not reach a waterway.

Section: 7. HANDLING AND STORAGE

Advice on safe handling	:	Do not ingest. Do not breathe dust/fume/gas/mist/vapours/spray. Do not get in eyes, on skin, or on clothing. Wash hands thoroughly after handling. Use only with adequate ventilation. Do not mix with bleach or other chlorinated products – will cause chlorine gas.
Conditions for safe storage	:	Keep away from strong bases. Keep out of reach of children. Keep container tightly closed. Store in suitable labeled containers.
Suitable material	:	Keep in properly labelled containers.
Unsuitable material	:	The following compatibility data is suggested based on similar product data and/or industry experience: Product is corrosive to aluminum. Aluminum should not be used for feed, storage, or transportation systems.

Section: 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Engineering measures	:	Effective exhaust ventilation system. Maintain air concentrations below occupational exposure standards.

Personal protective equipment

Eye protection	:	Safety goggles Face-shield

Hand protection	:	Wear the following personal protective equipment: Standard glove type. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.
Skin protection	:	Personal protective equipment comprising: suitable protective gloves, safety goggles and protective clothing
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
Hygiene measures	:	Handle in accordance with good industrial hygiene and safety practice. Remove and wash contaminated clothing before re-use. Wash face, hands and any exposed skin thoroughly after handling. Provide suitable facilities for quick drenching or flushing of the eyes and body in case of contact or splash hazard.

Section: 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Liquid
Colour	:	clear
Odour	:	odourless
Flash point	:	> 93.3 °C Method: ASTM D 56, Tag closed cup
pH	:	< 1, 100 %
Odour Threshold	:	no data available
Melting point/freezing point	:	no data available
Initial boiling point and boiling range	:	> 100 °C
Evaporation rate	:	similar to water
Flammability (solid, gas)	:	no data available
Upper explosion limit	:	no data available
Lower explosion limit	:	no data available
Vapour pressure	:	similar to water
Relative vapour density	:	no data available
Relative density	:	1.267
Density	:	10.6 lb/gal
Water solubility	:	completely soluble
Solubility in other solvents	:	no data available
Partition coefficient: n-octanol/water	:	no data available
Auto-ignition temperature	:	no data available

Thermal decomposition temperature	:	no data available
Viscosity, dynamic	:	no data available
Viscosity, kinematic	:	no data available
Molecular weight	:	no data available
VOC	:	no data available

Section: 10. STABILITY AND REACTIVITY

Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	No dangerous reaction known under conditions of normal use.
Conditions to avoid	:	Freezing temperatures. Extremes of temperature
Incompatible materials	:	Contact with strong alkalies (e.g. ammonia and its solutions, carbonates, sodium hydroxide (caustic), potassium hydroxide, calcium hydroxide (lime), cyanide, sulfide, hypochlorites, chlorites) may generate heat, splattering or boiling and toxic vapors. Contact with reactive metals (e.g. aluminum) may result in the generation of flammable hydrogen gas. 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	:	Oxides of carbon Oxides of phosphorus

Section: 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	:	Inhalation, Eye contact, Skin contact

Potential Health Effects

Eyes	:	Causes serious eye damage.
Skin	:	Causes severe skin burns.
Ingestion	:	Causes digestive tract burns.
Inhalation	:	May cause nose, throat, and lung irritation.
Chronic Exposure	:	Health injuries are not known or expected under normal use.

Experience with human exposure

Eye contact	:	Redness, Pain, Corrosion
Skin contact	:	Redness, Pain, Corrosion

Ingestion	: Corrosion, Abdominal pain
Inhalation	: Respiratory irritation, Cough

Toxicity

Product

Acute oral toxicity	: Acute toxicity estimate : > 5,000 mg/kg
Acute inhalation toxicity	: no data available
Acute dermal toxicity	: no data available
Skin corrosion/irritation	: no data available
Serious eye damage/eye irritation	: no data available
Respiratory or skin sensitization	: no data available
Carcinogenicity	: no data available
Reproductive effects	: no data available
Germ cell mutagenicity	: no data available
Teratogenicity	: no data available
STOT - single exposure	: no data available
STOT - repeated exposure	: no data available
Aspiration toxicity	: no data available

Components

Acute dermal toxicity	: Hydroxyethylidenediphosphonic Acid LD50 rabbit: > 10,000 mg/kg

Section: 12. ECOLOGICAL INFORMATION

Ecotoxicity

Environmental Effects	: This product has no known ecotoxicological effects.

Product

Toxicity to fish	: LC50 Pimephales promelas (fathead minnow): 1,098 mg/l Exposure time: 96 hrs Test substance: Product

LC50 Oncorhynchus mykiss (rainbow trout): 1,146 mg/l
Exposure time: 96 hrs
Test substance: Product

NOEC Pimephales promelas (fathead minnow): 625 mg/l
Exposure time: 96 hrs
Test substance: Product

NOEC Oncorhynchus mykiss (rainbow trout): 625 mg/l
Exposure time: 96 hrs
Test substance: Product

Toxicity to daphnia and other aquatic invertebrates : EC50 Daphnia magna (Water flea): 682 mg/l
Exposure time: 48 hrs
Test substance: Product

NOEC Daphnia magna (Water flea): 313 mg/l
Exposure time: 48 hrs
Test substance: Product

Persistence and degradability

no data available

Mobility

no data available

Bioaccumulative potential

no data available

Other information

no data available

Section: 13. DISPOSAL CONSIDERATIONS

If this product becomes a waste, it could meet the criteria of a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Before disposal, it should be determined if the waste meets the criteria of a hazardous waste.

Hazardous Waste: : D002

Disposal methods : Where possible recycling is preferred to disposal or incineration. If recycling is not practicable, dispose of in compliance with local regulations. Dispose of wastes in an approved waste disposal facility.

Disposal considerations : Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal. Do not re-use empty containers.

Section: 14. TRANSPORT INFORMATION

The shipper/consignor/sender is responsible to ensure that the packaging, labeling, and markings are in compliance with the selected mode of transport.

Land transport (DOT)

Proper shipping name	: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.
Technical name(s)	: HYDROXYETHYLIDENE DIPHOSPHONIC ACID
UN/ID No.	: UN 3265
Transport hazard class(es)	: 8
Packing group	: III

Air transport (IATA)

Proper shipping name	: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.
Technical name(s)	: HYDROXYETHYLIDENE DIPHOSPHONIC ACID
UN/ID No.	: UN 3265
Transport hazard class(es)	: 8
Packing group	: III

Sea transport (IMDG/IMO)

Proper shipping name	: CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.
Technical name(s)	: HYDROXYETHYLIDENE DIPHOSPHONIC ACID
UN/ID No.	: UN 3265
Transport hazard class(es)	: 8
Packing group	: III

Section: 15. REGULATORY INFORMATION

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

This material does not contain any components with a CERCLA RQ.

SARA 304 Extremely Hazardous Substances Reportable Quantity

This material does not contain any components with a section 304 EHS RQ.

SARA 311/312 Hazards	: Acute Health Hazard
SARA 302	: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.
SARA 313	: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

California Prop 65

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

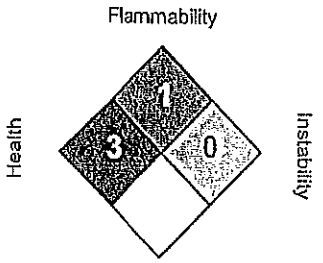
INTERNATIONAL CHEMICAL CONTROL LAWS :

TOXIC SUBSTANCES CONTROL ACT (TSCA)
The substances in this preparation are included on or exempted from the TSCA 8(b) Inventory (40 CFR 710)

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA)
The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

Section: 16. OTHER INFORMATION

NFPA:



HMIS III:

HEALTH	3
FLAMMABILITY	1
PHYSICAL HAZARD	0

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

Revision Date	: 10/15/2015
Version Number	: 1.1
Prepared By	: Regulatory Affairs

REVISED INFORMATION: Significant changes to regulatory or health information for this revision is indicated by a bar in the left-hand margin of the SDS.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
For additional copies of an SDS visit www.nalco.com and request access.

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Once-Through Cooling Chemical Additives

- Manufacturers Product Identification Number: **Acti-Brom 1318 (Sodium Bromide)**
- Product Use: **Biocide**
- Chemical Composition: **NaBr**
- Classification (non-persistent, persistent or bioaccumulative): **Not Available**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Intermittent use; not exceeding 2 hours/unit/day**
- Product toxicity data: **See attached data sheets**
- Concentration of whole product or active ingredient in wastestream: **Not Detectable**
- Outfall: **001**

NALCO

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 * = Chronic Health Hazard

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. There may be irritation to the gastro-intestinal tract with nausea and vomiting.

INHALATION :
Not a likely route of exposure. Repeated or prolonged exposure may irritate the respiratory tract.

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. Use personal protective equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so. Keep people away from and upwind of spill/leak. Ventilate spill area if possible. Ensure clean-up is conducted by

trained personnel only. Do not touch spilled material. Have emergency equipment (for fires, spills, leaks, etc.) readily available. 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 :
Do not get in eyes, on skin, on clothing. Do not take internally. Use with adequate ventilation. Do not breathe vapors/gases/dust. Keep the containers closed when not in use. Have emergency equipment (for fires, spills, leaks, etc.) readily available. Ensure all containers are labeled.

STORAGE CONDITIONS :
Store the containers tightly closed. Store in suitable labeled 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. Where concentrations in air may exceed the limits given in this section or when significant mists, vapors, aerosols, or dusts are generated, an approved air purifying respirator equipped with suitable filter cartridges is recommended. Consult the respirator / cartridge manufacturer data to verify the suitability of specific devices. In event of emergency or planned entry into unknown concentrations a positive pressure, full-facepiece SCBA should be used. If respiratory protection is required, institute a complete respiratory protection program including selection, fit testing, training, maintenance and inspection.

HAND PROTECTION :
When handling this product, the use of chemical gloves is recommended. The choice of work glove depends on work conditions and what chemicals are handled. Please contact the PPE manufacturer for advice on what type of glove material may be suitable. Gloves should be replaced immediately if signs of degradation are observed.

SKIN PROTECTION :
Wear standard protective clothing.

EYE PROTECTION :
Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS :
Use good work and personal hygiene practices to avoid exposure. Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Always wash thoroughly after handling chemicals. When handling this product never eat, drink or smoke.

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

The following results are for a similar product.

ACUTE ORAL TOXICITY :

Species:	Rat
LD50:	> 5,000 mg/kg
Test Descriptor:	Similar Product

ACUTE DERMAL TOXICITY :

Species:	Rabbit
LD50:	> 2,000 mg/kg
Test Descriptor:	Similar Product

PRIMARY SKIN IRRITATION :

Species:	Rabbit
Draize Score:	0.0 /8.0
Test Descriptor:	Similar Product

PRIMARY EYE IRRITATION :

Species:	Rabbit
Draize Score:	16.0 /110.0
Test Descriptor:	Similar Product

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	Test Type	Value	Test Descriptor
Bluegill Sunfish	96 hrs	LC50	0.52 mg/l	HOBr (Generated from NaBr)
Rainbow Trout	96 hrs	LC50	0.23 mg/l	HOBr (Generated from NaBr)
Sheepshead Minnow	96 hrs	LC50	0.19 mg/l	HOBr (Generated from NaBr)
Bluegill Sunfish	96 hrs	LC50	> 1,000 mg/l	Similar Product
Rainbow Trout	96 hrs	LC50	> 1,000 mg/l	Similar Product
Fathead Minnow	96 hrs	LC50	0.097 mg/l	HOBr (Generated from NaBr)
Fathead Minnow	96 hrs	LC50	> 5,000 mg/l	Product

ACUTE INVERTEBRATE RESULTS :

Species	Exposure	Test Type	Value	Test Descriptor
Daphnia magna	48 hrs	LC50	0.038 mg/l	HOBr (Generated from NaBr)
American Oyster	96 hrs	LC50	0.54 mg/l	HOBr (Generated from NaBr)
Mysid Shrimp (Mysidopsis bahia)	96 hrs	LC50	0.17 mg/l	HOBr (Generated from NaBr)
Daphnia magna	48 hrs	LC50	7,900 mg/l	Active Substance (Sodium Bromide)
Ceriodaphnia dubia	48 hrs	LC50	> 5,000 mg/l	Product

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

This section contains additional information that may have relevance to regulatory compliance. The information in this section is for reference only. It is not exhaustive, and should not be relied upon to take the place of an individualized compliance or hazard assessment. Nalco accepts no liability for the use of this 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 : Non-Hazardous

CERCLA/SUPERFUND, 40 CFR 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 173.315 chemicals used in washing or to assist in the lye peeling of fruits and vegetables, 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.

NSF NON-FOOD COMPOUNDS REGISTRATION PROGRAM (former USDA List of Proprietary Substances & Non-Food Compounds) :
NSF Registration number for this product is : 145774
This product is acceptable for treatment of cooling and retort water (G5) in and around food processing areas. This product is acceptable for treating boilers, steam lines, and/or cooling systems (G7) where neither the treated water nor the steam produced may contact edible products in and around food processing areas.

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 :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

CLEAN AIR ACT, Sec. 112 (Hazardous Air Pollutants, as amended by 40 CFR 63), Sec. 602 (40 CFR 82, Class I and II Ozone Depleting Substances) :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

CALIFORNIA PROPOSITION 65 :
Substances listed under California Proposition 65 are not intentionally added or expected to be present in this product.

MICHIGAN CRITICAL MATERIALS :
Substances listed under this regulation are not intentionally added or expected to be present in this product. Listed components may be present at trace levels.

STATE RIGHT TO KNOW LAWS :
This product is a registered biocide and is exempt from State Right to Know Labelling Laws.

INTERNATIONAL CHEMICAL CONTROL LAWS :

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) :
The substance(s) in this preparation are included in or exempted from the Domestic Substance List (DSL).

AUSTRALIA
All substances in this product comply with the National Industrial Chemicals Notification & Assessment Scheme (NICNAS).

CHINA
All substances in this product comply with the Provisions on the Environmental Administration of New Chemical Substances and are listed on or exempt from the Inventory of Existing Chemical Substances China (IECSC).

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 Existing and New Chemical Substances list (ENCS).

KOREA
All substances in this product comply with the Toxic Chemical Control Law (TCCL) and are listed on the Existing Chemicals List (ECL)

PHILIPPINES
All substances in this product comply with the Republic Act 6969 (RA 6969) and are listed on the Philippines 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 : 03/26/2012
Version Number : 1.22

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Once-Through Cooling Chemical Additives

- Manufacturers Product Identification Number: **Ammonia**
- Product Use: **Biocide (oxidizing)**
- Chemical Composition: **NH3**
- Classification (non-persistent, persistent or bioaccumulative): **Believed Non-persistent**
- Product or active ingredient half-life: **Not Available**
- Frequency of product use: **Intermittent use; not exceeding 2 hours/day/unit**
- Product toxicity data: **See attached data sheets**
- Concentration of whole product or active ingredient in wastestream: **Not Detectable**
- 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

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Harmful if inhaled.
Causes skin and eye irritation.

Precautionary statements

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

Control parameters

Occupational exposure limits

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	Daphnia - *Daphnia magna*	48 hours
	Acute EC50 491 mg/l	Daphnia - *Daphnia pulex*	48 hours
	Acute LC50 259 mg/l	Fish	96 hours
	Acute LC50 >117 mg/l	Fish	96 hours
	Acute LC50 >126 mg/l	Fish	96 hours

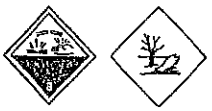
Section 13. Disposal considerations

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

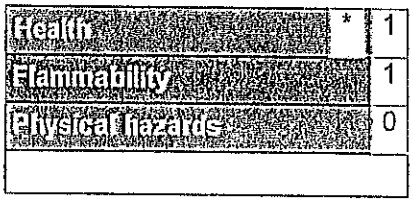
California Prop. 65

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

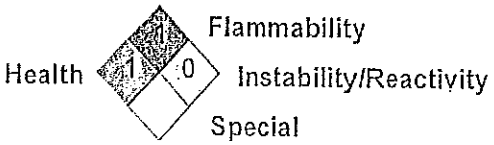
Hazardous Material Information System (U.S.A.)



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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 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 K

Contract Laboratory Information

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000
Worksheet 2.0 – Pollutant Analysis Requirements

Outfall 001 is an external, continuous discharge of non-process Once-Through Cooling Water. As required by the permit application, the outfall was sampled for four consecutive weeks beginning 12/06/2024 and submitted for the laboratory analysis of the parameters listed in Tables 1, 2, 3 (partial list), 6, 8 and 9.

Outfall 101, 201 and 301 are internal discharges to Outfall 001; therefore, characterization sampling is not required.

Characterization analysis was performed by the following entities:

1. Temperature, pH and Total Residual Chlorine analysis was performed by company personnel.

2. All other analysis was performed by SPL, 1825 E. Plano Pkwy Suite 160, Plano, Texas 75074, (972-424-6508).

Attachment L

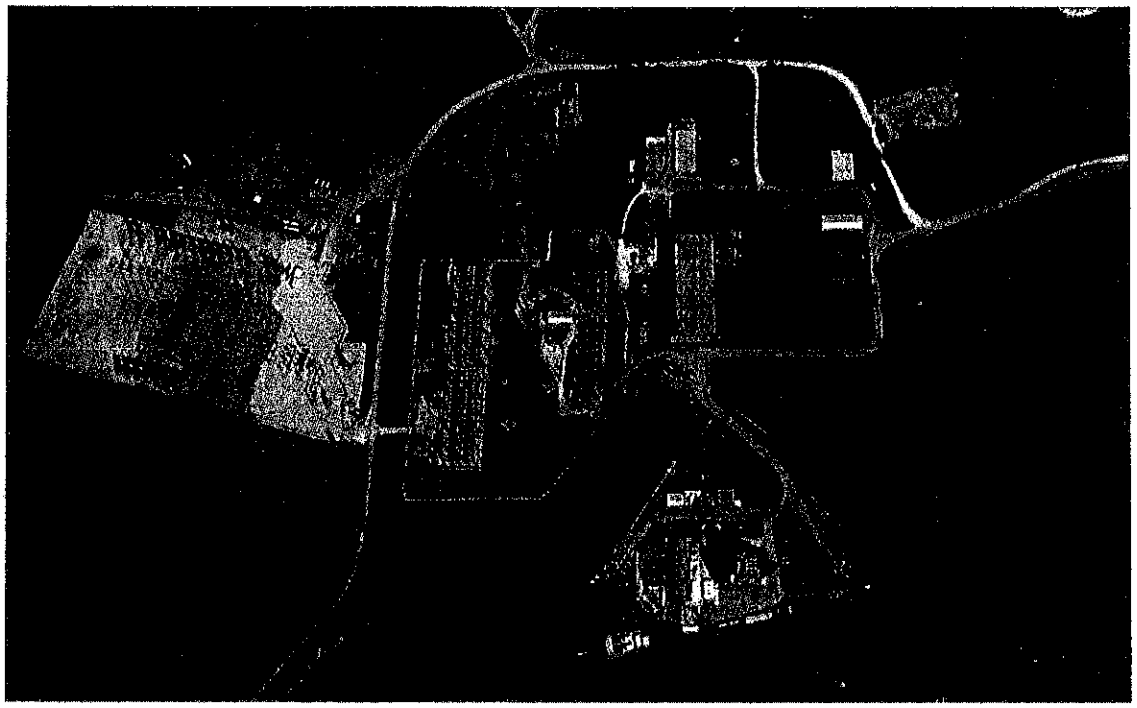
Trinidad Steam Electric Station
§ 316(b) Information to Inform the Entrainment BTA Determination and Select the Chosen Method of Compliance for Impingement BTA

Final Report, August 2018

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

Trinadad Steam Electric Station § 316(b) § 122.21(r)(2)-(8) and § 125.98(f) Information to Inform the Entrainment BTA Determination and Select the Chosen Method of Compliance for Impingement BTA

Final Report, July 2019



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

ERCOT – Electric Reliability Council of Texas

EPA - United States Environmental Protection Agency

MGD – Million Gallons per Day

MDCT – Mechanical Draft Cooling Tower

NPDES – National Pollution Discharge Elimination System

ppt – parts per thousand

TCEQ – Texas Commission on Environmental Quality

T&E – Threatened and Endangered

TPDES – Texas Pollution Discharge Elimination System

TPWD – Texas Parks and Wildlife Department

TRSES – Trinidad Steam Electric Station

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 Trinadad Steam Electric Station (TRSES). The three objectives of this document are to:

1. Provide the § 122.21(r)(2) through (8) information,
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*".

TRSES withdraws cooling water from a man-made lake (Trinadad Reservoir) and the fisheries are stocked and managed by the Texas Parks and Wildlife Department (TPWD). Luminant submitted a request to the Texas Department of Environmental Quality (TCEQ) in a letter dated

April 22, 2015 to grant an information waiver for the § 122.21(r)(2) - (13) information for TRSES based on withdrawal from a freshwater reservoir with a stocked and managed fishery). TCEQ responded with a letter dated May 26, 2015 approving Luminant's request. TRSES's AIF is <125 MGD (i.e., AIF for 2014-2018 was 55 mgd) and additionally Luminant is providing information in this document to support that TRSES qualifies for an exemption from some or all of the entrainment information at § 122.21(r)(9) - (13) by virtue of withdrawing cooling water from a man-made reservoir with a stocked and managed fishery (see Chapter 9). However, even though Luminant is not required to provide the entrainment information at § 122.21(r)(9) - (13) for TRSES, TCEQ is still required to make an entrainment BTA determination as required at § 125.98(f) of the Rule. The objective of this document is to provide TCEQ with the following:

1. The § 122.21(r)(2) - (8) information for TRSES,
2. Provide information to support TCEQ's entrainment BTA determination, and
3. Luminant's chosen method of compliance to satisfy the impingement mortality reduction BTA requirements.

Information Provided to Support the Entrainment BTA Determination

Relative to providing information to assist TCEQ in the entrainment BTA determination, Section 10 of this document provides information on the factors that TCEQ must and may consider at § 125.98(f) of the Rule. A summary of key considerations includes:

- Based on information provided in Appendix B and Texas Parks and Wildlife 2017 Trinidad Reservoir Monitoring Survey Report (Appendix C). There is no mention of negative impacts from the operation of TRSES in the TPWD monitoring report.
- There are no federally threatened or endangered species nor designated critical habitat for such species at risk in the Trinidad Reservoir from TRSES's 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 $42.1 and $132.6 million
    - Two types of fine-mesh screens were evaluated that included fine-mesh modified traveling screens estimated to cost in excess of $4 million and narrow-slot wedgewire screens (an exclusion technology) that were estimated to have a capital cost of over $14.9 million for a 0.5 mm slot size and approximately $8.2 million for a 2.0 mm slot size.
    - An alternative water supply source was deemed infeasible for TRSES.
    - Given the magnitude of the estimated capital cost and TRSES's capacity utilization over the past five years of <5%, 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 TRSES 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 TRSES 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 five years has averaged 55 MGD. This represents 19.3% of the Unit 6 design intake flow and <13% of TRSES's permitted flow. These flows are a significant flow reduction and is the result of a practice to only operate cooling water pumps when electric power is being generated.
    - The current overall health of the Trinidad Reservoir fishery relative to estimated technology costs and current TRSES operations and the fact that the reservoir is currently closed to the public resulting in no public benefit for any new entrainment BTA installed.

The above considerations support a determination that the existing CWIS at TRSES 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, for TRSES, Luminant selects use of a CCRS at § 125.94(c)(1) of the Rule and TCEQ's May 26, 2015 letter to Luminant approved use of the CCRS for impingement BTA.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

The purpose of this document is to provide TCEQ with site-specific information required for Luminant's TRSES to comply with § 316(b) of the Clean Water Act (CWA). The introduction consists of three sections that include a general overview of the Rule, a brief discussion of the compliance approach for TRSES 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 (TCEQ for TRSES). 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 Trinidad Steam Electric Station

The compliance approach for TRSES is as follows:

1. Per TCEQ's § 316(b) requirements, this document provides the § 122.21(r)(2) – (8) information for TRSES.
2. Document that Trinidad's AIF is <125 MGD but provide information to support that the facility also qualifies for the entrainment information waiver at § 125.95(a)(3) of the Rule in the event that operations increase to exceed a flow of 125 MGD at some point in the future.
3. Provide TCEQ with information to support the entrainment BTA determination for TRSES as specified at § 125.98(f) of the Rule.
4. Formalize selection of the chosen method or compliance for impingement BTA.

Report Organization

The report is organized into ten chapters. Following this Introduction, Chapters 2 through 8 provide the § 122.21(r)(2) – (8) information respectively. Chapter 9 provides information to support TCEQ's site-specific entrainment BTA determination and Chapter and Chapter 10 provides references used in the document. Also attached are the following Appendices:
Appendix A –TCEQ's letter of approval that the Trinidad Reservoir qualified as a CCRS
Appendix B – TRSES Source Waterbody Biological Information
Appendix C - Trinidad Reservoir Fishery Management Plan and
TCEQ Approval Letter
Appendix D – Evaluation of Fine-mesh Screens for TRSES

2 SOURCE WATERBODY INFORMATION

This chapter provides the source waterbody information for TRSES required at § 122.21(r)(2) of the Rule. Below each of the three subsections required is stated followed by either the required information for TRSES or where that information can be located in other TRSES submittals Luminant has provided to TCEQ.

(i) A narrative description and scaled drawings showing the physical configuration of all source water bodies used by your facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports your determination of the water body type where each cooling water intake structure is located:

Narrative Description with Scaled Drawing, Areal Dimensions and Depths

The physical configuration of Trinidad Reservoir and the location of TRSES is shown in Figure 2-1 and larger view of the TRSES CWIS is shown in Figure 2-2. Trinidad Reservoir's areal dimensions and depths were found at:
http://www.twdb.texas.gov/surfacewater/rivers/reservoirs/trinidad/index.asp.

"Trinidad Lake, the smallest lake in the Trinity River Basin, is located about two miles south of Trinidad in southwestern Henderson County, on an unnamed slough as an off-channel reservoir. It is owned and operated by the TXU Generation Company LLP for condenser-cooling water for a steam-electric generating plant. Water right was granted by Permit No. 818 (Application No. 862) dated July 1, 1925 from the State Board of Water Engineers for construction of the dam and use of water from the Trinity River. Actual construction started and was completed in 1925. The dam is an earthfill embankment of 1,200 feet long with the top at elevation 290 feet above mean sea level. The spillway is part of the levee, and is equipped with one tainter gate. In 1946 a flume 16 feet wide and 6 feet deep was constructed to discharge the water from the gate over the embankment for drainage into the river. The top of the gate is at elevation of 287 feet above mean sea level. The reservoir is operated at a capacity of 6,200 acre-feet and a surface area of 690 acres at an elevation of 283 feet above mean sea level. There is no significant drainage area to contribute runoff to this off-channel reservoir. Water level is maintained by pumping from the river." And from:

https://tshaonline.org/handbook/online/articles/rot08

"TRINIDAD LAKE. *The Trinidad Lake project was started and completed in 1925. The reservoir, located just south of Trinidad in southwestern Henderson County (centered at 32°07' N, 96°06' W), has a capacity of 7,800 acre-feet and a surface area of 753 acres at an elevation of 285 feet above mean sea level. Water is pumped from the Trinity River to maintain this level. There is no significant drainage area to contribute material to this off-channel storage. The lake is surrounded by flat to rolling terrain surfaced by sandy and clay loams that support water-tolerant hardwoods, conifers, and grasses."*

In terms of depth, Luminant estimates the depth is approximately 20 ft.

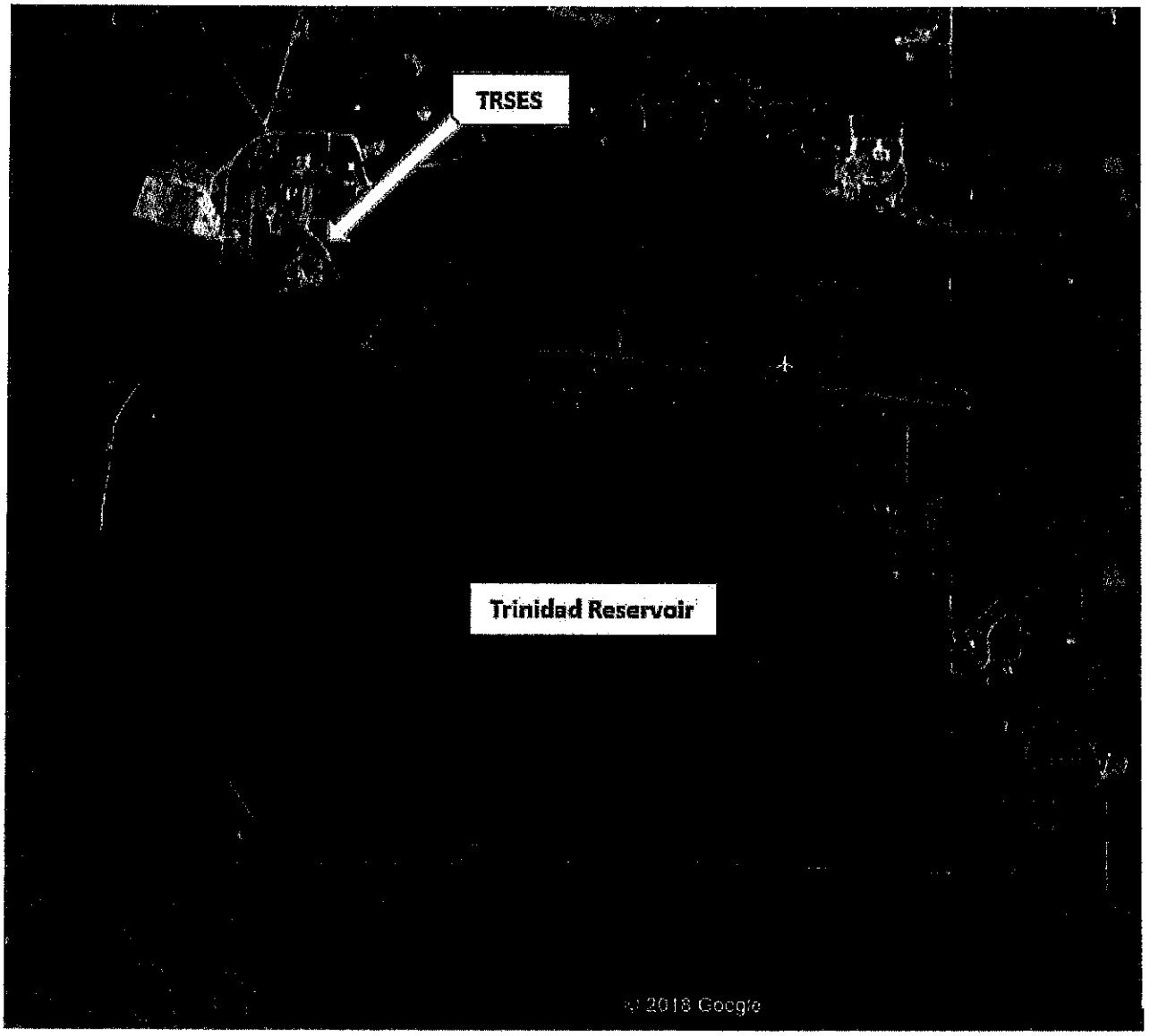

Figure 2-1. Ariel view of Trinidad Reservoir

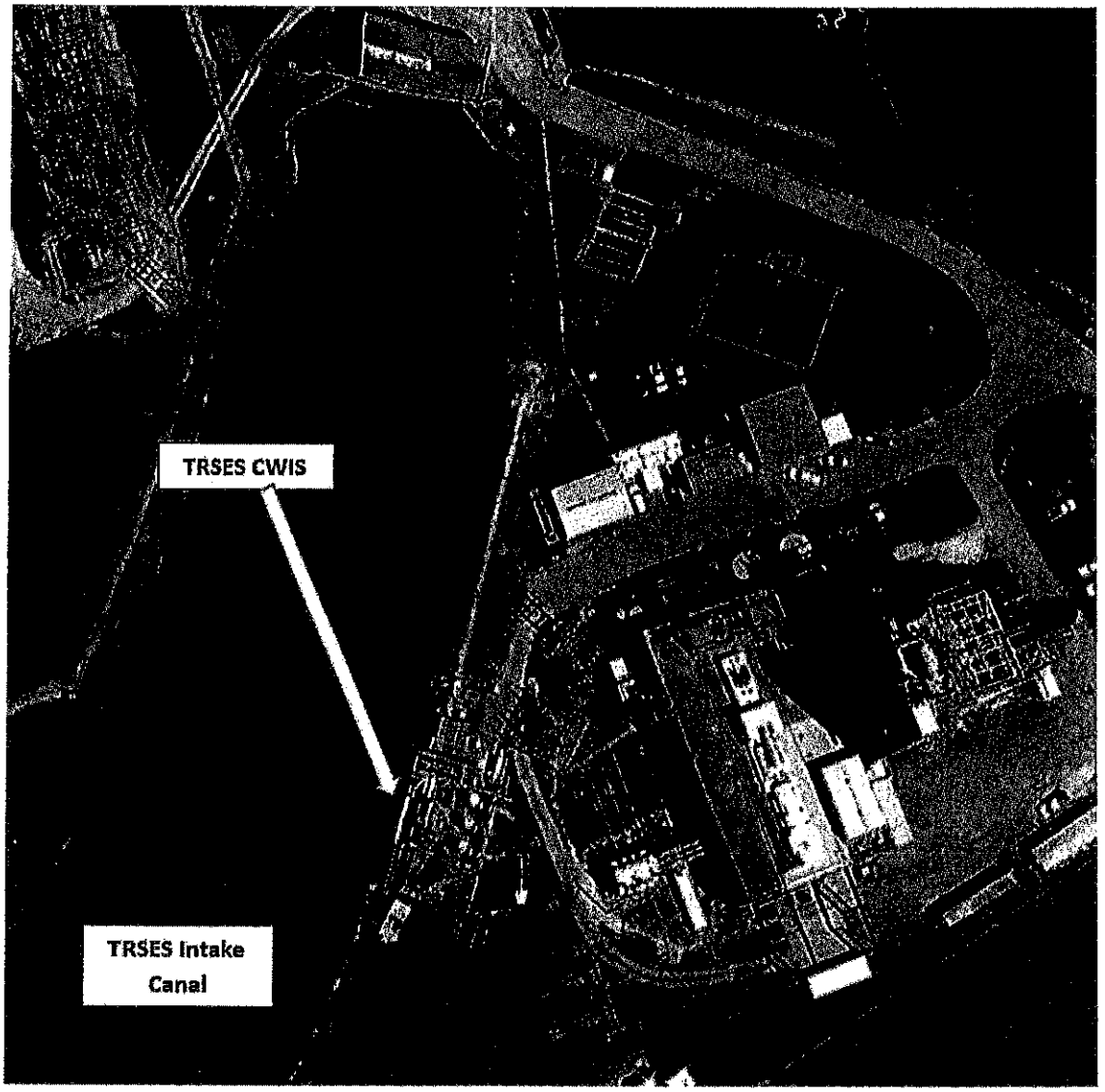

Figure 2-2. Ariel of TRSES CWIS on Trinidad Reservoir.

Salinity

Trinidad Reservoir is a freshwater waterbody with salinities <1 ppt.

Temperature

Luminant is not required to monitor or record water temperature at the intake structure.

(ii) Identification and characterization of the source waterbody's hydrological and geomorphological features, as well as the methods you used to conduct any physical studies to determine your intake's area of influence within the waterbody and the results of such studies. - Information on Lake Hubbard Reservoir's hydrological and geomorphological features were

provided in the narrative description above. Luminant did not conduct any physical studies to determine TRSES's intake's area of influence within the waterbody.

(iii) Locational maps – Provided in Figure 2-1 and 2-2.

3 CWIS INFORMATION

The Rule at § 122.21(r)(3) requires Luminant to provide the following cooling water intake information for TRSES. Each of the five subsections is listed below and followed by either the information or where the information can be found in other documents provided to TCEQ by Luminant for TRSES

(i) A narrative description of the configuration of each of your cooling water intake structures and where it is located in the water body and in the water column:

TRSES is located on the shore of Trinidad Reservoir and is a single 244 MW facility (i.e., Unit 6) constructed in 1965. TRSES has one cooling water intake structure (CWIS), located along the side, approximately 1700 ft from the mouth, of the 1900 ft long intake canal which originally supported other generating Units that have since been retired. The canal is approximately 150 ft. wide in front of the CWIS. The CWIS has three bays, each bay is equipped with one vertical, mixed flow circulating water pump, located downstream of the traveling water screens. The Unit 6 three circulating water pumps have a rated capacity of 130.3 cfs (66,000 gpm). When all three circulating water pumps are operating, the flow to the facility is 441.1 cfs (198,000 gpm or 285 mgd). 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. The screens for each CWIS are 10 ft. wide, are equipped with 3/8 in. square mesh.

Velocities within the CWIS were calculated at the conservation pool water level (El. 283 ft) and the maximum design flow capacity (441.1 cfs). Velocities approaching the traveling water screens are estimated at 1.32 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.

This information is provided in the permit application (see Attachment J - Design and Engineering Calculations of the CWIS). The elevation of the intake bells for Trinidad Reservoir is 267 ft. 10 in. msl.

(ii) Latitude and longitude in degrees, minutes and seconds for each of your cooling water structures;

This information is provided in the Texas Pollution Discharge Elimination System (TPDES) permit application in worksheet 11 question 2a.

(iii) A narrative description of the operation of each of your cooling water intake structures, including design intake flows, daily hours of operation number of days of the year in operation and seasonal changes, if applicable;

As discussed, the three circulating water pumps for Unit 6 pumps are each rated at 66,000 gpm (95 mgd producing a total plant flow of 198,000 gpm (285 mgd).

Historically, TRSES operated at least one circulation water pump regardless of facility generation. However, TRSES now only operates the cooling water pumps when electricity is being generated. This is reflected in Table 8-1 that shows an average annual plant cooling water flow of 55 MGD and capacity utilization was approximately 4.4% over the past five years. The facility does not have any clear pattern of operation.

(iv) A flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges;

An TRSES flow distribution diagram can be found as Attachment F of TPDES permit application.

(v) Engineering drawings of the cooling water intake structure

The CWIS engineering drawings for TRSES can be found in Attachment J (Design and Engineering Calculations of the CWIS) in the TPDES permit application.

4 SOURCE WATERBODY BIOLOGICAL 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 TRSES, the source waterbody is the Trinidad Reservoir. 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. However, no site-specific entrainment data was collected in the vicinity of the intake.

(ii) A list of species (or relevant taxa) for all life stages and their relative abundance near the CWIS. While no site-specific entrainment data is available, information is provided in Appendix B on species in the Trinidad Reservoir, 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.

Section 3 of Appendix B provides a list of the species most susceptible to impingement and entrainment. Gizzard, threadfin shad "both forage species" and sunfish (larger larvae for entrainment and juveniles for impingement), are the three fishes most vulnerable to entrainment and impingement. Both shad species 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. Juvenile shad and sunfish 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 Trinidad Reservoir 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 Trinidad Reservoir is provided in Section 3 of Appendix B.

(vi) *Identification of all 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 or designated critical habitat that occur in Trinidad Reservoir (U.S. Fish and Wildlife Service [USFWS], 2018). Four bird species are federally listed as threatened or endangered for the Trinidad Reservoir area in Henderson County (Table 2) [USFWS, 2019]. The four listed bird species are discussed in Section 4 and listed in Table 4.1 of Appendix B and none have a nexus with the TRSES CWIS. Therefore, the only potential impact to federally protected species would be in the event that a CCRS using cooling towers was required.

(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. 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.

[1] The "action area" can be generally considered the area in the vicinity of impingement and entrainment at the CWIS.

Luminant did not nor has no plans to collect new data by conducting field studies to supplement existing data and information for TRSES.

(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 TRSES.

(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 the Trinidad Reservoir.

(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 TRSES's CWIS.

5 COOLING WATER SYSTEM

The Rule at § 122.21(r)(5) requires that Luminant provide the cooling water system data for TRSES. Each of the three subsections for this requirement is listed below and either the information is provided or the location where the information can be found in other TRSES documents provided to TCEQ.

(i) A narrative description of the operation of the cooling water system and its relationship to cooling water intake structures; the proportion of the design intake flow that is used in the system; the number of days of the year the cooling water system is in operation and seasonal changes in the operation of the system, if applicable; the proportion of design intake flow for contact cooling, non-contact cooling, and process uses; a distribution of water reuse to include cooling water reused as process water, process water reused for cooling, and the use of gray water for cooling; a description of reductions in total water withdrawals including cooling water intake flow reductions already achieved through minimized process water withdrawals; a description of any cooling water that is used in a manufacturing process either before or after it is used for cooling, including other recycled process water flows; the proportion of the source waterbody withdrawn (on a monthly basis);

Narrative Description of the Cooling Water System and Relationship to the CWIS – A description of the TRSES CWIS is provided in Chapter 3. TRSES's Unit 1 employs a once through cooling system such that after water is withdrawn from the Trinidad Reservoir through the CWIS and is conveyed through cooling water pipes to the Unit 1 condensers. After passing through the condensers the thermal discharge is conveyed and discharged back into the Trinidad Reservoir where it is discharged at the northeast end of the facility at monitoring point 001.

Proportion of DIF Used in Cooling System – Over >98% of the design intake flow is used for condenser cooling

Number of Days of the Year Cooling System is in Operation and Seasonal Changes in Operation – As noted in Table 8-1 TRSES has a low capacity utilization over the past five years (i.e., approximately 4.4%). The generating unit operates only when instructed to do so by ERCOT, which operates the electric grid and manages the deregulated market for 75 percent of the state. As discussed in Chapter 3 cooling water pumps as of the latter part of 2018 are now used only in conjunction with operation of the associated generating unit.

Non-Contact Cooling and Process Uses and Use of Gray Water for Cooling – As a steam electric generating station, this provision is not applicable to TRSES.

Reductions in Total Water Withdrawals Already Achieved Through Minimized Process Water Withdrawals – As a steam electric generating station, this provision is not applicable to TRSES.

Description of Any Cooling Water That is Used in a Manufacturing Process – TRSES does not use any water for a manufacturing process.

The Proportion of the Source Waterbody Withdrawn on a Monthly Basis – Currently data is not available to make a reasonable estimate of current water withdrawals on a monthly basis. This is due to:

1. The change in cooling water pump operation to only operate in conjunction with operation of the associated generating unit
2. Overall low capacity utilization

(ii) Design and engineering calculations prepared by a qualified professional and supporting data to support the description required by paragraph (r)(5)(i) of this section – Yes, the calculations were made by a qualified professional engineer.

(iii) Description of existing impingement and entrainment technologies or operational 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 - TRSES uses 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".* - TCEQ has agreed that the Trinidad Reservoir qualifies as a CCRS and the Rule indicates that a CCRS is the best means of flow reduction and results in a proportional reduction in both impingement and entrainment. Additionally, Luminant has changed cooling water flow practices at TRSES such that the pumps are operated only when the facility is generating electricity. This practice has resulted in an AIF <125 mgd.

6 CHOSEN METHOD OF COMPLIANCE FOR IMPINGEMENT

The Rule at § 122.21(r)(6) requires Luminant to discuss the chosen method of compliance with the impingement mortality standard for TRSES. Facilities must either select one of the seven alternatives at § 125.95(c)(1) through (7) unless the facility 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 TRSES Luminant chooses use of a CCRS as defined at § 125.94(c)(1) of the Rule and TCEQ's May 26, 2015 letter to Luminant (Appendix A) approved use of the CCRS as impingement BTA.

7 ENTRAINMENT PERFORMANCE STUDY INFORMATION

The Rule at §122.21(r)(7) requires Luminant to discuss entrainment performance studies for TRSES. Specifically, the Rule requires "*The owner or operator of an existing facility must submit any previously conducted studies or studies obtained from other facilities addressing technology efficacy, through-facility entrainment survival, and other entrainment studies. Any such submittals must include a description of each study, together with underlying data, and a summary of any conclusions or results. Any studies conducted at other locations must include an explanation as to why the data from other locations are relevant and representative of conditions at your facility. In the case of studies more than 10 years old, the applicant must explain why the data are still relevant and representative of conditions at the facility and explain how the data should be interpreted using the definition of entrainment at 40 CFR 125.92(h).*"

Luminant has never conducted entrainment performance studies at TRSES. Luminant did participate in an EPRI § 316(b) supplemental project that included conducting a literature survey of all impingement and entrainment performance studies that could be located. The final report for the literature survey is titled "*Narrative Descriptions of Impingement and Entrainment Survival Studies*" (EPRI 2014). This study identified 16 entrainment survival studies, some of which were through plant survival studies and some of which were survival after collection on fine-mesh traveling water screens. However, 13 of the studies were conducted at facilities located on oceans and estuaries where species are not representative of TRSES's source waterbody; two of the studies were conducted on the Great Lakes and the third was conducted on the mainstem Missouri River and none are considered representative for a freshwater water reservoir and the species subject to entrainment at TRSES.

8 SYSTEM OPERATION INFORMATION

The Rule at § 122.21(r)(8) requires Luminant to discuss the operational status of TRSES. Specifically, *"the owner or operator of an existing facility must submit a description of the operational status of each generating, production, or process unit that uses cooling water.*

Below each of the five subsections for this information is stated, followed either by the information or where that information can be found in other Luminant documents provided to TCEQ.

(i) For power production or steam generation, descriptions of individual unit operating status including age of each unit, capacity utilization rate (or equivalent) for the previous 5 years, including any extended or unusual outages that significantly affect current data for flow, impingement, entrainment, or other factors, including identification of any operating unit with a capacity utilization rate of less than 8 percent averaged over a 24-month block contiguous period, and any major upgrades completed within the last 15 years, including but not limited to boiler replacement, condenser replacement, turbine replacement, or changes to fuel type;

TRSES has a single operating unit (Unit 1) that went into operation in 1965. Capacity utilization for the last five years is shown in Table 8-1. There were no unusual or significant outages. Capacity utilization was <5% for the last five years. No major upgrades or changes in fuel type occurred during the prior fifteen years. Also provided are the average annual actual intake flows for the past five years (i.e. 2014 – 2018) and the five-year average is 55 mgd. However, for the purpose of determining if the facility must provide the entrainment information at § 122.21(r)(9)-(13) the definition of AIF at § 125.92(a) states that currently (i.e., prior to October 14, 2019) AIF is based on the most current three years of flow data. The AIF for the purpose of this permit application is therefore 43.3 mgd that is significantly less than 125 mgd and therefore TRSES is currently not subject to providing the entrainment information at § 122.21(r)(9)-(13).

Table 8-1 TRSES flow and capacity utilization data for last 5 years

Flow/Capacity Utilization	2014	2015	2016	2017	2018	5 Year Average
Average Flow (MGD)	91	55	46	29	55	55
Capacity Utilization	5.35%	4.74%	3.38%	1.92%	6.65%	4.41%

(ii) Descriptions of completed, approved, or scheduled uprates and Nuclear Regulatory Commission relicensing status of each unit at nuclear facilities – TRSES is a fossil unit and this provision is not applicable to the facility.

(iii) *For process units at your facility that use cooling water other than for power production or steam generation, if you intend to use reductions in flow or changes in operations to meet the requirements of 40 CFR 125.94(c), descriptions of individual production processes and product lines, operating status including age of each line, seasonal operation, including 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* – TRSES has no processing units and this subsection is not applicable to the facility.

(iv) *For all manufacturing facilities, descriptions of current and future production schedules* – TRSES is not a manufacturing facility and this subsection is not applicable to the facility.

(v) *Descriptions of plans or schedules for any new units planned within the next 5 years* – Luminant has no plans to construct any new units at TRSES in the next five years.

9 122.21(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."*

Currently, since Trinidad's AIF is <125 MGD it is not required to submit the entrainment information at § 122.21(r)(9) – (13) of the Rule. However, in the event that Trinidad's operation increases in the future and AIF exceeds 125 MGD, the purpose of this chapter is to document that Luminant's TRSES would qualify for the § 122.21(r) information waiver and to will formally request that the entrainment information at § 122.21(r)(9) – (13) 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.

9.1 TRSES Withdraws Condenser Cooling Water from a Manmade Lake or Reservoir

Cooling makeup water for TRSES's CCRS is withdrawn from the Trinidad Reservoir. A description of the history of dam construction was extracted from the Texas Water Development Board (http://www.twdb.texas.gov/surfacewater/rivers/reservoirs/trinidad/index.asp). The text from the Water Board website is provided in Chapter 2 of this document and documents the history of construction of the dam that created the reservoir.

The dam and reservoir are owned and operated by Luminant for the purpose of providing cooling water for TRSES.

9.2 Trinidad Reservoir Has a Stocked and Managed Fishery

The Trinidad Reservoir is private reservoir owned and operated by Luminant and is not open to the general public. In November 2015 Luminant submitted a fisheries management plan to TCEQ for approval for five of its privately owned reservoirs that included the Trinidad Reservoir. The letter specifically requested approval of the plan for use in complying with the Rule. TCEQ responded with a letter dated December 10, 2015 approving the plan. Both the Luminant letter requesting approval and the fishery management plan, as well as the TCEQ approval letter are provided as Appendix C.

9.3 Trinidad Reservoir Does Not Have Federally Protected Threatened and Endangered Species or Designated Critical Habitat

As discussed in Chapter 4, there is no risk to federally threatened or endangered species nor their designated critical habitat due to TRSES CWIS operations. While there are four federally listed

bird species in the area none are affected by TRSES's CWIS (see Appendix B for a more detailed discussion of this topic).

9.4 Request for Wavier of the § 122.21(r)(9)-(13) Entrainment Information

Luminant, should TRSES flows exceed 125 MGD in the future, plans to make use of the provision at § 125.95(a)(3) of the Rule for waiver of the § 122.21(r)(9)-(13) information. TRSES should qualify for the waiver of the § 122.21(r) entrainment information based on the information provided in Subsections 9.1, 9.2 and 9.3 of this chapter.

10 INFORMATION TO INFORM THE TRSES SITE-SPECIFIC ENTRAINMENT BTA DETERMINATION

10-1 Director Requirements at §125.98(f)

While Luminant qualifies for a waiver from the entrainment information at § 122.21(r)(9)-(13), TCEQ is still required to make an entrainment BTA determination for TRSES 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 entrainment studies should not be required for TRSES, based having an AIF well below 125 MGD, TCEQ is still required to make an entrainment BTA determination. Therefore, Luminant is providing information in this Chapter to aid TCEQ in making the TRSES entrainment BTA determination.

10.2 Factors That Must Be Considered

Each of the five factors that **must be considered** in making the entrainment BTA determination are discussed below.

10.2.1 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);"*

Section 3 of Appendix B provides a list of the species most susceptible to impingement and entrainment. Gizzard, threadfin shad "both forage species" and sunfish (larger larvae for entrainment and juveniles for impingement), are the three fishes most vulnerable to entrainment and impingement. Both shad species 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. Juvenile shad and sunfish 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.

Importantly Trinidad Reservoir does not contain any federally protected federal threatened or endangered species and the reservoir is not designated critical habitat for such species.

10.2.2 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., <5%) and the estimated cost of a CCRS retrofit (i.e., $42.1 million to over $132 million) TRSES would most likely be retired if a retrofit was required.

10.2.3 Land Availability

The Rule states for this factor "*(iii) Land availability inasmuch as it relates to the feasibility of entrainment technology;*

The Rule states for this factor "*(iii) Land availability inasmuch as it relates to the feasibility of entrainment technology;* - There appears to be land to accommodate a mechanical draft cooling tower if one were required. However, if a cooling tower were required a structural study would be necessary to verify available land could support the tower.

10.2.4 Remaining Useful Plant Life

The Rule states for this factor "*(iv) Remaining useful plant life;* - No retirement date has been announced for TRSES.

10.2.5 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 9.2.5.1.

10.2.5.1 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.

10.2.5.1.1 Use of a CCRS

TRSES already employs a CCRS as documented in Appendix A. 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 the Trinidad Reservoir as a CCRS, means TRSES 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 10-2. While a site-specific evaluation was not conducted for TRSES, based on TRSES's design intake cooling water flow (198,000 gpm) a CCRS mechanical draft retrofit cost depending on the degree of difficulty would be:

1. Easy -$42.1 million
2. Average - $64.0 million
3. Difficult - $94.2 million
4. Very Difficult - $132.6 million

Note that the estimates are made after scaling up the difficulty cost factors shown in Figure 10-2 from 2010 to 2019 dollars using https://www.usinflationcalculator.com/.

In terms of social costs, given that TRSES's capacity utilization rate over the past five years is 4.4% and it would not likely be economical to perform a retrofit even if at the easy retrofit cost. If required to retrofit with a cooling tower, 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

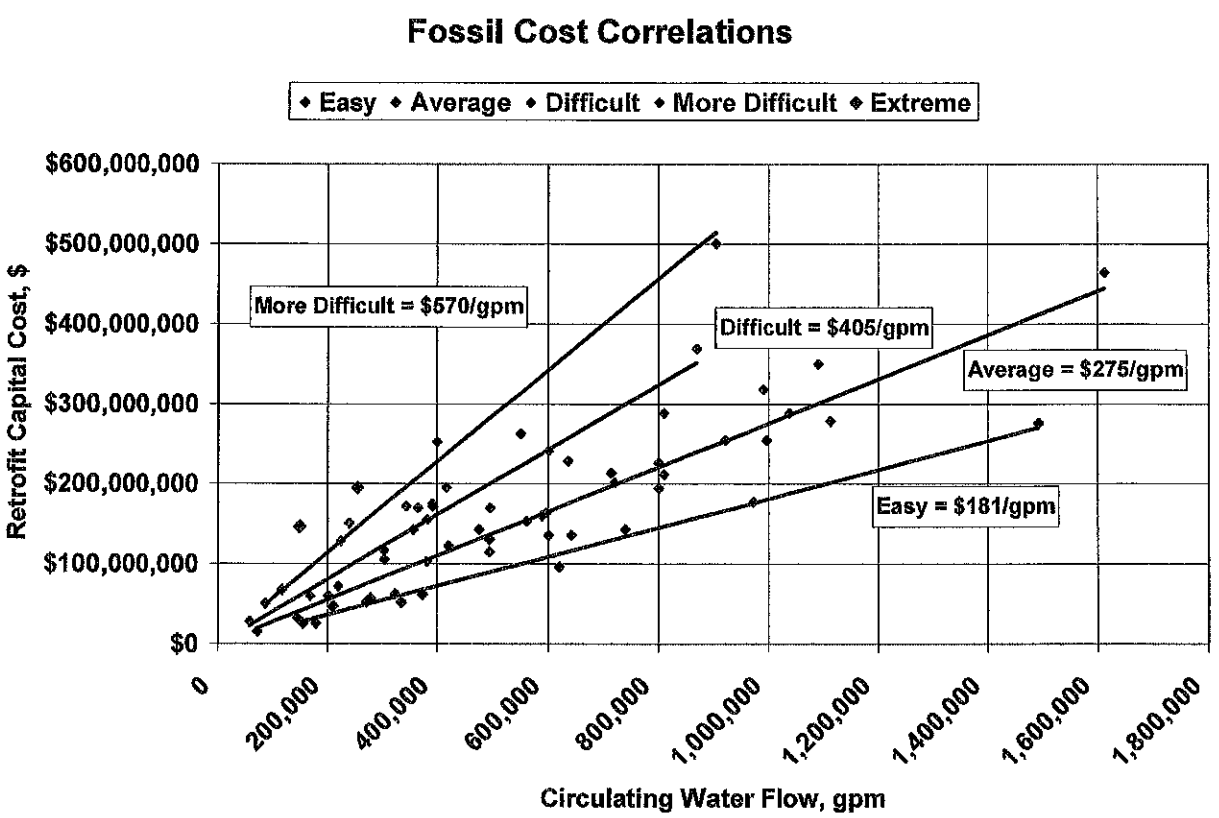

Figure 10-2. Degree of difficulty CCRS retrofit costs based on EPRI cost of CCRS retrofit study (EPRI 2010).

10.2.5.1.2 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 TRSES 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 TRSES and concludes by discussing the technical feasibility and compliance cost for both fine-mesh modified traveling screens and narrow-slot wedgewire screens.

10.2.5.1.2.1 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 at § 125.92(s) 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 TRSES, survival continues to be poor and is often <30% (EPRI 2006).

For TRSES's CWIS the estimated capital and O&M cost for modified fine-mesh traveling screens are provided in Table 10-1 below and the estimated net present value and annualized costs discounted at 7% and 3% are provided in Table 10-2 below. A detailed discussion of these screens is provided in Section 3 of Appendix D.

Table 10-1. Order of magnitude estimated cost of modified fine-mesh traveling water screens for TRSES.

Capital Cost (millions)	Permitting and Pre-construction Study Cost	Annual O&M Cost
$4.0	$316,000	$161,000

Table 10-2 Estimated net present value and equivalent annual costs at both 7% and 3% discount rates for fine-mesh modified traveling screens at TRSES.

Technology	IPS Fine-mesh Modified Traveling Screens with a New Fish Return (millions)
Net Present Value (2018 $) (7% Discount rate)	$4.9 M
Net Present Value (2018 $) (3% Discount rate)	$6.0 M
Equivalent Annual Cost (2018 $) (7% Discount rate)	$0.40 M
Equivalent Annual Cost (2018 $) (3% Discount rate)	$0.48

10.2.5.1.2.2 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 TRES evaluation determined that it would be feasible to deploy this technology in the Trinidad Reservoir in the front of the TRSES CWIS. However, permits and approvals would be required, as well as some additional cost for permitting and approvals. 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 TRSES 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 bulkhead 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. The 0.5 mm slot option would use four, 5 ft diameter header pipes each designed for the flow through eight screens. The 2.0 mm slot option would use two, 7 ft diameter header pipes with seven screens each. Each header pipe would be aligned and anchored to the lake bottom using large concrete anchors. An automatic cleaning system, either brush cleaned or air-backwash would be used to clean the screens. The layout of the 0.5 mm slot option is provided on **Error! Reference source not found.** and the 2.0 mm slot option on **Error! Reference source not found.** of Appendix D.

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 TRSES. The results of the analysis are provided in Table 10-3 below. Capital costs to accommodate the total TRSES flow range from $14.9 million for 0.5 mm screens to $8.2 million for 2 mm screens. 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 10-3 Estimated cost for narrow-slot wedgewire screens at TRSES

Slot-size	Capital Cost (millions)	Permitting and Pre-construction Study Cost	Annual O&M Cost
0.5 mm	$14.9	$470,000	$321,000
2.0 mm	$8.2	$390,000	$144,000

Table 10-4 Estimated present value and annualized costs for 0.5 mm and 2.0 mm narrow-slot wedgewire screens for TRSES 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 (2018 $) (7% Discount rate)	$16.8	$9.0
Net Present Value (2018 $) (3% Discount rate)	$20.0	$10.6
Equivalent Annual Cost (2018 $) (7% Discount rate)	$1.4	$0.7
Equivalent Annual Cost (2018 $) (3% Discount rate)	$1.6	$0.9

In summary, at capital costs in excess of $4.0 million dollars for modified fine-mesh screens and almost a cost of $8.2 to 14.9 million for 2.0 mm and 0.5 narrow-slot wedgewire screens sizes respectively, installation of these technologies would not make economic sense given TRSES's low capacity utilization and would place the facility at a severe economic disadvantage and threaten its future viability.

10.2.5.1.3 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."* TRSES is no exception to this finding, and water reuse, other than through use of a CCRS as discussed in Section 10.2.5.1.1 of this document is not considered technically feasible. The Rule's 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 Wastewater Treatment Plant (WWTP) to TRSES of any size is in Tyler, TX. However, there are two facilities with a combined treatment capacity of only 29 mgd (https://tylerpaper.com/news/local/tyler-water-utilities-turns-marking-decades-of-planning-to-ensure/article_e98f3cdd-94ee-5b7e-a2b5-c0ee22a3d44d.html). The 29 MGD would only be enough water to reduce once-through cooling by 1010%. Since some nearly 50 miles of piping would be required to supply and return the water this source of cooling water is not considered practical. While both Dallas's Central Wastewater Treatment Plant and Southside Wastewater Treatment Plant could potential provide a significant amount of wastewater for cooling (i.e., the Central Wastewater Treatment facility averages 100 mgd) these facilities are located approximately 60 miles from TRSES and piping would have to cross many roads and residential properties (Figure 10-3) and therefore use of water from these facilities is not considered feasible. This is especially the case given that TRSES has a capacity utilization of 4.4$ over the five years.

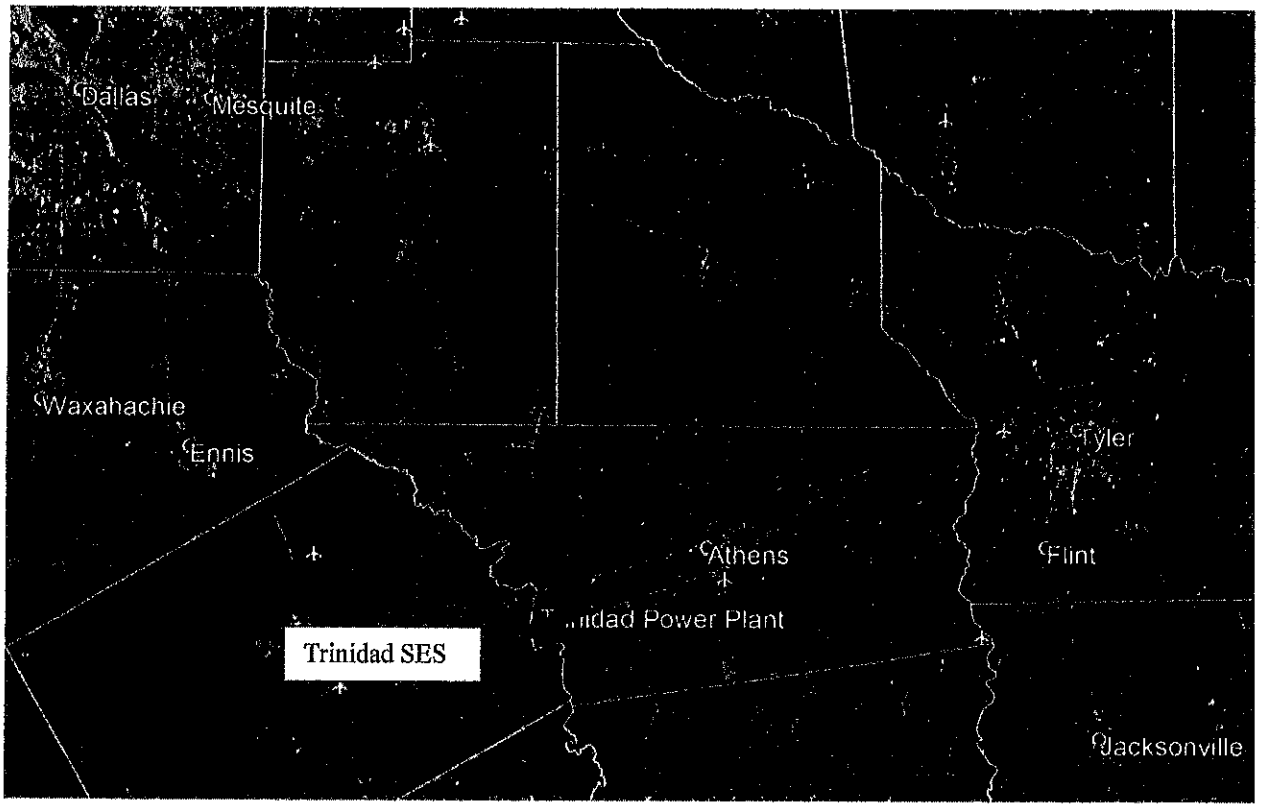

Figure 10-3 – Larger wastewater treatment facilities near TRSES

10.2.5.2 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. TRSES currently uses a CCRS,
2. under current operations TRSES 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

10.2.5.2.1 TRSES's Use of a CCRS

Trinidad Reservoir is a privately owned reservoir and was specifically constructed to supply cooling water to TRSES. Luminant provided information to TCEQ that TRSES 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 May 26, 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 9.2.5.1.1 of this document, TRSES 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"*, TRSES should be determined to employ BTA for entrainment on this basis alone.

10.2.5.2.2 Flow Reduction under Current Operations

As noted in Section 2 of the Rule TRSES's AIF over the past three years is 43.3 MGD and capacity utilization over the past five years is <5%. 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 approximately 85%. The flow reduction of 85% means there is a significant reduction in entrainment from the Trinidad Reservoir. As required by the Rule, capacity utilization and flow must be updated at each permit renewal and may change in the future.

10.2.5.2.3 Expected Biological Benefits Relative to Cost

Since the Trinidad Reservoir is not currently open to Public use there would be no public fishery benefit to an increased fish population as a result of a new entrainment BTA, if required. Given the cost of new entrainment BTAs discussed in Section 10.2.5.1, the cost of the evaluated technologies are expected to be wholly disproportionate relative their biological benefits. With regard to the 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.

10.3 Factors That May Be Considered

Each of the five factors that **may be considered** in making the entrainment BTA determination are discussed below.

10.3.1 Entrainment Waterbody Impacts

The Rule states for this factor "*(i) Entrainment impacts on the waterbody;*" – No site-specific entrainment study was conducted in the Trinidad Reservoir, since TRSES's AIF is well below 125 MGD. As noted in Chapter 4 and the most recent fishery data gives no indication that TRSES is having a significant impact on the Trinidad Reservoir fishery.

10.3.2 Thermal Discharge Impacts

The Rule states for this factor "*(ii) Thermal discharge impacts;* - As discussed earlier in this document, the Trinidad Reservoir was created for the purpose of serving as a cooling pond for TRSES. TCEQ has acknowledged in the May 26, 2015 letter to Luminant that the Trinidad Reservoir qualified as a CCRS under the Rule's definition at § 125.92(c)(2).

10.3.3 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 TRSES prior to October 14, 2014.

10.3.4 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 TRSES it would most likely be retired due to the current low capacity utilization. As a result, another less economical unit(s) would need to provide the electric power currently provided by TRSES resulting in a higher cost of electricity to the consumer.

10.3.5 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 Trinity River watershed. Water for the site and reservoir is authorized by 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 Trinity watershed, and contracted water from the Trinity River Authority are 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 moderate high total dissolved solids found in the Trinity River and the concentrating effect of the cooling tower, and the fact that any discharge would be back into the reservoir.

10.3.6 Availability of Other Cooling Water Sources

Due to the significant amount of water needed for condenser cooling at TRSES (i.e., 285 mgd), as discussed in Subsection 10.2.5.1.3 there are no long-term/cost effective water sources within reasonable proximity to TRSES to make this alternative feasible.

11 REFERENCES

Electric Power Research Institute (EPRI). 2011: Closed-cycle Cooling System Retrofit Study: Capital and Performance Cost Estimates, EPRI, Palo Alto, CA; 1022491.

Electric Power Research Institute (EPRI). 2013. Fish Protection at Cooling Water Intake Structures: A Technical Reference Manual – 2012 Update. EPRI, Palo Alto, CA; 3002000231.

Electric Power Research Institute (EPRI). 2014. Narrative Descriptions of Impingement and Entrainment Survival Studies. Palo Alto, CA.

Link-Belt Manual: Models 45A and 46A Traveling Water Screens, FMC Corporation Link-Belt Engineering Group, Chicago, IL

Texas Parks and Wildlife (TPWD). 2016. Striker Reservoir Performance Report. Inland Fisheries Division, Tyler South District, Tyler, Texas.

United States Environmental Protection Agency (USEPA). 2014. 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; Final Rule.

United States Environmental Protection Agency (USEPA). 2014b. Technical Development Document for the Final Section 316(b) Existing Facility Rule. United States Environmental Protection Agency (USEPA). 2014. Technical Development Document for the Final Section 316(b) Existing Facility Rule. EPA-821-R-14-002. https://www.epa.gov/cooling-water-intakes/support-documents-final-rule-existing-electric-generating-plants-and-factories .

ALUMINANT CCRS DESIGNATION REQUEST AND TCEQ APPROVAL LETTER

Luminant

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April 22, 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
Trinidad Reservoir
Certificate of Adjudication # 08-4970

Dear Ms. Clayton,

Luminant Power requests the Director's determination of Trinidad 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 Trinidad Reservoir was lawfully built in waters of the U.S. for the purpose of providing cooling water for the Trinidad Steam Electric Station.

The Trinidad reservoir was authorized in 1924, and it is located in Henderson County. The reservoir was constructed by Luminant specifically as an industrial cooling impoundment. It is owned, maintained, and operated by Luminant Power, which also has the necessary water rights.

The Trinidad 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, and then returned back to the reservoir to allow waste heat to be dissipated to the atmosphere before it is again reused. Also, because it is a reservoir, this system essentially eliminates blowdown and completely eliminates drift (both of which are losses associated with cooling towers).

A copy of the Certificate of Adjudication for the reservoir is attached. 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

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

May 26, 2015

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 Trinidad Reservoir

Dear Mr. Duncan:

This letter is in response to your letter dated April 22, 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 Trinidad Reservoir.

The documentation submitted with the request includes the following:

(1) cover letter including information on Trinidad Reservoir;
(2) the Certificate of Adjudication for water rights issued by the TCEQ with the most recent Amendment granted on September 4, 1986 indicating that the reservoir was built for industrial cooling water purposes; and,
(3) 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), Trinidad 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 Trinidad 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 Trinidad 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 Trinidad 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

cc: Mr. Gary Spicer, Environmental Services, Luminant Power, 1601 Bryan Street Dallas Texas 75201

bcc: Mr. Mike Lindner, Team Leader, Industrial Wastewater Permitting, Water Quality Division, MC-148

B TRINIDAD RESERVIOR BIOLOGICAL INFORMATION

FREESE AND NICHOLS

Innovative approaches
Practical results
Outstanding service

TRINIDAD STEAM ELECTRIC STATION

316(b) BIOLOGICAL INFORMATION

Prepared for:

EPRI

May 2019

Prepared by:

FREESE AND NICHOLS, INC.
4055 International Plaza, Suite 200
Fort Worth, Texas 76109
817-735-7300

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1.0 INTRODUCTION

Trinidad Steam Electric Station (TRSES) is located approximately 2 miles south of the town of Trinidad in Henderson County, Texas. The water right to build Trinidad Lake was granted by permit number 818 and dated July 1, 1925, with construction completed the same year (TWDB, 2019). The impoundment is 690 acres with a volume of 6,200 acre-feet at conservation pool elevation (TWDB, 2019). The manmade reservoir is not open to the general public, but some anglers access the fishery at a public road crossing (Farm-to-Market Road 1667). Employees historically used to the reservoir for fishing and other recreational activities, but recent recreational use is low due to the low utilization rate of the power plant and low number of employees. Luminant manages the reservoir for its intended use as an industrial cooling impoundment. However, the reservoir was historically used by the Texas Parks and Wildlife Department for the Florida Largemouth Bass (*Micropterus salmoides*) brood stock program (Richard Ott, TPWD Inland Fisheries, personal communication). Recent management efforts included a fishery survey conducted by Freese and Nichols, Inc. (FNI) in 2016. Data from the FNI survey were used to describe fish species that occur in Trinidad Lake and therefore meets the basis to waive 40 CFR 122.21(r) requirements (FNI, 2017).

2.0 SPECIES NEAR TRINIDAD STEAM ELECTRIC STATION COOLING WATER INTAKE STRUCTURE

The most important sport fish in Trinidad Lake include Largemouth Bass, Channel Catfish (*Ictalurus punctatus*), and White Crappie (*Pomoxis annularis*). Yellow Bass (*Morone mississippiensis*) is a close relative of White bass (*M. chrysops*) that are abundant in the impoundment and may be targeted by some anglers. Important forage fish include shad (*Dorosoma* spp.) and sunfish (*Lepomis* spp.) Table 1 provides a list of the most common species that occur near the TRSES 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. 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 fisheries survey documented high densities of Gizzard Shad, but Threadfin

Shad abundance was low. Gizzard Shad had an Index of Variability of 82, indicating that 82% of the population is an available size for predation (FNI, 2017).

Sunfish, including Bluegill (*Lepomis macrochirus*) and Longear Sunfish (*L. megalotis*), are the most common sunfish species in the impoundment. 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. While sunfish populations in general were stable, the fisheries survey found low numbers of Green Sunfish (*Lepomis cyanellus*) and Redear Sunfish (*Lepomis microlophus*) were absent (FNI, 2017).

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. FNI survey data (2017) indicate a Largemouth Bass catch-per-unit-effort (CPUE) of 74/hour and a balanced population structure. Age-0 individuals were also represented in the survey, indicating successful recruitment. White Crappie were collected at Trinidad Lake and abundance was high, with a CPUE of 9.7/net-night. Length structure was high, with most individuals measuring over 12 inches in length (FNI, 2017). No Black Crappie (*Pomoxis nigromaculatus*) were collected in the survey, but it is possible they exist in the reservoir.

Table 1: Fish Species of Likely Occurrence in Trinidad Lake[a]

Common Name	Scientific Name	Entrainment Probability [b]	Impingement Probability [c]
PELAGIC			
Gizzard Shad	*Dorosoma cepedianum*	H	H, L[d]
Threadfin Shad	*Dorosoma petenense*	H	M
BANK/STRUCTURE			
Crappie	*Pomoxis* spp.	L	L
Largemouth Bass	*Micropterus salmoides*	L	L
Yellow Bass	*Morone mississippiensis*	L	L
Sunfish	*Lepomis* spp.	M	M, L[e]
BENTHIC			
Channel Catfish	*Ictalurus punctatus*	L	L
Blue Catfish	*Ictalurus furcatus*	L	L

H = High likelihood; M = Moderate likelihood; L = Low likelihood

[a] Species of likely occurrence based on fishery survey of Trinidad Lake (FNI, 2017)
[b] Entrainment Probability refers to 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
[d] For Gizzard Shad, impingement probability is high for juveniles and low for adults
[e] For sunfish species, impingement probability is moderate for juveniles and low for adults

Yellow Bass is a predatory species found in Trinidad Lake that are sometimes targeted by anglers. Adults are generally found among offshore pelagic environments in schools and feeding in midwater or near the surface. Spawning typically occurs as water temperatures warm in early spring and is reported at various locations from 15–26 degrees Celsius water temperature (Wallus and Simon, 2006). As with other species, warmer cooling water effluent can accelerate spawning for Yellow Bass (Webb and Moss, 1968). Yellow Bass often move upstream into creeks to spawn in shallow water. Demersal and adhesive, eggs sink and attach to submerged substrates, typically over sand and gravel-cobble (Wallus and Simon, 2006). Yellow Bass do not provide parental protection and adults return to deeper water once spawning is complete. Yellow Bass electrofishing CPUE was high at 150/hour and gill net CPUE was 24.3/hour (FNI, 2017). The majority of Yellow Bass were ≤ 8 inches in length.

Channel Catfish and Blue Catfish are common littoral and bottom-dwelling species in the region, but only Channel Catfish were found in significant numbers in Trinidad Lake (FNI, 2017). Catfish 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 a large population of Channel Catfish, with a CPUE of 16.3/net-night; however, the population was unbalanced with most individuals >20 inches in length (FNI, 2017). As a result of low harvest pressure, recruitment of young fish is low, which could be a result of crowding by larger individuals.

3.0 SPECIES AND LIFE STAGES SUSCEPTIBLE TO IMPINGEMENT AND ENTRAINMENT

The species most susceptible to impingement and entrainment in Trinidad Lake 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 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. During sever cold weather, Gizzard Shad may also become lethargic. 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. These species deposit demersal eggs in guarded nests among shallow, littoral habitats. 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, 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.

Yellow Bass migrate upstream into reservoir tributaries to spawn, however Trinidad Lake is not located on a tributary, as make-up water is pumped from the nearby Trinity River. Therefore, Yellow Bass spawning is likely limited to the cooling water discharge channel. Since Yellow Bass 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 Trinidad Lake, the primary spawning area would be the discharge canal, which is far from the CWIS and the probability of larval entrainment would be low. As juvenile Yellow Bass move among pelagic areas, it is possible that some impingement could occur. However, Yellow Bass are strong swimmers and impingent of healthy fish 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, but unlikely due to their low abundance in Trinidad Lake.

4.0 SPECIES OF REGULATORY INTEREST

Commercial fishing is not allowed on Trinidad Lake; therefore, there are no commercially important species in the reservoir. Gamefish include Largemouth Bass, White Crappie, and Channel Catfish. Yellow Bass is not a gamefish but are sometimes harvested by anglers. Since Lake Trinidad is not open to the general public, recreational fishing has historically been limited to employees and public access at the bridge crossing.

Four bird species are federally listed as threatened or endangered for the Trinidad Lake area in Henderson County (Table 2) [USFWS, 2019]. In addition, there are no aquatic species federally listed as threatened or endangered that occur in the reservoir, and no critical habitats occur within the Trinidad Lake area. The following sections describe the bird species in relation to the Trinidad power plant.

Table 2. Federally Listed Species in Trinidad Lake 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
Whooping Crane	*Grus americana*	E	Yes	No
Interior Least Tern	*Sternula antillarum*	E	Yes	No

Source: USFWS (2019).

* 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 (2019a) data show a sighting of two red knots approximately 9 miles south of Trinidad Lake at the Richland Creek Wildlife Management Area (WMA) north unit in May of 2016. There are no recorded sightings of red knot at Trinidad Lake 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 plover 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 Trinidad Lake; 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 (2019b) data shows a piping plover sighting at the John Bunker Sands wetland complex approximately 41 miles northwest of Trinidad Lake, most recently in August 2015. The species has not been seen previously in the area, and the chance of seeing a piping plover again is low due to its rarity and the lack of exposed sandy shoreline at Trinidad Lake. Critical habitat has been designated for this species; however, it does not exist at any inland Texas locations.

4.3 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). A pair of whooping cranes was spotted at Lake Ray Hubbard in May 2013, approximately 60 miles northwest of Trinidad Lake (eBird, 2019c). Sightings near large bodies of water, agriculture fields, and near wetlands are not uncommon during migratory season within the flight path. Trinidad Lake 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.

4.4 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 (2019d) data show multiple sightings approximately 9 miles south of Trinidad Lake at the Richland Creek WMA north unit, most recently in July 2018. The likelihood of this species occurring at Trinidad Lake is moderate, depending on reservoir elevation. The interior least turn could use exposed reservoir shoreline habitat when the pool elevation is below normal. Despite a moderate potential for the occurrence of this species at Trinidad Lake, normal plant operations are not expected to affect the bird species. No critical habitat has been designated for this species.

4.5 SPECIES CONCLUSIONS

While protected species have potential to occur within the Trinidad Lake area, there is no nexus between any of the federally listed bird species and the TRSES cooling water intake structure. No critical habitat for any federally listed species occurs within or in the area of the Trinidad reservoir or any upstream tributaries. Normal plant operations are not expected to have any effect on the listed bird species.

5.0 REFERENCES

Baglin, R.E., and R.V. Kilambi. 1968. Maturity and spawning periodicity of the gizzard shad, *Dorosoma cepedianum* (Lesueur), in Beaver Reservoir. Proc. Ark. Acad. Sci. 22:38–43.

Bodola, A. 1966. Life history of the gizzard shad, *Dorosoma cepedianum* (Lesueur), in western Lake Erie. Fishery Bulletin of the U.S. Fish and Wildlife Service 65(2):391–425.

Burgess, W.E. 1989. Freshwater and Marine Catfishes. T.F.H. Publications, Inc. Neptune, N.J. 784 pp.

Campbell, L. 2003. Endangered and threatened animals of Texas: Their life history and management. Endangered Resource Branch, Texas Parks and Wildlife Department, Austin.

Canadian Wildlife Service (CWS) and U.S. Fish and Wildlife Service (USFWS). 2007. International Recovery Plan for the Whooping Crane (*Grus Americana*), third revision. Ottawa: Recovery of Nationally Endangered Wildlife (RENEW), and USFWS, Albuquerque, New Mexico. 162 pp.

Carlander, K.D. 1969. Handbook of Freshwater fishery biology. Vol.1. The Iowa State Univ. Press, Ames. 752 pp.

eBird. 2018a. eBird: An online database of bird distribution and abundance [web application]. Red Knot range map and species accounts. eBird, Ithaca, New York. Available: http://www.ebird.org (accessed May 22, 2019).

———. 2018b. eBird: An online database of bird distribution and abundance [web application]. Piping Plover range map and species accounts. eBird, Ithaca, New York. Available: http://www.ebird.org (accessed May 22, 2019).

———. 2018c. eBird: An online database of bird distribution and abundance [web application]. Whooping Crane range map and species accounts. eBird, Ithaca, New York. Available: http://www.ebird.org (accessed May 22, 2019).

———. 2018d. eBird: An online database of bird distribution and abundance [web application]. Least Tern range map and species accounts. eBird, Ithaca, New York. Available http://www.ebird.org (accessed May 22, 2019).

Elliott-Smith, Elise and Susan M. Haig. 2004. Piping plover. The birds of North America Online. (A. Poole, Editor) Cornell Laboratory of Ornithology, Ithaca. Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/002.

Freese and Nichols Inc. (FNI). 2017. Trinidad Reservoir Fishery Survey Report. Environmental Science Group, Austin, Texas. Project No. LGC16678.

Lee, D.S. 1980. *Micropterus salmoides* (Lecepede), Largemouth bass. pp. 608 *in* D. S. Lee et al., Atlas of North American Freshwater Fishes. N.C. State Mus. Nat. Hist., Raleigh, *i-r*+854 pp.

Lockwood, M.W., and B. Freeman. 2004. The TOS handbook of Texas birds. Texas A&M University Press, College Station.

Moss, R.E. and K.B. Mayes. 1993. Current status of *Notropis buccula* and *Notropis oxyrhynchus* in Texas. River Studies Report 8. Austin, Texas. Texas Parks and Wildlife Department, 150 pp.

Oberholser, H.C. 1974. The bird life of Texas. Vols. 1-2. Univ. Texas Press, Austin, Texas.

Riggs, C.D. 1955. Reproduction of the white bass, Morone chrysops. Invest. Ind. Lakes and Streams 4(3):158–159.

Schloemer, C.L. 1947. Reproductive cycles in five species of Texas centrarchids. Science 106:85–86.

Texas Water Development Board (TWDB). 2019. Trinidad Lake (Trinity River basin). Available: http://www.twdb.texas.gov/surfacewater/rivers/reservoirs/trinidad/index.asp

Thomas, C., T.H. Bonner, and B.G. Whiteside. 2007. Freshwater Fishes of Texas. Texas A&M University Press, College Station. 202 pp.

U.S. Fish and Wildlife Service (USFWS). 1967. Office of the Secretary, Native Fish and Wildlife: Endangered Species. *Federal Register*. March 11, 1967 (Vol. 32, No. 48), 4001.

———. 2007. Status of the Red Knot (*Calidris canutus rufa*) in the Western Hemisphere. http://www.fws.gov/northeast/PDF/RedKnotAssessmentMay2007.pdf.

———. 2014a. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red knot. U.S. Fish and Wildlife Service, Department of the Interior. Federal Register: December 11, 2014 (Vol. 79, No. 238).

———. 2014b. Interior Least Tern *Sterna antillarum*. http://www.fws.gov/midwest/endangered/birds/leasttern/pdf/InteriorLeastTernFactSheetMarch2014.pdf

———. 2017. Whooping Crane Survey Results: Winter 2016–2017. https://www.fws.gov/uploadedFiles/Region_2/NWRS/Zone_1/Aransas-Matagorda_Island_Complex/Aransas/Sections/What_We_Do/Science/Whooping_Crane_Updates_2013/WHCR_Update_Winter_2016-2017.pdf.

———. 2019. Official Species List for Trinidad Lake Area. Arlington Ecological Services Field Office. May 21, 2019.

Wallus, R., and Simon T.P. 2006 Reproductive biology and early life history of fishes in the Ohio River drainage: Aphredoderidae through Cottidae, Moronidae, and Sciaenidae. Vol. 5. CRC press, 2006.

Webb, J.F., and D.D. Moss. 1968. Spawning behavior and age and growth of white bass in Central Hill Reservoir, Tennessee. Proc. S.E. Assoc. Game Fish Comm. 21:343–357.

Appendix A

Trinidad Reservoir 2016 Survey Results

Appendix A
Trinidad Reservoir 2016 Survey Results
(nn = net-night)

	Trinidad Reservoir (2016)			
	Electrofishing		Gill Net	
Common Name	No.	CPUE (No./hour)	No.	CPUE (No./nn)
Spotted Gar	2	2.0	6	2.0
Longnose Gar			1	0.3
Threadfin Shad	27	27.0		
Gizzard Shad	55	55.0	49	16.3
Common Carp	1	1.0		
Ribbon Shiner	4	4.0		
Golden Shiner	4	4.0		
Bullhead Minnow	37	37.0		
Smallmouth Buffalo	1	1.0		
Channel Catfish	4	4.0	49	16.3
Blue Catfish			1	0.3
Inland Silverside	84	84.0		
White Crappie	6	6.0	29	9.7
Bluegill	566	566.0		
Green Sunfish	7	7.0		
Longear Sunfish	92	92.0		
Warmouth	13	13.0		
Largemouth Bass	74	74.0	1	0.3
Freshwater Drum			8	2.7
Yellow Bass	150	150.0	73	24.3

C TRSES FISHERIES MANAGEMENT PLAN

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(Sent via electronic mail)

November 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) – Fisheries Management Program of Non-Public Access Reservoirs
Request for Agency Review/Comment

Dear Ms. Clayton,

Luminant Power owns eleven reservoirs, and has generating facilities on a total of fifteen reservoirs within the State of Texas, that are designed and maintained to support power plant operations subject to 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. .

For various reasons, including safety, limited accessibility, security, etc., five of the reservoirs owned by Luminant are not open to the public for fishing or other recreation (i.e., non-public access, or private). Typically The Texas Parks and Wildlife Department (TPWD) is the agency responsible for managing the state's diverse freshwater fisheries resources, with the goal to provide the best possible angling while protecting and enhancing freshwater aquatic resources. The TPWD does not, however, routinely manage the fisheries since the five reservoirs are not public waterbodies.

Although the fisheries of the five reservoirs are not directly managed by the TPWD, Luminant has and does work with the TPWD on general and specific fisheries management matters for these reservoirs. This includes discussions with TPWD biologists on fisheries and vegetation management, authorizations/permits for stocking of herbivores species, notifications of unusual events/findings, and cooperative efforts with TPWD in the utilization of these reservoirs for rearing of particular species or the collection of particular genetic strains for use in TPWD's hatchery breeding programs.

Luminant has and does actively manage these reservoirs as needed, but the issuance of the new 316(b) regulations has now made it appropriate for Luminant to more formalize its fisheries management activities. Specifically, to affirm the criteria identified in 40 CFR 125.95(a)(3), at page 48435, Luminant has developed a ***Fisheries Management and Stocking Program for Luminant's Non-Public Access Closed-cycle Cooling System Reservoirs.*** The attached Management and Stocking Program is based on the TPWD's procedures and practices utilized for public waterbodies, and is designed to meet the equivalent standard identified in the above referenced citation.

Luminant requests the TCEQ to review (and comment on if needed) the attached *Management and Stocking Program* for conformance with the agency's expectations. In order to support the sampling schedule identified in the program, Luminant asks that the agency respond to our request for review.

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

Attachment
gls

FISHERIES MANAGEMENT AND STOCKING PROGRAM FOR LUMINANT'S NON-PUBLIC ACCESS CLOSED-CYCLE COOLING SYSTEM RESERVOIRS

Luminant owns and operates five private reservoirs that support power plant operations. Although these reservoirs are Waters of the U.S. and the State, they are not open to public fishing, so the fisheries are not ordinarily managed by the Texas Parks and Wildlife Department (TPWD). While specific reservoir fisheries and habitat issues on these reservoirs can and have been addressed by TPWD, there is presently no routine State or Federal resource agency stocking or management program in place. Each of these reservoirs support fish communities and provide other ecological benefits, and it is also one of Luminant's objectives to ensure that the reservoirs also serve their intended purpose as cooling water supply for power generation.

Each of the five reservoirs has been designated by the Texas Commission on Environmental Quality (TCEQ) as a closed-cycle recirculating system. It is important to note that there are no known federally-listed aquatic or terrestrial federally listed threatened or endangered species associated with these reservoirs, and none of the reservoirs are designated as critical habitat by the U.S. Fish and Wildlife Service. The five reservoirs are:

Reservoir	Steam Electric Station (SES)	Associated TPDES Permit No.	Surface Area at Pool (acres)	County
Lake Creek	Lake Creek SES	WQ0000954000	550	McLennan
Trinidad	Trinidad SES	WQ0000947000	740	Henderson
Twin Oak	Oak Grove SES	WQ0001986000	2,330	Robertson
Valley	Valley SES	WQ0000948000	1,080	Fannin & Grayson
Forest Grove*	Forest Grove SES	WQ0002032000	1,502*	Henderson

* Note: The dam gates at Forest Grove Reservoir have not yet been closed and the reservoir is below 10% capacity. Fisheries management is not possible or appropriate at this time. Once the reservoir is filled and operational, it will be incorporated into this Program.

While these reservoirs provide environmental benefits, like all Texas reservoirs they are also vulnerable to population imbalances and/or the occurrence of invasive species, in particular those that would not normally thrive at temperate latitudes. The proliferation of certain species such as tilapia species, threadfin shad, gizzard shad, hydrilla, water hyacinth, zebra mussels, and giant salvinia can impair both the ecological balance of the reservoir and power plant operations.

The fisheries program detailed below is designed to establish a consistent approach that addresses the fisheries management that is appropriate for Luminant's non-public access reservoirs. The program will be expanded or contracted as necessary to include or drop reservoirs depending of their applicability to the 316(b) regulations, or other factors.

FISHERIES PROGRAM

This program incorporates the routine monitoring, data collection and analysis needed to support a long-term stocking and management program of these Luminant reservoirs. The objectives of the program include:

- Detect any substantial changes in the aquatic community that may lead significant population imbalance or to power plant operation problems;
- Detect the presence of any new species;
- Monitor for the spread of any potentially harmful species that may presently exist in the reservoirs;
- Identify and implement any stocking needed to support maintenance of appropriate fisheries or vegetation control; and
- Utilize sampling techniques that are standardized, reproducible, and accepted by the scientific community.

Information from the sampling program will be used to identify issues and, if necessary, to modify Luminant's approach to management of each reservoir. Luminant plans to survey each of the reservoirs once every 4 years, which is the same sample frequency TPWD uses for managing public fisheries.

The sampling program is modeled after the TPWD standard procedures for data collection. Since these reservoirs are not subject to the pressures of public fishing, the objectives for reservoir management are somewhat different than those employed by TPWD for public fisheries. As a result the type of data collected and sampling effort may deviate slightly from the TPWD procedures.

The program outlined below presents the two primary fish sampling methods employed across the state for reservoir fisheries – boat electrofishing and gill netting. Electrofishing is the primary tool used to sample littoral (shoreline) fish communities and gill nets are the primary tool used to sample pelagic (open-water) communities.

FISHERIES MONITORING

Electrofishing and gill netting would be conducted in accordance with the TPWD *Texas Inland Fishery Assessment Procedures Survey Methods.* The type of data collected may deviate from the standard data since it would not have application to the objectives of this study. For example, tissue samples for Largemouth Bass genetic analysis would not be necessary since there would be no objective for maintaining a certain genetic strain in the population.

Equipment and Effort

Electrofishing target species that utilize shoreline habitats, including Largemouth Bass, sunfish, and shad. Electrofishing is conducted at night during the fall. Sampling is conducted along shoreline stations and consists of 5 minutes of continuous electrofishing (pulsed direct current only) at each station. A number of stations will be scaled as appropriate for the size of the reservoir, with a target of 12 stations. The electrofishing boat would be equipped with a dual anode system powered by a 5,000-watt generator.

Gill netting is typically conducted during the winter and spring and is used to target pelagic (open-water) or bottom-dwelling species such as catfish, temperate bass, gar, buffalo, and common carp. For this project, gill netting would be conducted in the fall, in conjunction with electrofishing. Gill nets are 125-foot long (x) 8-foot tall experimental-mesh monofilament nets. Each panel consists of a different mesh size, including 1.0, 1.5, 2.0, 2.5, and 3.0 inch mesh. The gill nets are equipped with a float line and a lead

line so the net is stretched vertically in the water column. Gill nets are deployed during daylight hours, fished overnight, and retrieved the next day. This level of effort is considered a net-night for each net. Due to the relatively small sizes of each of the reservoirs, three net-nights would be used at each reservoir.

Data Requirements

For electrofishing, Largemouth Bass would be measured to total length (millimeter) and weighed (grams). All other species would be measured to the nearest inch group. For gill netting, length and weight of five individuals within each inch-group of each catfish and temperate bass species would be obtained. All other fish would be identified and measured to the nearest inch-group.

Data would be recorded on paper or electronic forms once electrofishing is complete at each station, and maintained by station. Data from gill nets, will be maintained by station and mesh size.

Basic water quality parameters including temperature, pH, dissolved oxygen, conductivity, and Secchi depth would be measured at each sampling station at the time of the surveys.

Data Analysis

The following data analysis would be performed for electrofishing and gill net target species. For electrofishing, this includes black bass (i.e. Largemouth and Spotted Bass) and recreationally important sunfish, such as Bluegill and Redear Sunfish. For gill nets, the target species include all catfish (except bullheads) and temperate bass.

- Catch-per-unit-effort (CPUE) expressed as catch/hour (electrofishing) and catch/net-night (gill netting);
- Proportional Stock Density (PSD),
- Relative Stock Density;
- Relative weight (Wr) using national standards
- Length-frequency histogram

Data analysis for all other species would include CPUE and length-frequency histogram and PSD would be developed for Gizzard Shad.

HABITAT ASSESSMENT

Reservoir habitat assessment will be an integral part of evaluating fish community structure. In addition, monitoring aquatic plant communities can be particularly important for detecting invasive plant species, such as *Hydrilla*, giant salvinia, water hyacinth, and other potentially damaging species.

In line with TPWD procedures, there are two basic habitat types – structural habitat and vegetation. Structural habitat consists of generally abiotic physical features such as rock and submerged timber. Vegetation consists of any aquatic plant that is in the water and is accessible to fish. Structural habitat is typically surveyed once, unless the reservoir is subject to extensive water level fluctuations. Aquatic vegetation is generally dynamic and, similar to fisheries sampling, surveys are conducted in conjunction with fisheries surveys (at least once every 4 years). Vegetation surveys must be conducted before submerged plants recede or die during the winter.

Methods
Habitat assessment methods are provided in the TPWD Inland Fisheries *Habitat Assessment Procedures*. The general methodology involves circumnavigating the reservoir by boat and identifying and delineating various habitat features. Particular habitat features (i.e. standing timber or aquatic vegetation) are identified either visually and/or by sonar. Those features will then delineated using a global positioning system unit to document geographic coordinates. For aquatic vegetation, a grappling rake is used to sample plants at frequent intervals. In addition, recent aerial photography may be used to help identify certain features and aid in mapping results.

Data Analysis
Results are mapped using geographic information system software and quantified according to habitat type(s). Specific habitat features are quantified and presented in tables. Information will include acres of each habitat type and percent of reservoir covered by each habitat type. Habitat observations and fisheries data will be distilled to provide general reservoir status and management implications.

REPORTING

Reports would be prepared for each reservoir. Each report would provide an overview of sampling methods, tabular and figurative data summaries, habitat descriptions and maps, and appended field data. Included in the reports would be discussion of management implications and any other information that may be deemed appropriate.

SCHEDULE

Each of the reservoirs would be sampled on a 4-year rotation (which is the same sample frequency TPWD uses for managing public fisheries), one each year beginning in 2015. The order will be determined by, or possibly altered, to meet the need to support wastewater permit renewals where that schedule allows. The most cost-effective approach would be to collect all information described in this scope of work during one sample event, which would be in the fall. A draft report will be prepared within 2 months of completion of field data collection. The final report for each reservoir will be maintained by Luminant and a copy will be provided to the TCEQ Water Quality Assessment Section, mail code MC-150.

17 November 2015

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

December 10, 2015

Mr. David P. Duncan, Director, Environmental Generation
Environmental Services
Luminant Power
1601 Bryan Street
Dallas, Texas 75201

RE: Request for review and comment of the 316(b) Fisheries Management Program of Non-Public Access Reservoirs

Dear Mr. Duncan:

This letter is in response to your letter dated November 17, 2015 requesting review and approval of a proposed fisheries management plan for non-public access reservoirs.

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*, effective October 2014, requires certain information to be submitted with renewal applications for Texas Pollutant Discharge Elimination System permits. However, the rule allows for a waiver from some, or all, of the information required provided that the facility is operating as a closed cycle recirculating system and the following criteria are met (40 CFR §125.95(a)(3)):

1. the facility is located in a manmade reservoir,
2. the reservoir is stocked and managed by a State or Federal natural resources agency or the equivalent, and
3. the manmade lake or reservoir does not contain any federally listed endangered or threatened species and it is not designated as critical habitat.

The plan indicates that the procedures to be followed are based upon stocking and managing procedures established by the Texas Parks and Wildlife Department (TPWD). Additionally, these reservoirs have been monitored and managed for years in conjunction with TPWD staff and established TPWD procedures. Management of these reservoirs has been ongoing for some time; therefore formalizing this stocking and management program is not considered to be a circumvention of requirements under 40 CFR §122.21.

TCEQ Water Quality Division (WQD) staff has reviewed Luminant's proposed Fisheries Management Program (program) for 5 reservoirs. WQD staff concurs that the program

includes all of the normal procedures, measurements, and metrics needed to determine whether or not the fishery is healthy, sustainable, and balanced and is reflective of fisheries management programs used by the TPWD. WQD staff should be notified of any modifications to the program. WQD approves implementation of the program.

If you have any questions or comments regarding the contents of this letter please contact Ms. Lynda Clayton of my staff at 512-239-4591 or via email at Lynda.Clayton@tceq.texas.gov

Sincerely,

Jocelyn McMillin for

David W. Galindo, Director
Water Quality Division
Texas Commission on Environmental Quality

cc: Mr. Gary Spicer, Environmental Services, Luminant Power, 1601 Bryan Street Dallas Texas 75201

D TRSES FINE-MESH SCREEN EVALUATION

ALDEN

Solving flow problems since 1894

Appraisal Level Design and Costs Estimate for Fine-mesh Ristroph and Cylindrical Wedgewire Screens to meet 316(b) for the Trinidad Steam Electric Station

FINAL REPORT

Prepared for:

Luminant

July 2019

ALDEN Research Laboratory, Inc
30 Shrewsbury Street, Holden, Massachusetts 01520-1843

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1 INTRODUCTION

The Texas Commission on Environmental Quality (TCEQ) is in agreement with Luminant that the Trinidad Steam Electric Station (TRSES) withdraws from a cooling reservoir that acts as a closed-cycle recirculating system. 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 were evaluated; fine-mesh traveling water screens (TWS) with fish friendly features, and narrow-slot cylindrical wedgewire screens. Both 0.5mm and 2.0 mm openings were evaluated for each technology.

2 CWIS DESCRIPTION

TRSES is located along an intake canal on the northern shore of Trinidad Reservoir in Henderson County, TX. Trinidad Reservoir is an off-channel man-made reservoir, created in 1926 for cooling and is owned and operated by Luminant. At the conservation pool level of 283 ft. (mean sea level), the reservoir has a surface area of 1,080 acres and an average water depth of 10 ft. There is no public access to this reservoir. TRSES is a single unit natural gas fired facility with a total rating of 240 MW utilizing the reservoir for cooling. TRSES is designated for seasonal operation, with an average capacity factor of 4.41% from 2014 through 2018.

TRSES has one cooling water intake structure (CWIS), located along the shore of the 1,900 ft long intake canal, approximately 1,700 ft from the mouth. This CWIS originally supported other generating units that have since been retired. The canal is approximately 150 ft. wide in front of the CWIS. The CWIS has three bays. Each bay is equipped with a trash rack, a traveling water screen, and one vertical, mixed flow circulating water pump, located downstream of the traveling water screens. The trash rack located at the front of each intake 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 screens for each CWIS are 10 ft. wide and equipped with 3/8 in. square mesh. The three circulating water pumps have a rated capacity of 130.3 cfs (66,000 gpm, 95 MGD). The design intake flow (DIF) when all three circulating water pumps are operating is 441.1 cfs (198,000 gpm, 285 MGD). TRSES is permitted to withdraw up to 657.5 cfs (295,095 gpm, 425 MGD). The permitted flow accounts for the flow from older, retired units and cannot be achieved under current conditions. Therefore, the higher flow was not used for the design of the fine-mesh alternatives.

3 CONCEPTUAL DESIGN TO RETROFIT THE EXISTING INTAKE WITH FINE-MESH MODIFIED TRAVELING WATER SCREENS AND A FISH RETURN SYSTEM

Fine-mesh 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 can be used under § 125.94(c)(5) for best technology available (BTA) requirements for reducing impingement mortality.

Several types of fine-mesh TWS with fish protection features are available. They include 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 the conservation pool water level (El. 283 ft) and the current DIF (441.1 cfs) the velocity approaching the existing traveling water screens is approximately 1.3 fps. 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 TWS laboratory study (EPRI 2010). This is consistent with the findings of EPRI sponsored coarse-mesh modified TWS 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 would be technically feasible at TRSES.

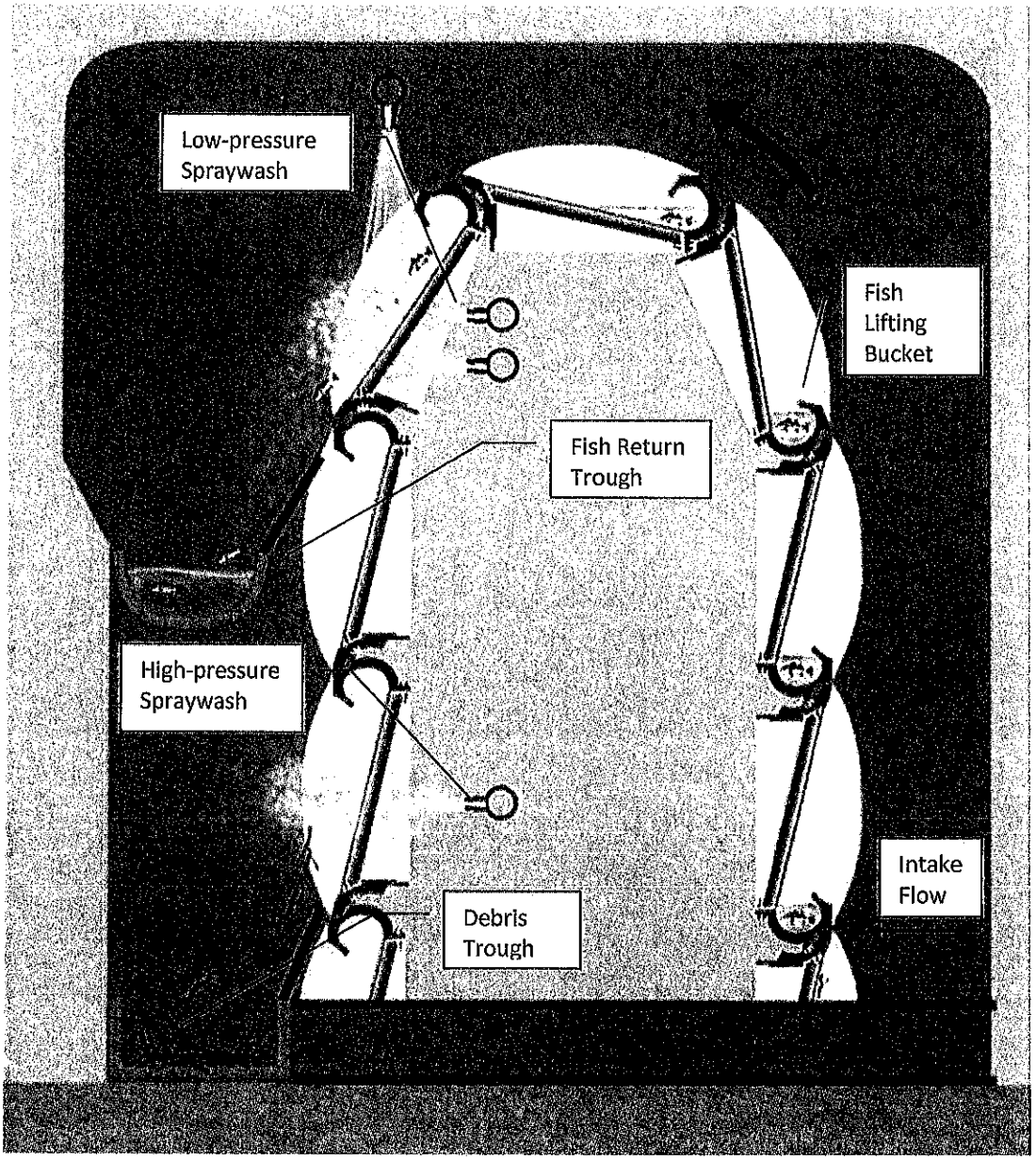


Figure 3-1: Typical Fish-Friendly Features of a Modified Traveling Water Screen

3.1 Design and Operation

The new fine-mesh modified TWS would be installed in the existing screen bays, replacing the existing TWS. Each screen basket would 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 wash would be used to gently remove the fish from the fish holding buckets into a fish sluice and a conventional high-pressure wash would then remove remaining debris into a debris sluice. The existing spraywash system is designed only for a high-pressure spray wash system and is not expected to be sufficient to meet the spraywash needs of the new screens. New, larger spraywash pumps were assumed to be needed.

Fish and debris removed by the low-pressure spray washes would flow into a fish trough located above the debris trough. The fish troughs from all five screens would combine with the debris troughs downstream of the last screen. The combined fish and debris trough would flow southwest, for approximately 860 ft, and discharge outside of the intake canal as shown in Figure 3-2. This discharge location was selected to minimize potential re-impingement without discharging directly into the warm water discharge.

Operation and maintenance (O&M) activities associated with the new screens are similar to those required for the existing TWS. The level of effort necessary would increase as a result of increased operation of the screens. The screens would be rotated and cleaned continuously whenever the TRSES circulating water pumps are operating as required by the Rule for modified traveling screens to reduce impingement duration of impingeable and entrainable life stages. The screens were assumed to rotate 4.4% of the time, based on the average capacity factor from 2014 through 2018. 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 would be inspected and cleaned daily to prevent any debris plugging and to remove bio-growth.

Figure 3-2: Conceptual Design for 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 as a result of debris and biofouling conditions in Trinidad Reservoir. 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 would increase due to the reduced open area associated with the fine-mesh screens. The increase in head loss across the fine-mesh screens would 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 would 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 would 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 at the current DIF of 441 cfs. 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. Note that 441 cfs is the current DIF for Unit 6, the only unit currently operating. However, the permitted facility flow is 657.5 cfs and one or more additional units may be added in the future that use this flow.

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 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 Trinidad Reservoir, are 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 would be lower than what would be expected in a riverine or other environment with greater ambient currents. The lack of ambient currents would also limit the effectiveness of any cleaning system because there would be no currents to transport debris away from the screens.

4.1 Design and Operation

Both potential wedgewire screen arrays at TRSES were designed with 5-ft diameter Tee-shaped screens, based on an average reservoir depth of 10 ft. Each screen includes two 5-ft long screening sections on either end of a center non-screening section with an overall length of approximately 18.2 ft, as shown on Figure 4-1.

The difference between the two slot sizes is the number of screens and size of the header pipe. The total number of screens necessary for each slot size is provided in Table 4-1.

Both options would use screens mounted to intake pipes connected to a bulkhead wall constructed across the intake canal upstream of the existing CWIS. Automated gates built into the bulkhead wall would act as emergency bypass gates in the event the wedgewire screens cannot be maintained in a

clean condition. The existing traveling water screens would remain in place and operational to screen the intake flow if the wedgewire screens need to be bypassed.

The 0.5 mm slot option would use four, 5 ft diameter header pipes each designed for the flow through eight screens. The 2.0 mm slot option would use two, 7 ft diameter header pipes with seven screens each. Each header pipe would be aligned and anchored to the lake bottom using large concrete anchors. An automatic cleaning system, either brush cleaned or air-backwash would be used to clean the screens. 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 would be equipped with an automated system to remove any debris and biofouling from the screen face. Two automatic cleaning systems are available. They include an air-backwash and a brush cleaning system. A pilot study is recommended to select the most appropriate cleaning system and cleaning frequency for TRSES. Alden anticipates that screens with 0.5 mm slot openings would require more frequent cleaning than screens with 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 would also be necessary. The emergency bypass gates, built into the bulkhead wall, would 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 would not change.

Table 4-1: Number of 5.0-ft Diameter Wedgewire Tee-screens needed to Screen the TRSES DIF

Slot-size	Total Number of Screens
0.5 mm	32
2.0 mm	14

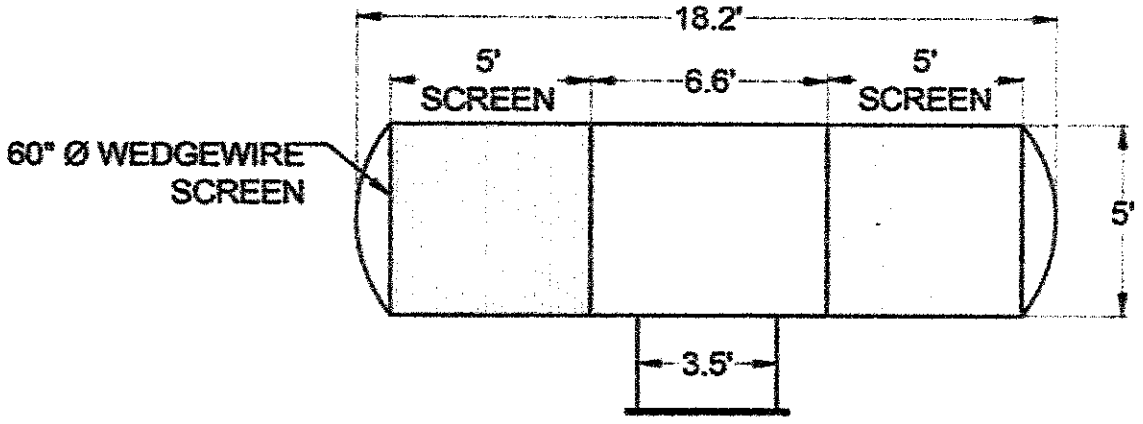


Figure 4-1: Typical 5.0-ft Diameter Narrow-slot Wedgewire Tee Screen

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 TRSES, it will 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 Trinidad Reservoir. 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 TRSES. These costs are consistent with 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 include; hydraulic modelling studies and biological or engineering evaluations of prototype fish protection systems. The costs associated with these additional studies 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 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 TWS and narrow-slot wedgewire screen options. The facility compliance costs are the costs that Luminant would incur at TRSES for each of the alternatives. These costs are presented as the net present value (NPV) and equivalent annual costs (EAC), based on assumed remaining life expectancy of 30 years (2019-2048). 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 for the 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 TRSES 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 TRSES

Alternative	Capital Costs (2019 $)	Permitting and Pre-construction Study Costs (2019 $)	Annual O&M (2019 $)
Fine-Mesh Ristroph Screens in Existing Intake	$4,026,000	$316,000	$161,000
Narrow-slot Wedgewire Screens with 0.5 mm Slots	$14,886,000	$470,000	$321,000
Narrow-slot Wedgewire Screens with 2.0 mm Slots	$8,173,000	$390,000	$144,000

Table 5-2: Incremental NPV and Annualized Compliance Cost Estimate for Fine-mesh Screens at TRSES

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]	$4,943,000	$16,802,000	$9,014,000
Net Present Value (2018 $) (3% Discount rate)[1,2]	$5,968,000	$20,033,000	$10,573,000
Equivalent Annual Cost (2018 $) (7% Discount rate)[1,2]	$398,000	$1,354,000	$726,000
Equivalent Annual Cost (2018 $) (3% Discount rate)[1,2]	$481,000	$1,614,000	$852,000

1. Incremental costs are the difference in costs from current traveling water screen operations.
2. Costs assume a remaining life expectancy of 30 years (2019-2048).

6 REFERENCES

Association for the Advancement of Cost Engineering (AACE). 2005. AACE International Recommended Practice No. 18R-97, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries, TCM Framework: 7.3 – Cost Estimating and Budgeting. February 2, 2005.

Black, J.L. 2007. Laboratory Evaluation of Modified Traveling Screens for Protecting Fish at Cooling Water Intakes. Master's Thesis, Wildlife and Fisheries Conservation, University of Massachusetts, Amherst.

Electric Power Research Institute (EPRI). 2003. Laboratory Evaluation of Wedge Wire Screens for Protecting Early Life Stages of Fish at Cooling Water Intakes. EPRI 1005339.

EPRI. 2006. Laboratory Evaluation of Modified Ristroph Traveling Screens for Protecting Fish at Cooling Water Intakes. 1013238. EPRI, Palo Alto, California.

EPRI. 2010. Laboratory Evaluation of Fine-mesh Traveling Water Screens. 1019027. EPRI, Palo Alto, CA.

Hanson, B. N., W. H. Bason, B. E. Beitz, and K. E. Charles. 1978. Studies of Profile-Wire Screens as Surface Water Intakes. Special Report for Delmarva Power and Light Company.

Heuer, J. H. and D. A. Tomljanovich. 1978. A Study on the Protection of Fish Larvae at Water Intakes Using Wedge-Wire Screening. TVA Technical Note B26.

Otto, R. G., T. I. Hiebert and V. R. Kranz. 1981. The Effectiveness of a Remote Profile-Wire Screen Intake Module in Reducing the Entrainment of Fish Eggs and Larvae. In: Proceedings of the Workshop on Advanced Intake Technology, San Diego, CA, April 1981. P. B. Dorn and J. T. Larson (Eds.)

U.S. Energy Information Administration (EIA). 2017. Electric Power Annual 2016. December 7,2017. Available at: https://www.eia.gov/electricity/annual/ Accessed April 2, 2018.

U.S. Environmental Protection Agency (EPA). 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. Report Number EPA 540-R-00-002 OSWER 9355.0-75. July 2000. U.S. Army Corps of Engineers, Omaha Nebraska. U.S. EPA ,Washington, DC.

Attachment M

Design and Engineering Calculations of CWIS

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

40 CFR 122.21 IMPACTED BY 316(b) of Clean Water Act
Trinidad Steam Electric Station
Cooling Water Intake

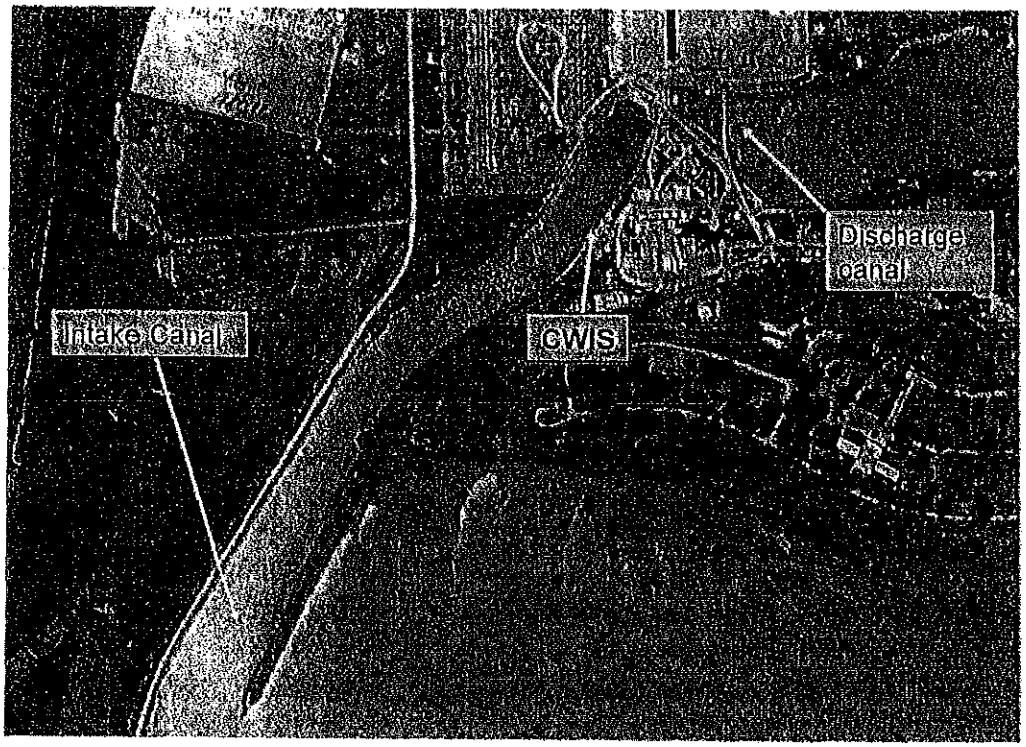
EPA signed into regulation new requirements for existing electric power generating facilities for compliance with Section 316(b) of the Clean Water Act on July 9, 2004. These regulations became effective on September 7, 2004 and are based on numeric performance standards. The Rule at 40 CFR 125 impacts 40 CFR 122.21 (Application for a permit) by requiring existing facilities defined in Part 125 to submit for review the following information:

(1) A narrative description of the operation of the cooling water system, its relationship to cooling water intake structures, the proportion of the design intake flow that is used in the system, the number of days of the year the cooling water system is in operation and seasonal changes in the operation of the system, if applicable;

Trinidad Steam Electric Station (TRSES) is located on the northern design shoreline of Trinidad Reservoir in Henderson County, TX. Trinidad is an off-channel man-made reservoir, created in 1926, and is owned and operated by TXU. The following figure provides an aerial photograph showing Trinidad's intake on the reservoir. At the conservation pool level of 283 ft. msl, the reservoir has a surface area of 1080 acres. TRSES is a single-unit natural gas-fired facility rated at 240 MW utilizing a once-through cooling water system. TRSES is designated for seasonal operation, and its 2004 capacity factor was about 2.5%.

TRSES has one cooling water intake structure (CWIS), located on the east side of the canal, approximately 1,700 feet from the mouth of the 1,900-foot long intake canal. The intake canal originally supported other generating Units that have since been retired. The canal is approximately 150 feet wide in front of the CWIS. The CWIS has three bays, each equipped with one vertical, mixed-flow circulating water pump, located downstream of traveling water screens. Bays 1 and 2 also are equipped with small fire water pumps. The three circulating water pumps have a rated capacity of 130.3 cfps (66,000 gpm) each. When all three circulating water pumps are operating, the flow to the facility is 441.1 cfps (198,000 gpm). There is a trash rack located at the front of each bay that prevents large debris from reaching the traveling water screens that are located about 13 feet downstream of the trash racks. The screens for each CWIS are 10-feet wide and have a 3/8-in. square mesh. This intake structure was designed with a raised threshold to each bay. The height of the threshold is EL 275 ft, which is above the bay bottom of EL 269.9 ft.

Velocities within the CWIS bays were calculated at the normal operating pool water level (El. 285 ft.) and at the low water level (EL. 280 ft.) Because the smallest cross-sectional area of each bay is found at the threshold, the maximum water velocity will occur at that location in the bay. At normal operating water level, the velocity in each bay is 1.3 fps. At minimum operating water level the velocity in each bay is 2.7 fps.



Trinidad Steam Electric Station (TRSES)

(2) Design and engineering calculations prepared by a qualified professional and supporting data to support the description listed above.

See the following documentation.

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

VELOCITY CALCULATIONS FOR TRINIDAD SES UNIT 6

Trinidad SES Intake Structure contains three (3) intake bays.

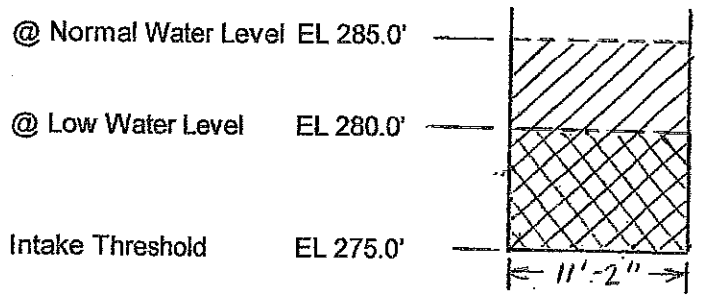
Bays 1 and 2 each contain:

1 Circulating Water Pump	66,000 gpm	(ref. Curve HTA-25491-A)
1 Fire Water Pump	750 gpm	(ref. Curve 88-02132-1A)

Bay 3 contains:

1 Circulating Water Pump	66,000 gpm	(ref. Curve HTA-25491-A)

Each Bay has the same dimensions and thus the same cross-section flow area (ref. Dwgs. C-632A and C-628C for dimensions and water levels). This intake structure is designed with a threshold at El. 275'-0" that is above the bay bottom of El. 269-11". This threshold reduces the cross-sectional area making the water velocity greatest at that location, not at the traveling water screen.



$Area_{NWL}$ = (285.0'-275.0')x(11.17')
= 111.7 ft^2

$Area_{LWL}$ = (280.0'-275.0')x(11.17')
= 55.85 ft^2

Maximum Water Velocity is equal for both Bays 1 and 2 and will occur when both the circulating water and fire water pumps are running:

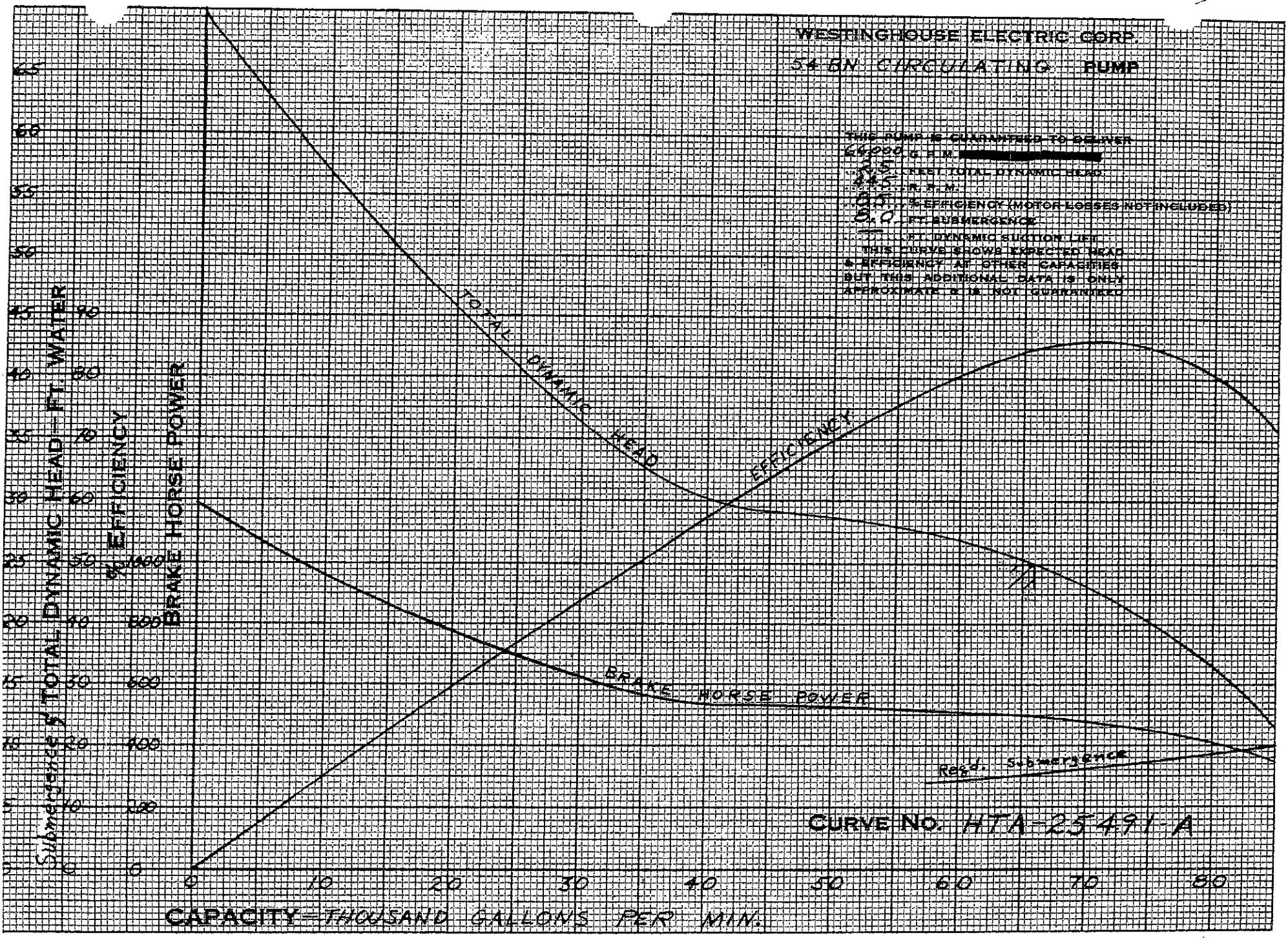
$$\text{Velocity} = \frac{\text{Flow Rate}}{\text{Flow Area}}$$

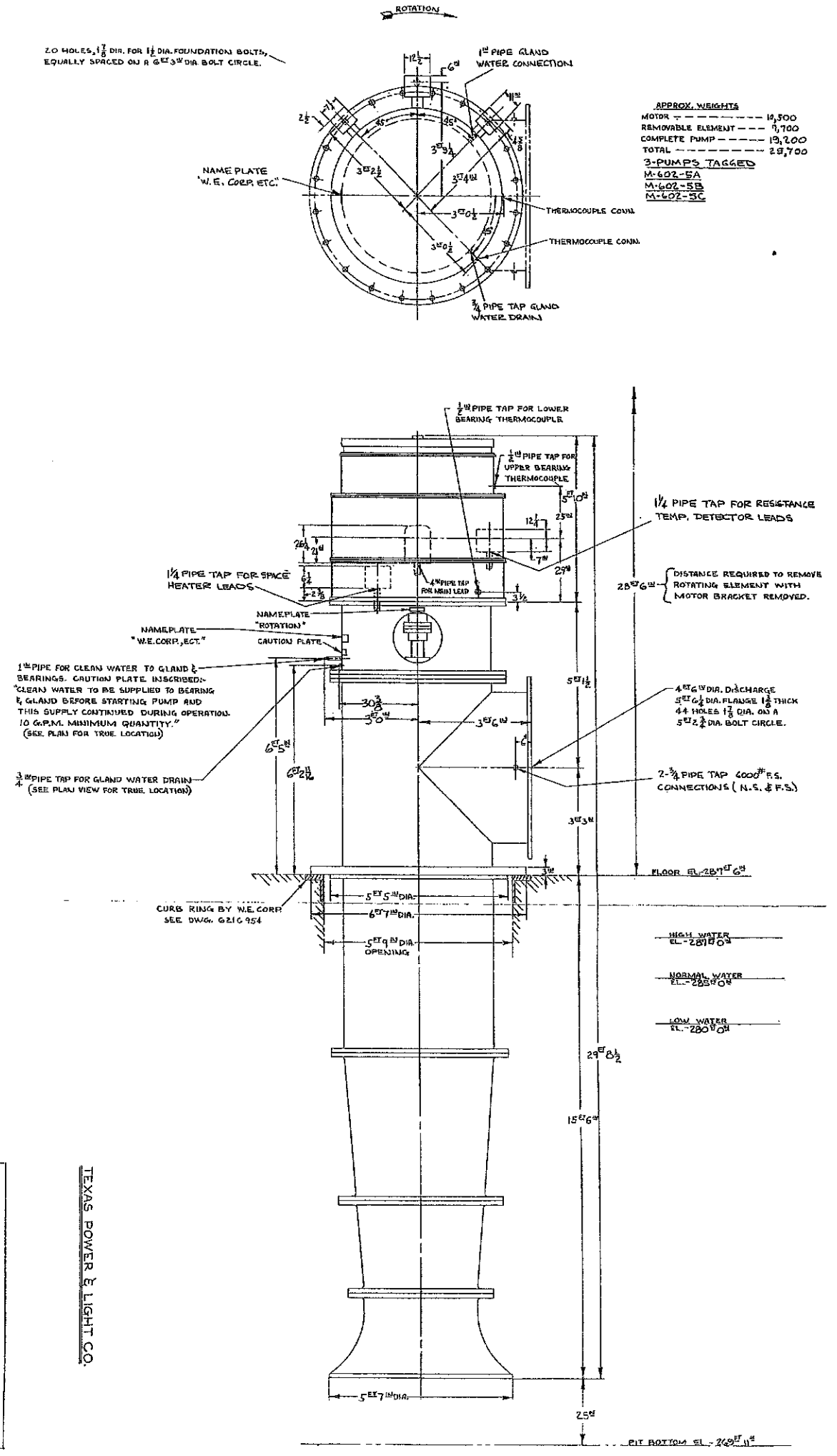
$$\text{Velocity @ Low Water Level} = \frac{(66{,}000+750)\ \text{gal}}{\text{min}} \Big| \frac{}{55.85\ ft^2} \Big| \frac{ft^3}{7.48\ \text{gal}} \Big| \frac{\text{min}}{60\text{s}} = 2.66\ \text{ft/s}$$

$$\text{Velocity @ Normal Water Level} = \frac{(66{,}000+750)\ \text{gal}}{\text{min}} \Big| \frac{}{111.7\ ft^2} \Big| \frac{ft^3}{7.48\ \text{gal}} \Big| \frac{\text{min}}{60\text{s}} = 1.33\ \text{ft/s}$$

STATE OF TEXAS
CAROL ANN ALSTON
85030
REGISTERED
PROFESSIONAL ENGINEER

Carol Ann Alston
5/25/06


WESTINGHOUSE ELECTRIC CORP.
54 BN CIRCULATING PUMP
THIS PUMP IS GUARANTEED TO DELIVER
64,000 G.P.M.
245 FEET TOTAL DYNAMIC HEAD
445 R.P.M.
88% EFFICIENCY (MOTOR LOSSES NOT INCLUDED)
20.0 FT. SUBMERGENCE
FT. DYNAMIC SUCTION LIFT
THIS CURVE SHOWS EXPECTED HEAD & EFFICIENCY AT OTHER CAPACITIES BUT THIS ADDITIONAL DATA IS ONLY APPROXIMATE & IS NOT GUARANTEED
TOTAL DYNAMIC HEAD
EFFICIENCY
BRAKE HORSE POWER
Reqd. Submergence
CURVE NO. HTA-25491-A
Submergence in FT.
TOTAL DYNAMIC HEAD — FT. WATER
EFFICIENCY %
BRAKE HORSE POWER
CAPACITY — THOUSAND GALLONS PER MIN.
0
10
20
30
40
50
60
70
80



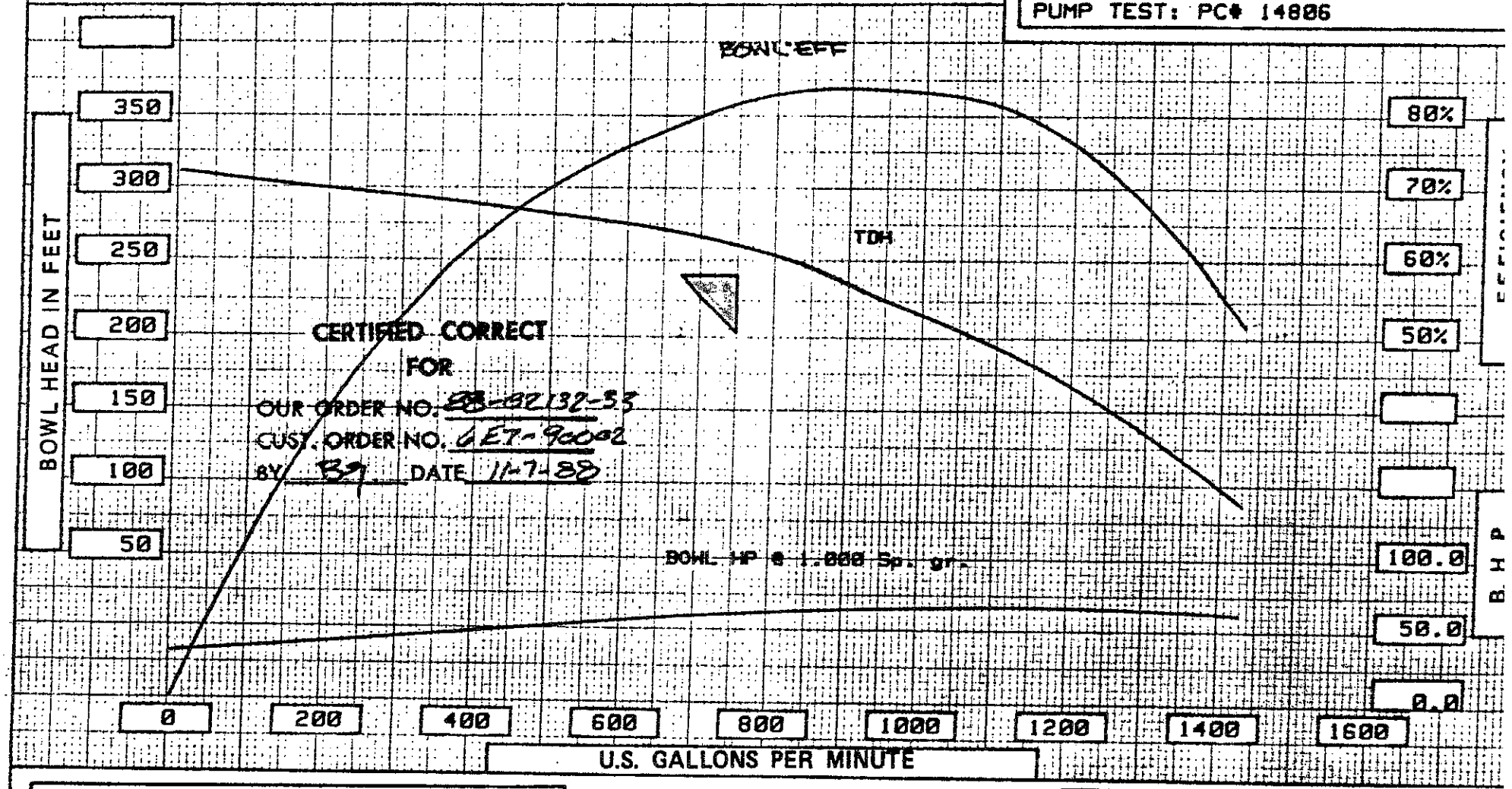
TEXAS POWER & LIGHT CO.

FRAME 54 BN CIRCULATING PUMP
TITLE OUTLINE

I. L. 1310-1061 – FIGURE 1 – 54 BN Circulating Pump Outline

Performance shown is the result of a test conducted in accordance with latest Hydraulic Institute Standards. Other Standards applicable when mutually agreed upon.

TEXAS UTILITIES ELECTRIC CO.
TRINIDAD STEAM ELECTRIC STATION
TRINIDAD TEXAS
750 GPM UL/FM LABELED FIRE PUMP
PUMP TEST: PC# 14806



CERTIFIED CORRECT
FOR
OUR ORDER NO. 88-02132-53
CUST. ORDER NO. GET-90002
BY BJ DATE 1-7-88

Peabody Floway
FRESNO, CALIFORNIA

TYPE 12LKM-FP
NO. OF STAGES 4
R.P.M. 1775
PUMP SERIAL NO. 88-02132

DWG. NO. 88-02132-1A

"There's a Difference"

DWN. BY R.M.G. DATE 1/7/88

Attachment N

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

Luminant Generation Company LLC
Trinidad Steam Electric Station
TPDES Permit No. WQ0000947000

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:

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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.

5.0 REFERENCES

Gould. 1962. Texas Plants: a checklist and ecological summary. Texas Agricultural Experiment Station, MP-585.

Hubbs, C., R.J. Edwards, G.P. Garrett. 1991. An annotated checklist of the freshwater fishes of Texas, with keys to identification of species. The Texas Journal of Science. 43(4): Supplement.

Hubbs, C. 1982. A checklist of Texas freshwater fishes. Texas Parks and Wildlife Department, Technical Series No. 11. Austin.

Karr, J.R., K.D. Fausch, P.L. Angermeier, P.R. Yant, and I.J. Schlosser. 1986. Assessing biological integrity in running waters: a method and its rationale. Illinois Natural History Survey. Special Publication 5.

Neter, J., W. Wasserman and M. H. Kutner, 1990. Applied Linear Statistical Models. Third Edition

Miller, A.C., K. Killgore, B.S. Payne, and J. Franklin. 1987. Community habitat suitability models for warmwater fishes. Miscellaneous Paper EL-87-14. Department of the Army Waterways Experiment Station, Vicksburg..

Nielsen, L.A. and D.L. Johnson, editors. 1985. Fisheries Techniques. Southern Printing Company, Inc. Blacksburg, Virginia. 468 pp.

Robison, H.W. and T.M. Buchanan. 1992. Fishes of Arkansas. University of Arkansas Press, Fayetteville. 536 pp.

Texas Parks and Wildlife Department. 1976. Performance Report for Job A: Existing Reservoir and Stream Management Recommendations as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1981–2001. Performance Report for Granbury Reservoir as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1983–2001. Performance Report for Graham Reservoir as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1984. Performance Report for Lake Creek Reservoir as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1985–2001. Performance Report for Colorado City Reservoir as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1985–2001. Performance Report for Martin Creek Reservoir as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1985–2000. Performance Report for Fairfield Lake as required by Federal Aid in Fisheries Restoration Act. Austin

———. 1987–2000. Performance Report for Tradinghouse Creek Reservoir as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1987–2003. Performance Report for Lake Monticello as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1988. Performance Report for Job A: Existing Reservoir and Stream Management Recommendations as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1992–2000. Performance Report for Eagle Mountain Reservoir as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1988–1998. Performance Report for North Reservoir as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1975–2003. Performance Report for Lake Striker as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1989–2000. Performance Report for Ray Hubbard Reservoir as required by Federal Aid in Fisheries Restoration Act. Austin.

———. 1981–1997. Performance Report for Squaw Creek Reservoir as required by Federal Aid in Fisheries Restoration Act. Austin.

U.S. Environmental Protection Agency. 2004. National Pollutant Discharge Elimination System-Final regulations to establish requirements for cooling water intake structures at Phase II existing facilities; Final rule. Federal Register. July 9, 2004.

U.S. Fish and Wildlife Service (FWS). 1982a. Habitat suitability index models: largemouth bass. U.S. Fish and Wildlife Service. FWS/OBS-82/10.18.

———. 1982b. Habitat suitability index models: bluegill. U.S. Fish and Wildlife Service. FWS/OBS-82/10.8.

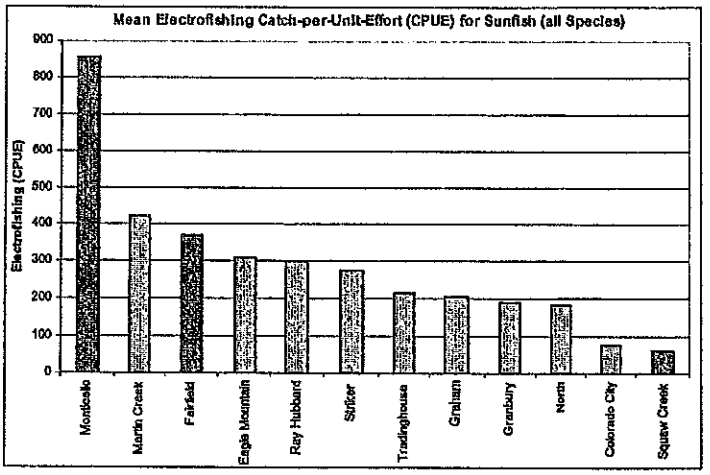
———. 1982c. Habitat suitability index models: channel catfish. U.S. Fish and Wildlife Service. FWS/OBS-82/10.2.

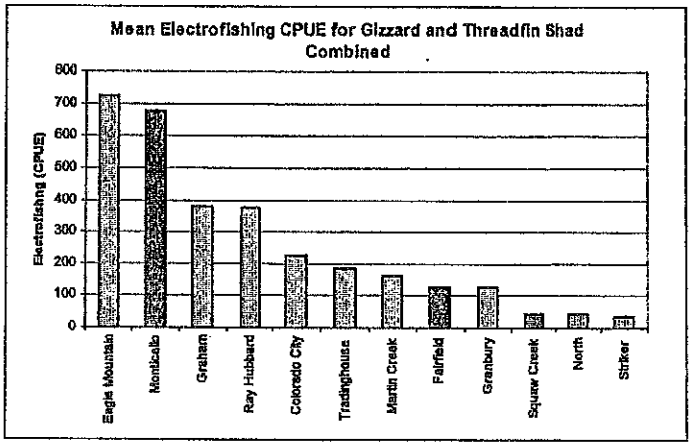
———. 1982d. Habitat suitability index models: white crappie. U.S. Fish and Wildlife Service. FWS/OBS-82/10.7.

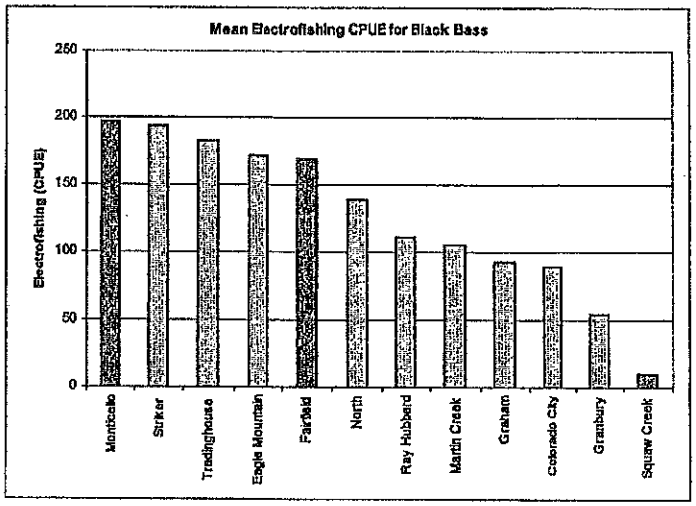
———. 1985. Habitat suitability index models and instream flow suitability curves: gizzard shad. U.S. Fish and Wildlife Service Biological Report 82(10.112).

Yeager, B.L. 1993. Dams. Pages 57–92. In C.F. Bryan and D.A. Rutherford, editors. Impacts on warmwater streams: Guidelines for evaluation. Southern Division, American Fisheries Society, Little Rock, Arkansas..

Figure 1: Mean Electrofishing CPUE for the Indicator Species, Sunfish, Shad, and Black Bass



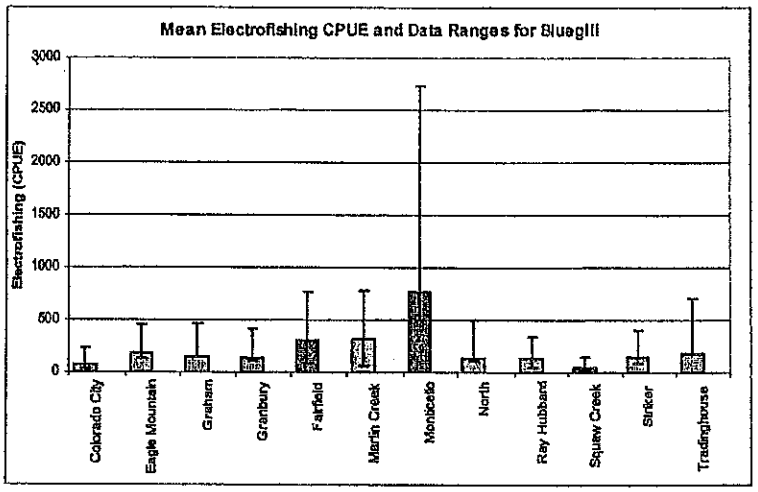


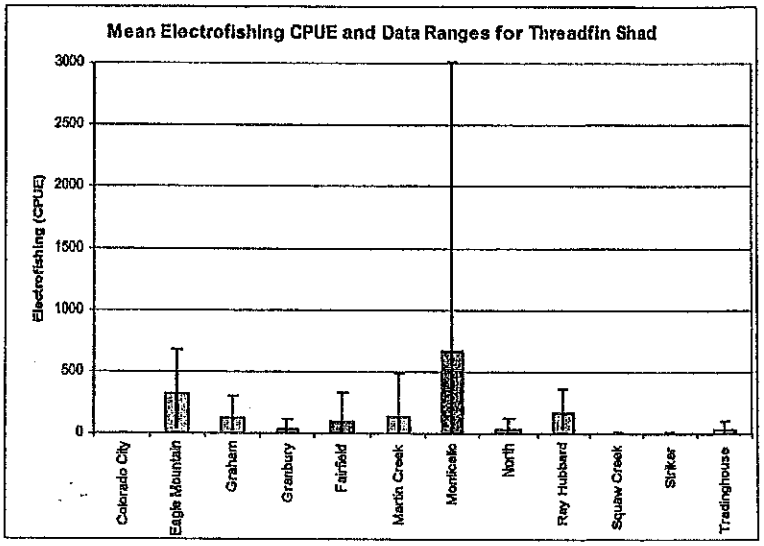


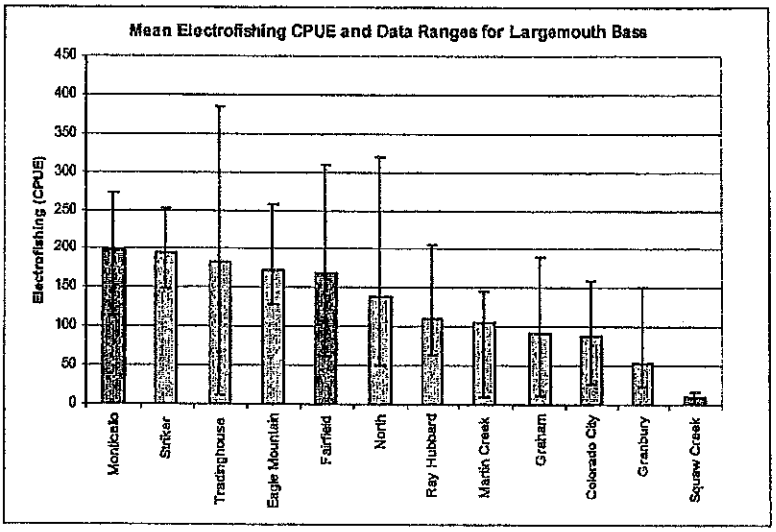
Figures 1a, 1b, and 1c

Representative reservoirs are shaded in dark gray.
Source: TPWD performance reports.

Figure 2: Mean Electrofishing and Data Ranges for Selected Species



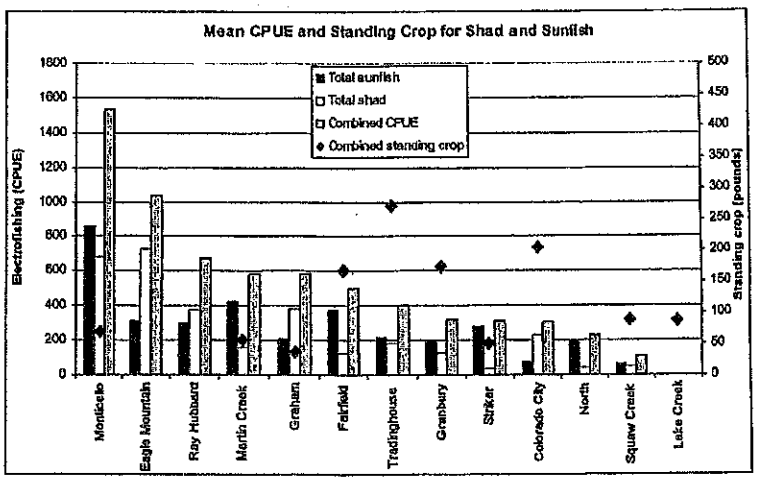


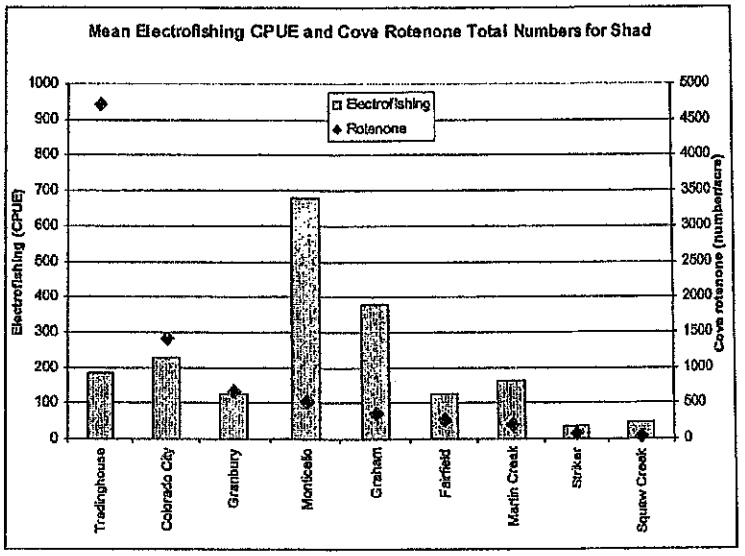


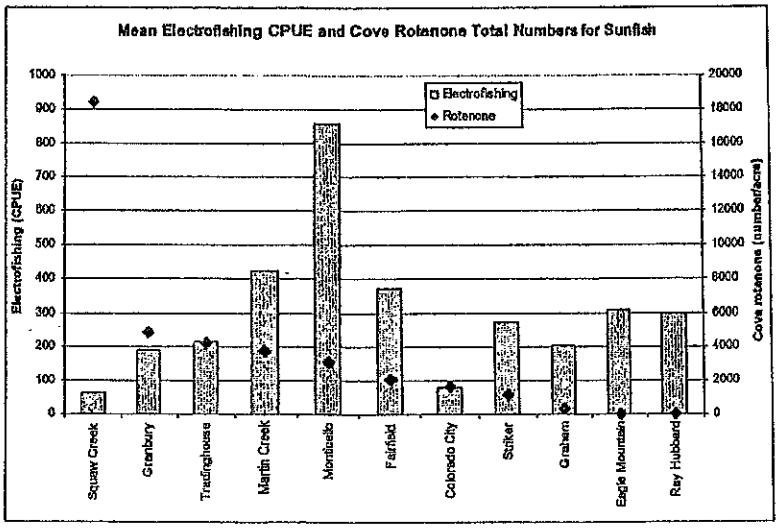
Figures 2a, 2b, and 2c

Error bars represent data ranges. Representative reservoirs are shaded in dark gray.
Source: TPWD performance reports.

Figure 3: Comparison Between Mean Electrofishing CPE and Cove Rotenone Data for Various Species

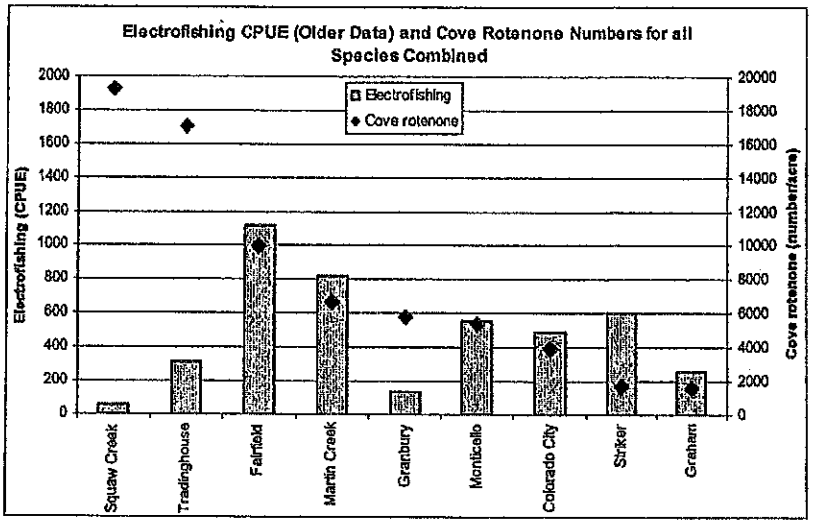


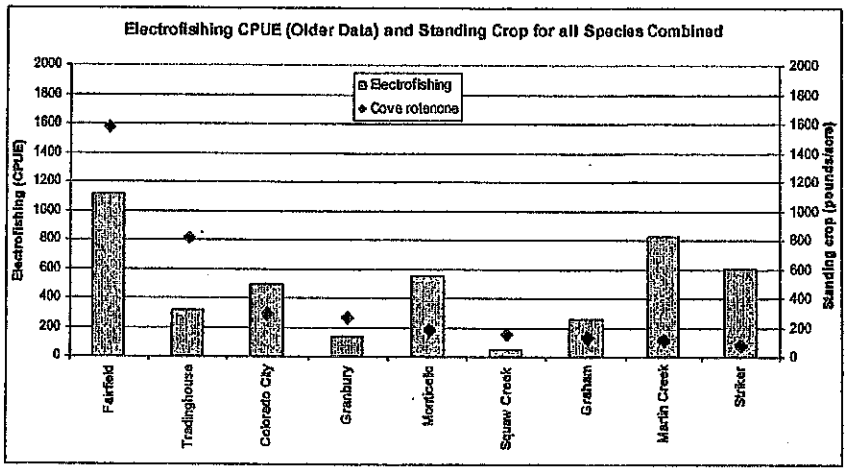




Figures 3a, 3b, and 3c

Figure 3 (Cont'd)

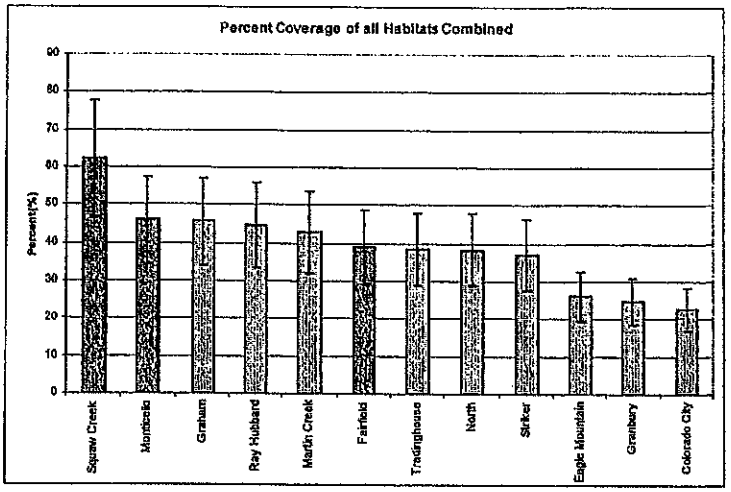


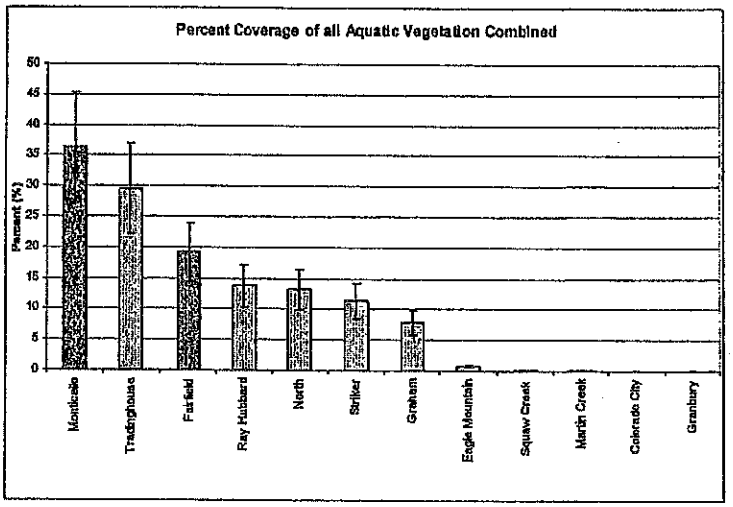


Figures 3d and 3e

Source: TPWD performance reports.

Figure 4: Percent Coverage of Selected Habitats by Reservoir





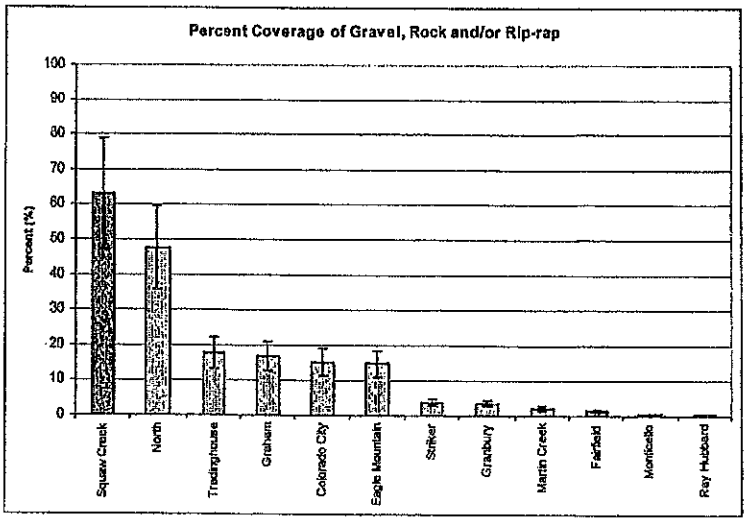


Figure 4a, 4b, and 4c

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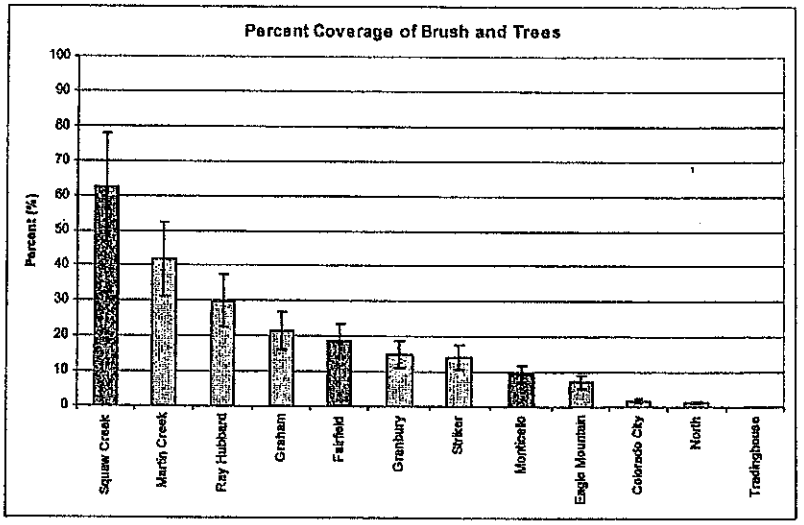


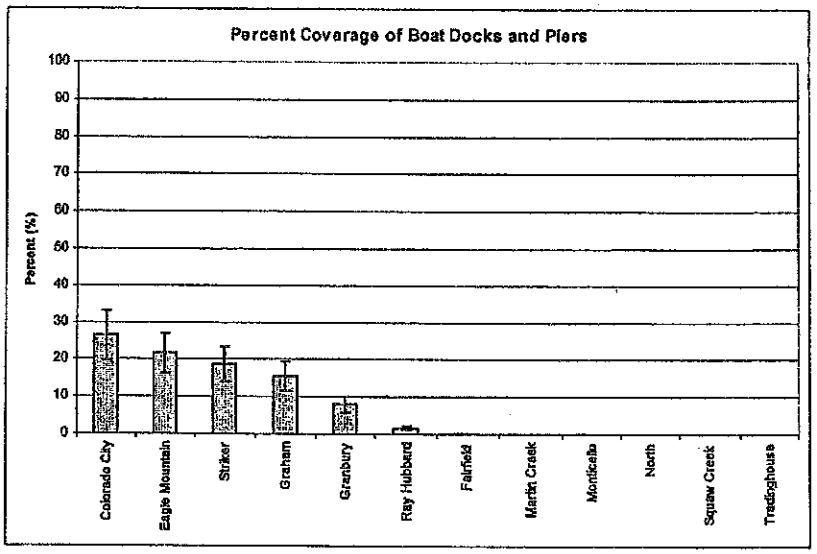
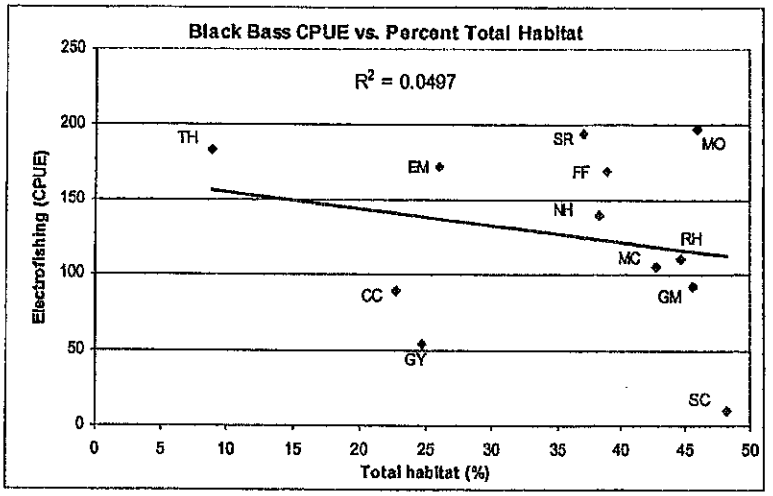
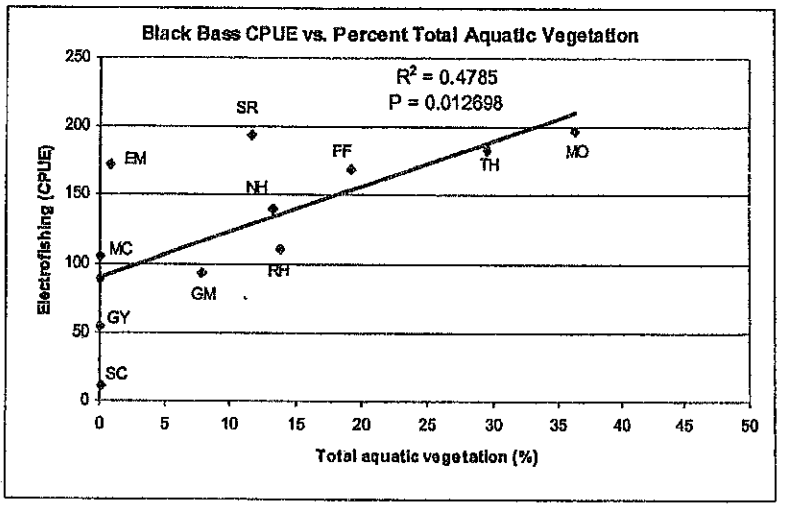


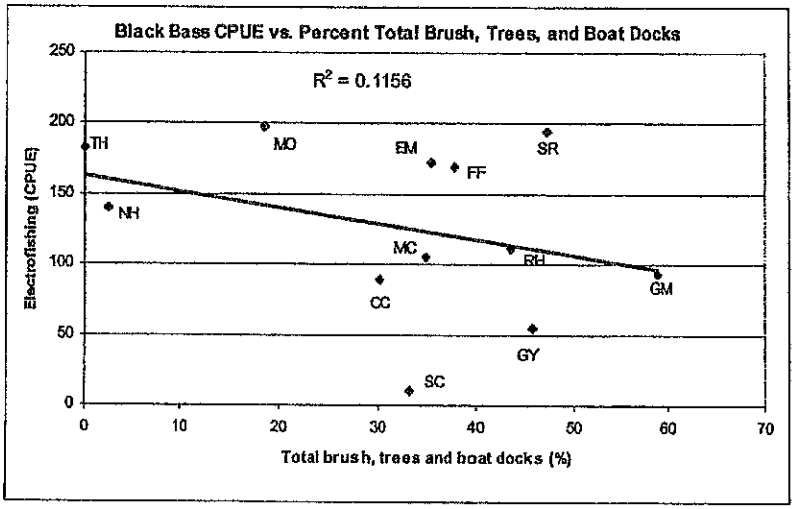
Figure 4d and 4e

Error bars indicate ±25% error.
Source: TPWD performance reports.

Figure 5: Relationship Between Sampling Catch Rates of Selected Species and Various Habitat Types

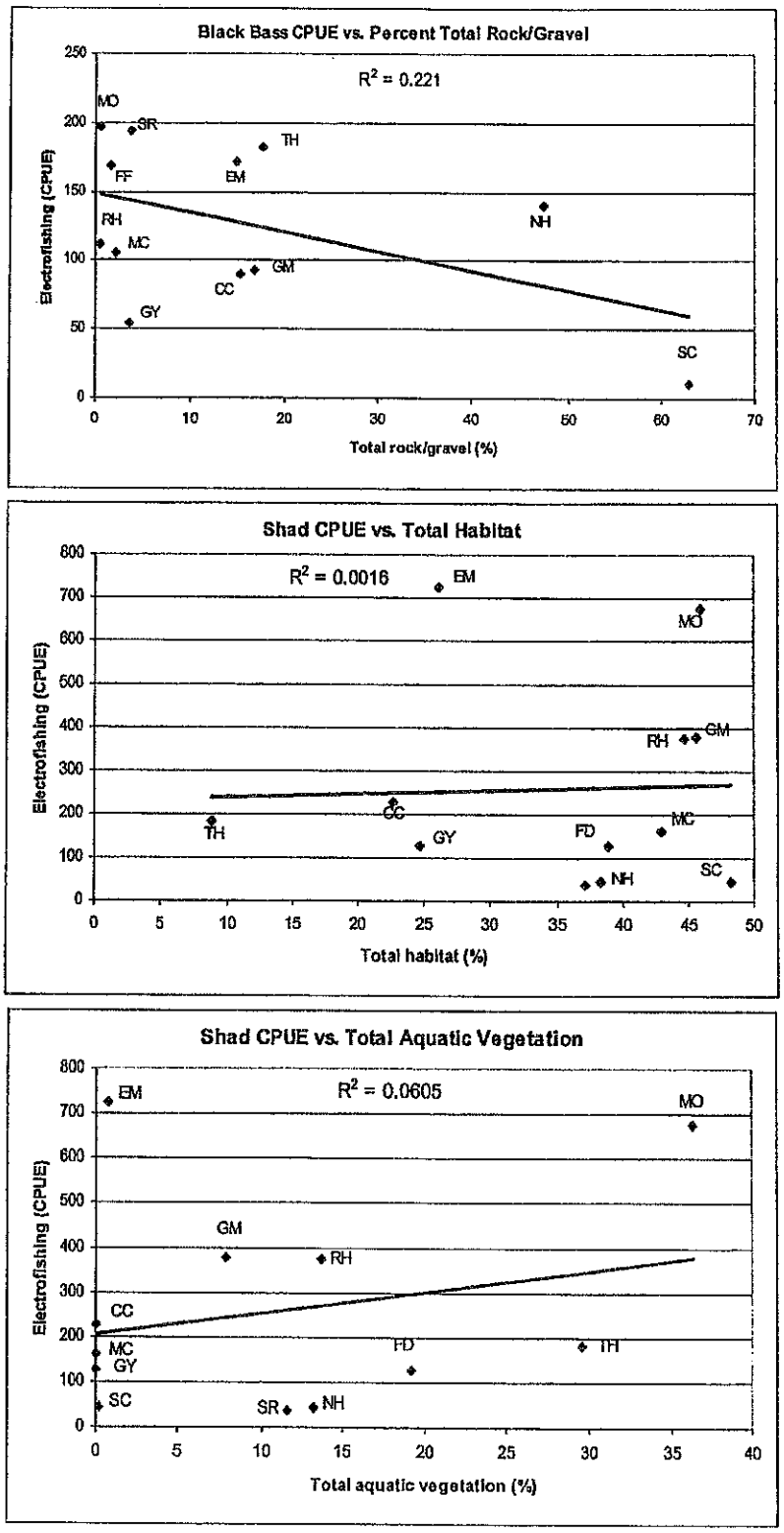






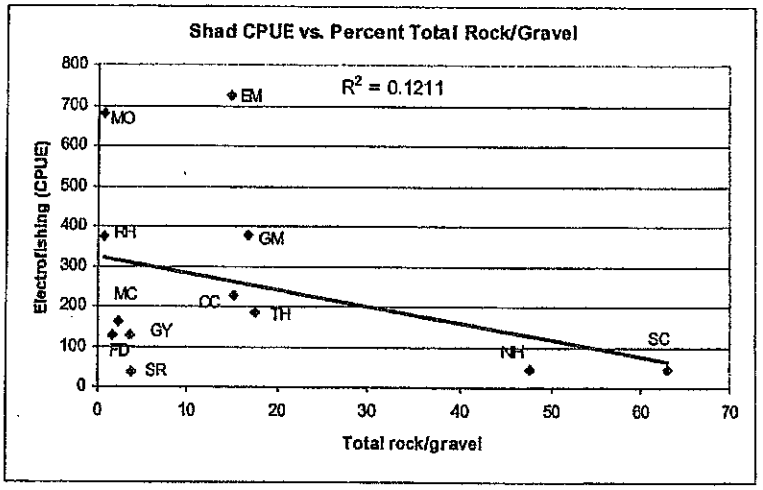
Figures 5a, 5b, and 5c

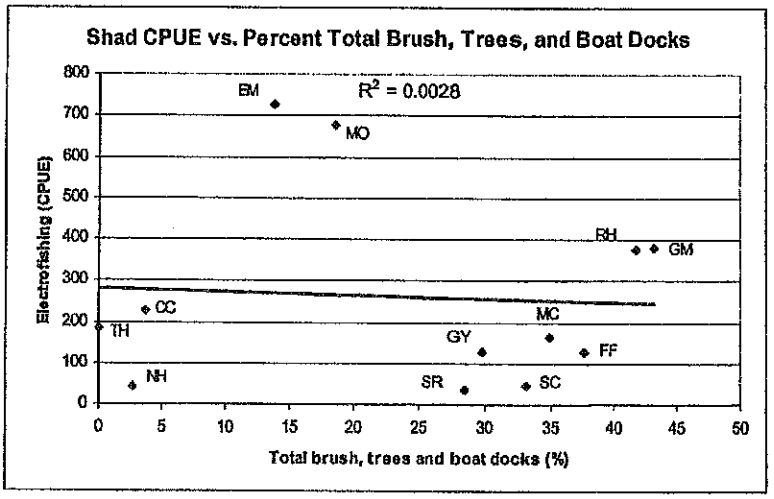
Figure 5 (Cont'd)

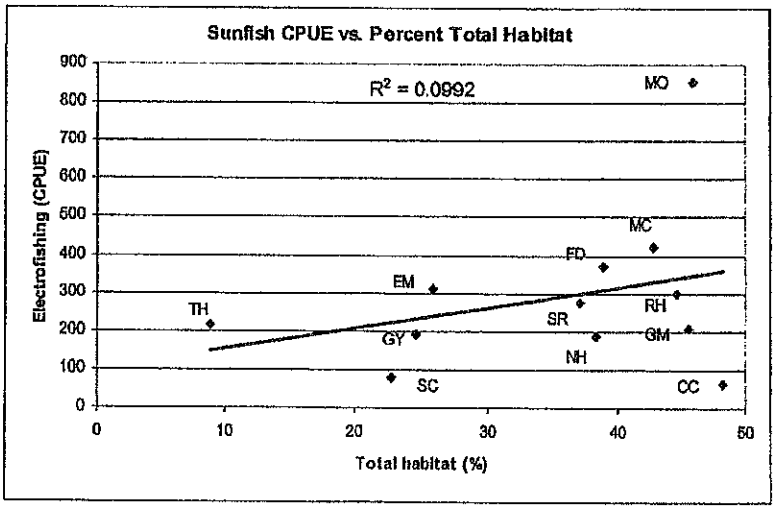


Figures 5d, 5e, and 5f

Figure 5 (Cont'd)

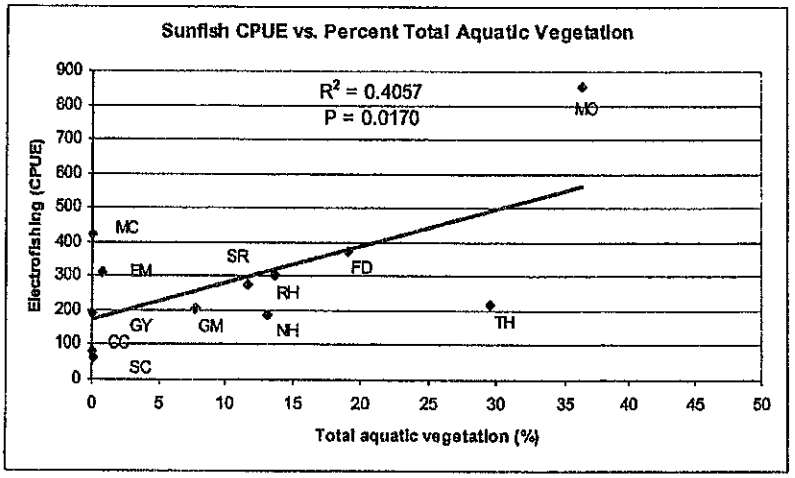


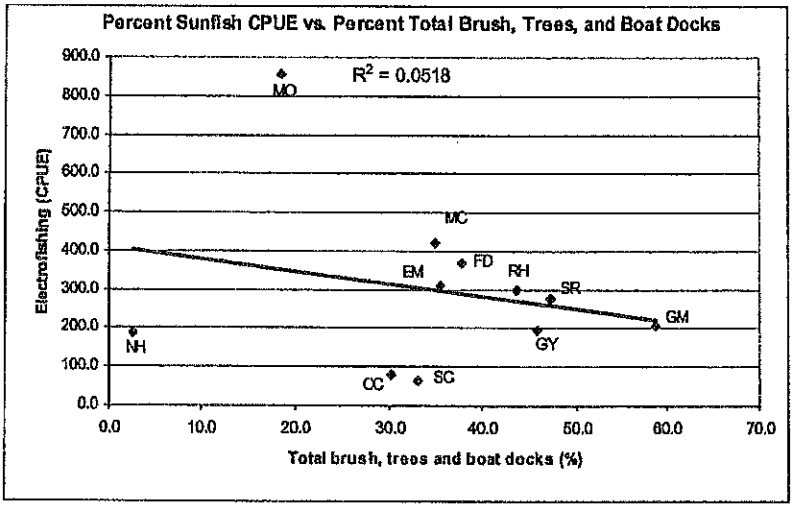


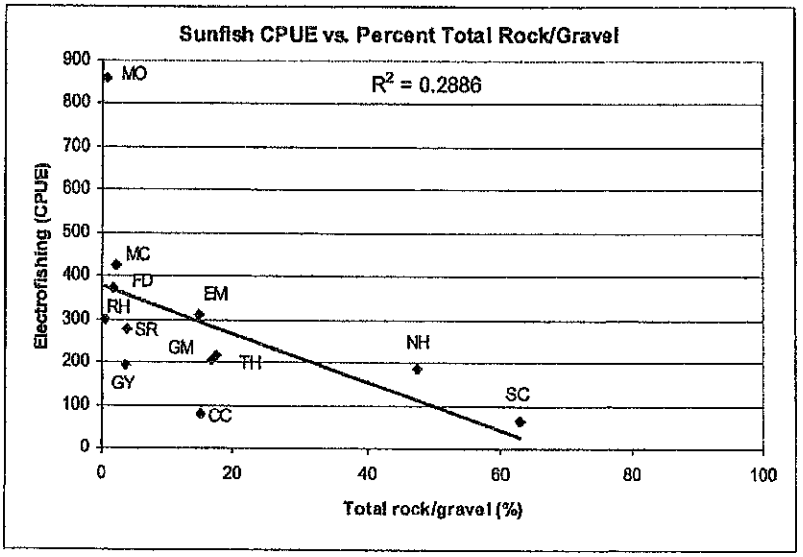


Figures 5g, 5h, and 5i

Figure 5 (Cont'd)



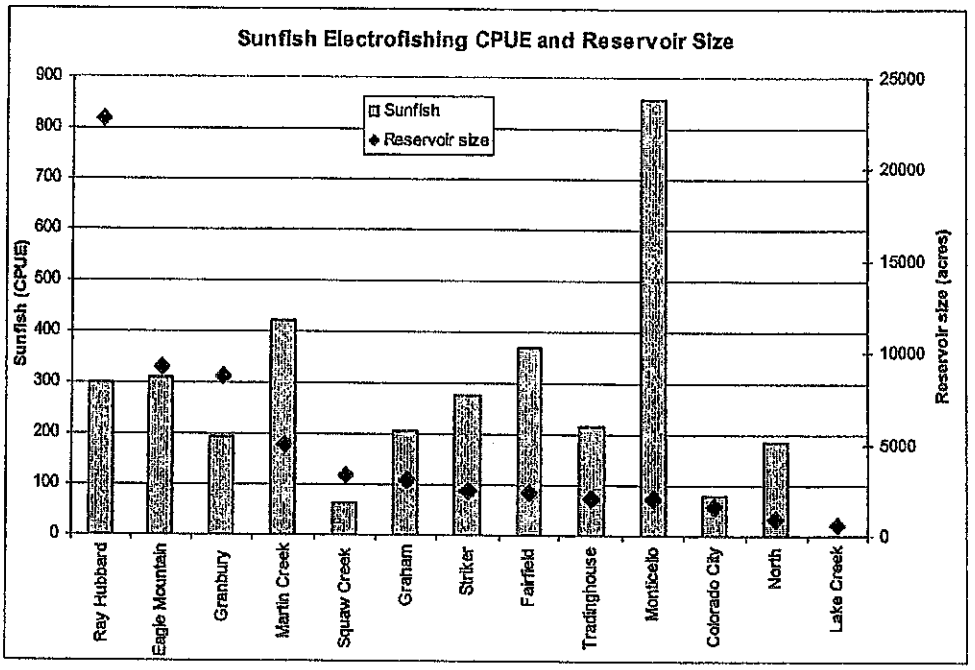


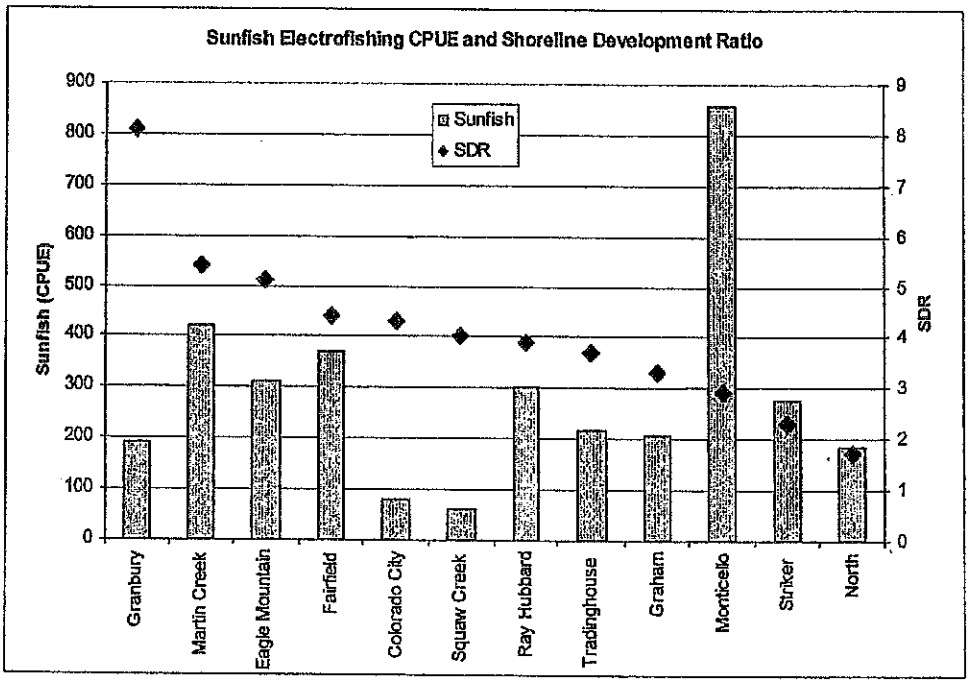


Figures 5j, 5k, and 5l

Source: TPWD performance reports.

Figure 6: Relationship Between Reservoir Sizes and Shoreline Development Ratios (SDR) and Sunfish Electrofishing Catch Rates





Figures 6a and 6b

Source: TPWD performance reports.

TABLE 1
RESERVOIR PHYSICAL CHARACTERISTICS

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	TNI	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	TNI	Freestone
Lake Creek	1985	616	26832960	no data	14.4	35.0	no data	7.5	39487	2.2	Brazos	1951	TNI	McLennan
Martin Creek	2001	5000	217800000	2.5	16.0	50.0	120	53.0	279840	5.4	Sabine	1974	TNI	Rusk
Monticello	1999	2000	87120000	3.8	20.3	40.0	335	18.0	95040	2.9	Cypress	1972	TNI	Titus
North	1998	907	39508920	5.0	20.0	55.0	300	7.5	37725	1.7	Trinity	1957	TNI	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	TNI	Hood, Somerville
Striker	1999	2400	104544000	2.0	15.0	35.0	200	16.0	84480	2.3	Angelina	Angelina	Nacogdoches County Water Control and Improvement District	Rusk
River Crest*													TNI	Red River
Tradinghouse	2000	2012	87642720	3.0	19.0	42.0	1200	23.0	121440	3.7	Brazos	1968	TNI	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

Reservoir	Black Bass Electrofishing CPUE Largemouth bass																		
	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

Reservoir	Spotted bass																		Total Mean
	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			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)

Shad Electrofishing CPUE																			
	Gizzard shad																		
Reservoir	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

	Threadfin shad																			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			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

Reservoir	Bluegill																		
	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

Reservoir	Other sunfish (not including bluegill)																			Total
	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																			
	White bass																		
Reservoir	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

	Striped bass																		
Reservoir	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

	Palmetto bass (hybrid white male x striped female 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	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																			
	White crappie																		
Reservoir	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

	Black crappie																			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	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 Area (acres)		No data available							No data available	No data available			
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 chrysop* s)	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.

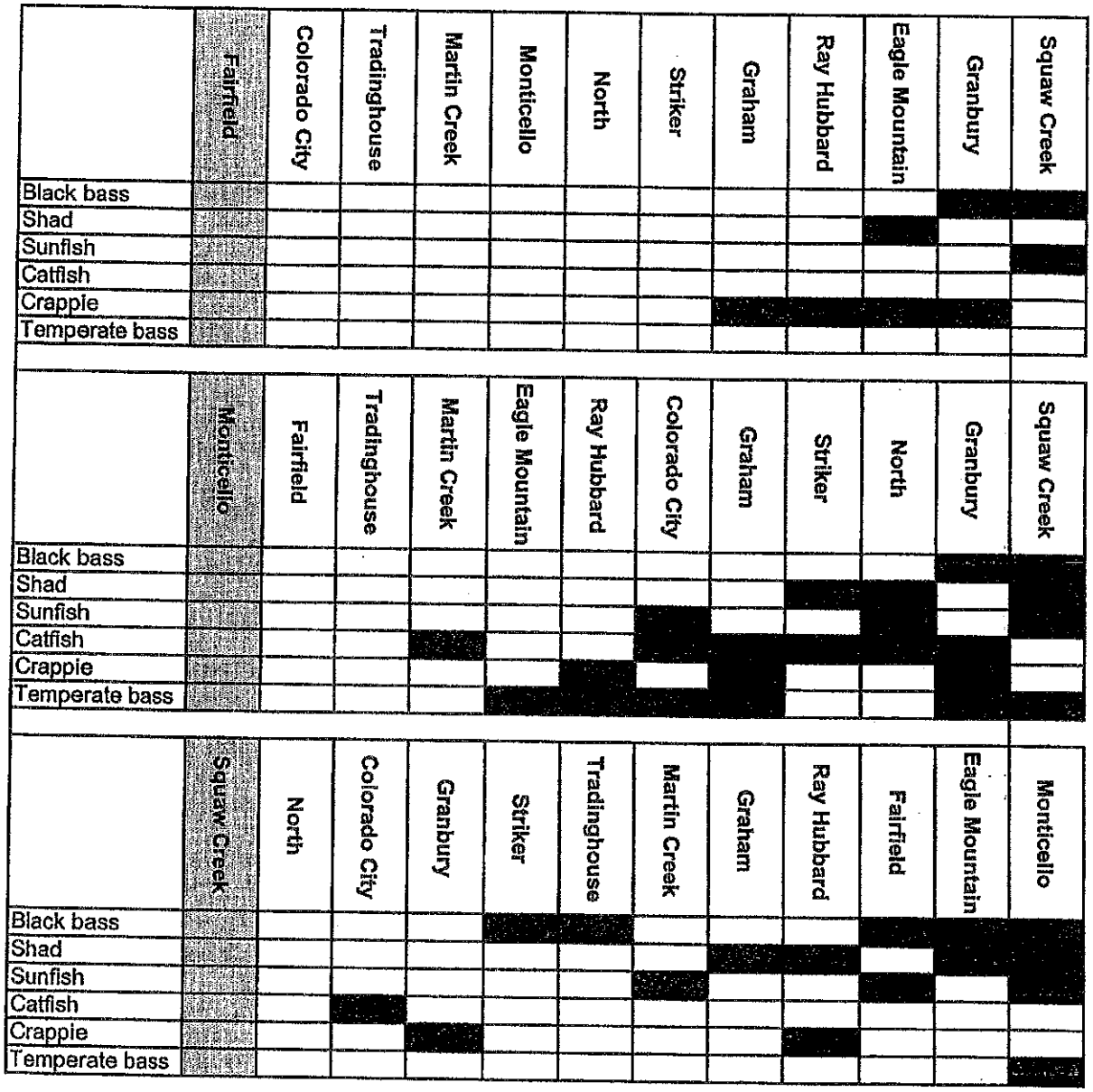
Source: TPWD Reservoir performance reports.

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	9.6	13.8	50.3	8200	8026	98.1	8.0	0.4	136.0	1.5			1.5	1.88	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	3.5					0.0		16.0	31.5	29.7	49.5	6700	6700	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	0.5	10.3	57.0	2.8	15.6	72.6			3.3	18.5	91.1	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	33.0	24.2	29.2	0.5	0.6		0.0	22.1	26.6			26.6	1.4	1.7	24.7	41.8	70.7	22475	8262	81.3	3994.0	17.8			199.0	0.9	0.9	18.66	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	36.0	3.9	24.6			0.6	3.8	3.7	23.3			23.3	4.0	18.2	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



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.

Trinidad Steam Electric Station
WQ0000947000
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 Trinidad Steam Electric Station (RN101943868), located at 1320 McEntire Rd., Trinidad, Henderson County, Texas 75163. The facility currently consists of one natural gas-fired steam electric generating unit.

This application is for the renewal of Texas Pollutant Discharge Elimination System (TPDES) Permit No. WQ0000947000 (EPA I.D. No. TX001031) which authorizes the discharge of wastewaters (once-through cooling and auxiliary cooling water) and previously monitored effluent (floor/equipment drains, equipment blowdown, water treatment wastes, low volume waste, metal cleaning waste and storm water) at a daily average flow not to exceed 425 million gallons per day via Outfall 001.

The discharge of once-through cooling water via Outfall 001 and previously monitored effluent via Outfalls 101, 201 and 301 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.

The raw water supply for the facility's cooling water and service water systems is from Trinidad Reservoir. 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. Domestic wastes are routed to an on-site septic system.