APPENDIX I

Public Outreach and Scoping

Note: The Section 508 amendment of the Rehabilitation Act of 1973 requires that the information in federal documents be accessible to individuals with disabilities. The U.S. Army Corps of Engineers (Corps) has made every effort to ensure that the information in this appendix is accessible. However, this appendix is not fully compliant with Section 508, and readers with disabilities are encouraged to contact Mr. Jayson Hudson at the Corps at (409) 766-3108 or at SWG201601027@usace.army.mil if they would like access to the information.

Environmental Impact Statement
Agency Meeting
Scoping Report

Dow Chemical Company Harris Reservoir Expansion Project

Department of the Army Permit Application
SWG-2016-01027

US Army Corps of Engineers ®

DOW ®

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1. Introduction

The National Environmental Policy Act of 1969 (NEPA) requires an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. Scoping is an opportunity for the U.S. Army Corps of Engineers (Corps) to introduce and explain the interdisciplinary approach to our environmental analysis as well as solicit public and agency comments regarding environmental resources, potential impacts, and alternatives that should be included.

This Scoping Report has been developed for the Corps to share the types of comments/concerns that were received from the cooperating and participating agencies during the agency scoping meeting on May 12, 2020 as well as agency comment letters received during the scoping period. Agency comments were used to develop alternatives to be carried forward for analysis in the EIS and identified issues that are important to the agencies to be considered in the analysis of the EIS. A summary of the public scoping process and comments are noted in a separate report.

1.1. Project Background

The Corps received a permit application for a U.S. Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act from Dow Chemical Company (Dow) for the proposed Project. The goal of the project is to utilize Dow's existing run-of-river water rights from the Brazos River to improve reliability for the existing Brazoria and Harris reservoir system during extended drought conditions.

The project includes the construction of an off-channel impoundment reservoir with a nominal storage capacity of 50,000-acre-feet that would be located directly upstream and adjacent to the existing Harris Reservoir. The proposed reservoir would cover approximately 2,000 acres and would include a pumped intake station on the Brazos River and a gravity outfall to Oyster Creek through the construction of a new bypass channel.

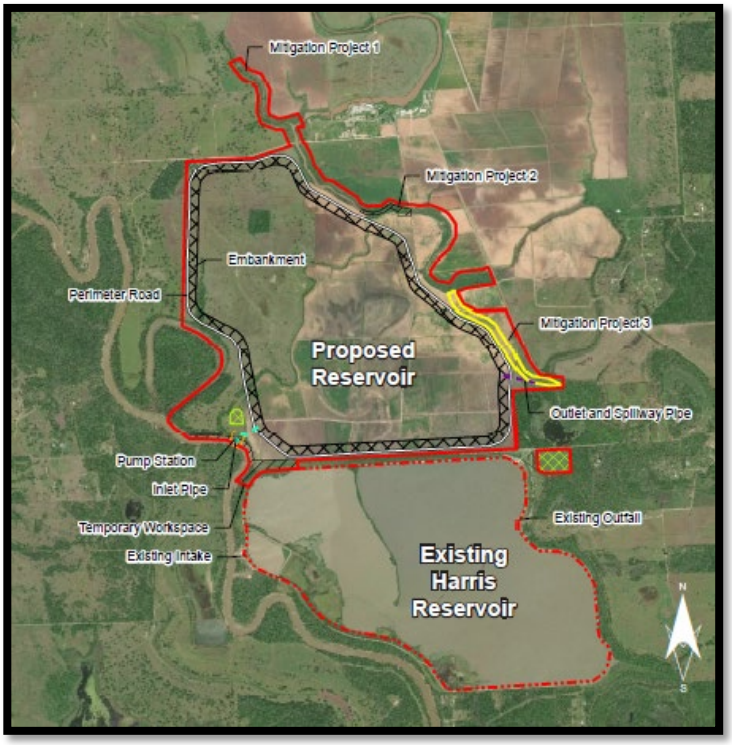

Figure 1 - Proposed Project Area.

The proposed reservoir would operate with the existing Harris and Brazoria reservoirs in a manner similar to current operations. During periods of drought, the proposed reservoir would be exhausted first, followed by the existing Harris Reservoir, and then the Brazoria Reservoir. As with current operations, emergency releases would occur due to severe weather, such as tropical storms and hurricanes exhibiting wind speeds that could potentially overtop the embankments.

The proposed Project includes plans for the mitigating of impacts via restoration projects, all on Oyster Creek. These three projects (referred to as Mitigation Projects 1, 2, and 3) to enhance the

flood capacity and to provide restoration and enhancements of the plant habitats and communities along the river bank (riparian area). The proposed stream restoration includes creating flat or shallowly sloped areas above the bankfull height to slow high velocity flows during storm events (bankfull benching), 100-foot buffer preservation, and buffer re-establishment up to 200 feet.

- Mitigation Project 1 is located on a 3,600-linear-foot unnamed tributary to Oyster Creek.
- Mitigation Project 2 is located on a 12,860-linear-foot segment of Oyster Creek.
- Mitigation Project 3, located on an 11,200-linear-foot segment of Oyster Creek, would serve as a receiving channel conveying overflows from Oyster Creek during high flows by providing additional hydraulic conveyance capacity in the floodplain, and would provide additional flood storage capacity by receiving backwater from Oyster Creek at the downstream end of Project 3 during flood events.



Figure 2 – Example Proposed Project improvements

1.2. Purpose and Need for Proposed Project

The Corps is required to restate the purpose and need for the project from the public interest perspective. The Corps, after coordinating with the cooperating agencies, developed the following overall purpose to identify and screen alternatives to the applicant's proposed Project:

To utilize Dow's existing run-of-river water rights from the Brazos River to improve reliability during extended drought conditions for the existing water supply system that serves Dow's Texas Operations in Freeport as well as other industrial, community and potable water users that rely on Dow's water supply. Based on modeling, Dow estimates that a total of 78,000 acre-feet of water storage capacity is necessary to provide Texas Commission on Environmental Quality's recommended 180 days of drought resilience. The current combined storage capacity in the existing Brazoria and Harris reservoirs is approximately 29,000 acre-feet. Therefore, Dow will need to develop the Harris Reservoir Expansion Reservoir to provide an additional storage capacity of at least 49,000 to provide a reliable water supply during drought.

2. Scoping Process

2.1. Transition to Virtual Meetings

Although agency scoping meetings are not always held in person, due to emergency health procedures, the agency scoping was required to be held virtually. On March 24, 2020, the Corps issued a memorandum: *Interim Army Procedures for National Environmental Policy Act (NEPA)* in response to the coronavirus (COVID-19) pandemic. The memorandum established interim Army NEPA procedures in consideration of the COVID-19 public health emergency. These interim NEPA procedures apply to all Army NEPA proponents responsible for NEPA compliance. The memorandum directed the following actions related to public meetings and the NEPA process:

- NEPA public meetings will be transitioned to virtual meetings, postponed, or cancelled, as deemed appropriate by the Army NEPA proponent.
- Alternative means of public engagement will be implemented and documented in public participation plans. Virtual meetings may be conducted using online meeting / collaboration tools, teleconference, social media, or email, as appropriate.
- NEPA public and Federal Register notices will inform the public about these alternative participation procedures and how to obtain NEPA materials on the project web site or through the mail. Public notices will provide a contact phone number, email, website address, and mailing address.
- Project information, including, but not limited to, scoping materials, draft NEPA documents, and comment forms will be available on project websites. This includes materials normally presented at public meetings.
- Project information, including, but not limited to, scoping materials, draft NEPA documents, and comment forms will be sent through the mail as either hard copies or as printable compact discs (as requested). Mailed materials will include requested materials normally presented at public meetings and materials on the project website.
- Army NEPA proponents will ensure cooperating agencies are aware of these NEPA alternative participation procedures.

In response to this memorandum, the Corps determined that the agency scoping meeting for the proposed Project would be moved to a virtual platform in accordance with the above interim procedures.

2.2. Agency Notification of Scoping

A meeting invitation was emailed to agencies on April 28, 2020 (**Appendix A**). Representatives from the following agencies were invited:

- Environmental Protection Agency (EPA)
- U.S. Fish & Wildlife Service (USFWS)
- Texas Commission on Environmental Quality (TCEQ)
- Texas Parks and Wildlife (TPWD)
- Texas Historical Commission (THC)
- Texas General Land Office (TXGLO)

The agencies were also provided maps and figures for the proposed project (**Appendix B**).

3. Agency Scoping Meeting Summary

A virtual public scoping meeting, hosted by the Corps, Galveston District, for the proposed Project EIS was held online via Cisco WebEx Events on May 12, 2020.

The purpose of this virtual agency scoping meeting was to provide the agencies with information about the proposed Project and to solicit comments and information to better enable the Corps to make a reasonable decision on factors affecting the public interest.

A total of 25 people attended the agency scoping meeting including the Corps and other agencies, Dow, and contractors. An attendee list is included in **Table 1**.

Table 1. Meeting Attendees

Agency/Company	Last Name	First Name	Title
Corps	Col. Vail	Timothy	Lead Agency
Corps	Hudson	Jayson	Lead Agency
Corps	Heinly	Bob	Lead Agency
Corps	Lumen	Mark	Lead Agency
EPA	Kasper	Paul	Cooperating Agency
EPA	Hayden	Keith	Cooperating Agency
USFWS	Bearb	Amber	Cooperating Agency
TCEQ	Lueg	Jenna	Agency
TPWD	Roco	Coleen	Agency
THC	Durst	Jeff	Agency
Dow	Sampson	Yvonne	Applicant
Dow	Cone	Gabriella	Applicant
Dow	Bond	Greg	Applicant
Dow	Rehman	Rana	Applicant
Dow	Finley	Tim	Applicant
Dow	Lord	Glenn	Applicant
Dow	Nipper	Will	Applicant
SWCA	Fiore	Whitney	Contractor
SWCA	Hartmann	Christine	Contractor
SWCA	Giblin	Kara	Contractor
Watearth	Lundberg	Jennifer	Contractor
Watearth	Walker	Jennifer	Contractor
Hollaway	Sankey	Amanda	Contractor
Hollaway	Stokes	Connor	Contractor
Hollaway	Aina	Emmanuella	Contractor

The meeting began with opening remarks from Col. Timothy Vail of the Corps Galveston District. Col. Vail read a summary of the proposed action and discussed the scoping process. Following this introduction, the meeting proceeded with a presentation of the proposed Project led by Mr. Greg Bong, a representative from Dow. This was followed by a presentation about the EIS scoping process, the purpose and need of the proposed Project, and known environmental concerns led by Mr. Jayson Hudson, a representative of the Corps. Presentation materials are located in **Appendix C**. Once presentations were completed, attendees were provided an opportunity to provide comments on the proposed project.

3.1. Verbal Comments Received

Following the formal presentation portion of the meeting, each agency was invited to provide verbal comments. A summary of verbal comments received from each agency during the meeting are provided in **Table 2**.

Table 2. Verbal Comments Received

Commenter (Last Name/First Name)		Agency	Comment
Hayden	Keith	EPA	No comments from a NEPA prospective but confirming July 2 is deadline for scoping comments.
Kaspar	Paul	EPA	Inquired about restoration and mitigation for Oyster Creek. Requested to clearly identify which activities have joint intent and purpose.
Bearb	Amber	USFWS	No comments at this time. Will review closely and provide written comments.
Lueg	Jenna	TCEQ	No comment. Asked if there would be wetland impacts. USACE confirmed yes there are wetlands within the footprint.
Roco	Coleen	TPWD	Comments were submitted in April 30, 2018 letter and included concerns with environmental impacts to Brazos Rivers and Oyster Creek from change in hydrology, concerns about aquatic organisms, concern with salinity change downstream in Oyster Creek. Will review wetland delineation and stream assessment and submit scoping comments in writing
		THC	No response.
		Texas GLO	No response.

3.2. Written Comments Received

EPA, USFWS, TCEQ, TPWD, and THC also provided written comments by the July 2nd, 2020, scoping deadline (see letters in **Appendix D**). The scoping letters contained 21 comments, as summarized below. NOAA National Marine Fisheries Service stated they will not provide comments since they do not have trust resources in the area.

- Reducing potential short-term *air quality* impacts during construction (1)
- Evaluating impacts to *waters of the U.S.* including wetland and stream functions and values (4)
- Concerns with impacts to *vegetation and wildlife habitats* including habitat loss, restoration, and spread of non-native species (3)
- Concerns with *sedimentation and water quality* due to removal of riparian habitat (3)
- Requests to provide plans for *mitigation* of impacts to streams and wetlands (5)
- General comments about the *public involvement* process (2)
- Concern with *environmental justice* including recommendations to consult with tribal governments (2)
- Request for the applicant to conduct baseline surveys for *threatened and endangered species* (1)

4. Alternatives

The Corps evaluated information obtained from scoping and with federal and state agencies, the public as well as data collection and analysis of environmental, socioeconomic, and engineering factors as part of development of alternatives to the proposed Project. The Corps prioritized minimization of impacts, both individually and cumulatively, to aquatic resources during both construction and operations in its development of alternatives. Using these concepts and considering avoidance and minimization to reduce impacts, the following seven Project alternatives were identified.

1. **No Action Alternative:** Under the No Action Alternative, no additional water storage would be constructed and that the proposed activity would not take place and Dow would continue to operate their water supply system as is currently done. The No Action alternative would include Dow's current water conservation and water reclamation projects.
2. **The Harris Reservoir Expansion Project Alternative:** This alternative includes construction of an off-channel reservoir located on approximately 2,000 acres directly north of the existing Harris Reservoir to add approximately 50,000 acre-feet of additional storage capacity and estimated annual yield of approximately 80,000 acre-feet. This location is in the floodplain for the Brazos River and Oyster Creek and adjacent to Dow's existing infrastructure.
3. **The Harris Expansion Project – Alternate Embankment Configuration:** This alternative includes alternate site layout for the construction of an off-channel reservoir located on approximately 2,000 acres directly north of the existing Harris Reservoir to add approximately 50,000 acre-feet of additional storage capacity and estimated annual yield of approximately 80,000 acre-feet. Alternative site layouts, or on-site alternatives, may reduce impacts to the Brazos River and Oyster Creek.
4. **The Off-Channel Reservoir–West Bank Brazos River Alternate Location**: This alternative will be located on the west bank of the Brazos River. This alternative would include consideration of an area outside the Oyster Creek Floodplain to construct a 50,000 AF reservoir and would allow Dow to use their existing Brazos River water rights but is not adjacent to Dow's existing infrastructure.
5. **The Allens Creek Reservoir Alternative:** This alternative is a proposed water supply storage reservoir planned for construction near the City of Wallis in Austin County. The off-channel reservoir is near the Brazos River on Allens Creek, a tributary of the Brazos, composed of diversions from the mainstem of the Brazos River which would be pumped to the impoundment formed by a dam on Allens Creek. The reservoir with have a storage capacity of up to 145,533 acre-feet and an approximate annual yield of 99,650 acre-feet. The maximum permitted diversion rate is 2,200 cubic feet per second (cfs) or approximately 1,400 MGD. The water right for Allens Creek Reservoir are owned by the Brazos River Authority and the City of Houston.
6. **The Seawater Desalination Alternative:** This alternative would include diversion of seawater using an intake facility, a reverse osmosis plant, an outfall to discharge brine concentrate, as well as water conveyance facilities.
7. **The Brackish Water Desalination Alternative:** This alternative would include diversion of brackish water from the Brazos River using an intake facility, a reverse osmosis plant, an outfall to discharge brine concentrate, as well as water conveyance facilities.

The Corps conducted a multi-step process to screen the range of alternatives to determine which alternatives are reasonable, practicable, and meet the Project purpose. The Project alternatives were analyzed using the following screening criteria to identify a range of reasonable alternatives: satisfaction of the overall Project purpose; practicable based on Clean Water Act Section 404(b)(1) Guidelines (technology, logistics, cost); and consideration of potential aquatic resources impacts. The alternatives screening analysis is summarized in **Table 3**.

Table 3. Comparison Summary of Alternatives

Alternative	Carried Forward (Yes/No)			
	Purpose and Need	**Practicability - Technology**	**Practicability - Logistics**	**Practicability - Cost***
No Action	No	Yes	Yes	Yes
Harris Reservoir Expansion	Yes	Yes	Yes	Yes
Harris Expansion Alternate Embankment Configuration	Yes	Yes	Yes	Yes
Harris Expansion Project –West Bank Brazos River Location Alternate	Yes	Yes	Yes	Yes
Allen's Creek Reservoir	No	Yes	No	Yes
Seawater Desalination	No	Yes	Yes	No
Brackish Water Desalination	Yes	Yes	Yes	Yes
**It is not a particular applicant's financial standing that is the primary consideration for determining practicability in regards to cost, but rather characteristics of the project and what constitutes a reasonable expense for these projects that are most relevant to practicability determinations.*				

Based on this analysis, the Corps determined that the No Action Alternative and four action alternatives will be carried forward for detailed analysis in the EIS. Both the Seawater Desalination alternative and Allens Creek Reservoir alternatives were eliminated because they do not allow Dow to use their existing run-of-river water rights from the Brazos River. In addition, the Allens Creek Reservoir site is owned by the Brazos River Authority and the City of Houston and is not reasonably available to Dow.

Appendix A

Meeting Invitation

From:	Hudson, Jayson M CIV USARMY CESWG (USA)
To:	Ardizzone.Charles; Houston.robert@epa.gov; Samson, Yvonne (Y); Roco, Coleen; Allison Buchtien; Kaspar, Paul; Jenna.Lueg@tceq.texas.gov; 401CERTS; Bill.Martin@thc.state.tx.us; Amy Nunez
Cc:	Whitney Fiore; Christine Hartmann; Kara Giblin; McMahan, Joseph A CIV USARMY CESWG (USA); HEINLY, Robert W CIV USARMY CESWG (USA); Hudson, Jayson M CIV USARMY CESWG (USA)
Subject:	SWG-2016-01027 Dow Chemical Company Virtual Agency Scoping Meeting
Date:	Tuesday, April 28, 2020 4:39:08 PM

EXTERNAL: This email originated from outside SWCA. Please use caution when replying.

The U.S. Army Corps of Engineers will be hosting a Virtual Agency Scoping Meeting for the Dow Chemical Company's Harris Reservoir Expansion EIS on May 12th from 9-11:30am. The purpose of the public scoping process is to identify relevant issues that will influence the scope of the environmental analysis and EIS alternatives.

The meeting will be hosted online at:
https://usace.webex.com/meet/jayson.m.hudson

You may use the website audio or call in on a telephone at:
Phone: 877-336-1839
Access: 426 9357#
Code: 1027#

If you call in from a telephone, please make sure to include your participant ID provided by the website when logging in. The participant ID will assist in facilitating the meeting. The meeting will be recorded for transcription into the administrative record.

For additional information on the project, including the initial public notice and the significance determination, please visit: https://www.swg.usace.army.mil/Business-With-Us/Regulatory/Special-Projects-Environmental-Impact-Statements/

Please respond to this email to confirm your agency's attendance.

Jayson M Hudson
Regulatory Project Manager
Policy Analysis Branch
Galveston District
409.766.3108

Please tell me how I am doing by completing the survey found at:
http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

Appendix B

Maps and Figures

Kara Giblin

From: Whitney Fiore
Sent: Wednesday, May 6, 2020 3:06 PM
To: Hudson, Jayson M CIV USARMY CESWG (USA); Ardizzone,Charles; Houston.robert@epa.gov; Samson, Yvonne (Y); Roco, Coleen; Allison Buchtien; Kaspar, Paul; Jenna.Lueg@tceq.texas.gov; 401CERTS; Bill.Martin@thc.state.tx.us; Amy Nunez; Hoth, David
Cc: Christine Hartmann; Kara Giblin; McMahan, Joseph A CIV USARMY CESWG (USA); HEINLY, Robert W CIV USARMY CESWG (USA)
Subject: RE: SWG-2016-01027 Dow Chemical Company Virtual Agency Scoping Meeting - Maps File 1 of 2

Follow Up Flag: Follow up
Flag Status: Completed

Good afternoon, SWCA is supporting USACE in preparing the EIS for the above-referenced project. We have attached a zip file with maps and figures intended to facilitate project understanding for next Tuesday's meeting.

Because some of you may have limited capacity related to file sizes, we are sending the maps and figures in two 5 MB zip files so another email will be sent shortly.

Thank you. I look forward to speaking with you all next week.

Whitney Fiore
Dow Reservoir EIS Project Manager

Whitney Fiore
C 310.387.7755

-----Original Message-----
From: Hudson, Jayson M CIV USARMY CESWG (USA) <Jayson.M.Hudson@usace.army.mil>
Sent: Tuesday, May 5, 2020 11:14 AM
To: Ardizzone,Charles <chuck_ardizzone@fws.gov>; Houston.robert@epa.gov; Samson, Yvonne (Y) <ysamson@dow.com>; Roco, Coleen <Colleen.Roco@tpwd.texas.gov>; Allison Buchtien <Allison.Buchtien@GLO.TEXAS.GOV>; Kaspar, Paul <kaspar.paul@epa.gov>; Jenna.Lueg@tceq.texas.gov; 401CERTS <401CERTS@tceq.texas.gov>; Bill.Martin@thc.state.tx.us; Amy Nunez <Amy.Nunez@GLO.TEXAS.GOV>; Hoth, David <david_hoth@fws.gov>
Cc: Whitney Fiore <wfiore@swca.com>; Christine Hartmann <Christine.Hartmann@swca.com>; Kara Giblin <KGiblin@swca.com>; McMahan, Joseph A CIV USARMY CESWG (USA) <Joseph.A.Mcmahan@usace.army.mil>; HEINLY, Robert W CIV USARMY CESWG (USA) <Robert.W.Heinly@usace.army.mil>
Subject: RE: SWG-2016-01027 Dow Chemical Company Virtual Agency Scoping Meeting

EXTERNAL: This email originated from outside SWCA. Please use caution when replying.

Correction, Tuesday May 12th.

Jayson M Hudson
Regulatory Project Manager
409.766.3108

Please tell me how I am doing by completing the survey found at:
http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

-----Original Message-----
From: Hudson, Jayson M CIV USARMY CESWG (USA)
Sent: Tuesday, May 5, 2020 10:12 AM
To: Ardizzone,Charles <chuck_ardizzone@fws.gov>; Houston.robert@epa.gov; Samson, Yvonne (Y) <YSamson@dow.com>; Roco, Coleen <Colleen.Roco@tpwd.texas.gov>; Allison Buchtien <Allison.Buchtien@GLO.TEXAS.GOV>; Kaspar Paul <Kaspar.Paul@epa.gov>; Jenna.Lueg@tceq.texas.gov; 401CERTS <401CERTS@tceq.texas.gov>; Bill.Martin@thc.state.tx.us; Amy Nunez <Amy.Nunez@GLO.TEXAS.GOV>; Hoth, David <david_hoth@fws.gov>
Cc: Whitney Fiore <wfiore@swca.com>; Christine Hartmann <Christine.Hartmann@swca.com>; Kara Giblin <KGiblin@swca.com>; McMahan, Joseph A CIV USARMY CESWG (USA) <Joseph.A.Mcmahan@usace.army.mil>; HEINLY, Robert W CIV USARMY CESWG (USA) <Robert.W.Heinly@usace.army.mil>
Subject: RE: SWG-2016-01027 Dow Chemical Company Virtual Agency Scoping Meeting

Hello,

I just wanted to send a reminder that the Corps will be hosting the Agency Scoping Meeting for the Dow Harris Reservoir Expansion EIS on Monday May 12th. If you plan to attend but have not RSVP'd, please let me know.

Thank you,

Jayson M Hudson
Regulatory Project Manager
409.766.3108

Please tell me how I am doing by completing the survey found at:
http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

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From: Hudson, Jayson M CIV USARMY CESWG (USA)
Sent: Tuesday, April 28, 2020 3:39 PM
To: Ardizzone,Charles <chuck_ardizzone@fws.gov>; Houston.robert@epa.gov; Samson, Yvonne (Y) <YSamson@dow.com>; Roco, Coleen <Colleen.Roco@tpwd.texas.gov>; Allison Buchtien <Allison.Buchtien@GLO.TEXAS.GOV>; Kaspar Paul <Kaspar.Paul@epa.gov>; Jenna.Lueg@tceq.texas.gov; 401CERTS <401CERTS@tceq.texas.gov>; Bill.Martin@thc.state.tx.us; Amy Nunez <Amy.Nunez@GLO.TEXAS.GOV>
Cc: Whitney Fiore <wfiore@swca.com>; Christine Hartmann <Christine.Hartmann@swca.com>; Kara Giblin <KGiblin@swca.com>; McMahan, Joseph A CIV USARMY CESWG (USA) <Joseph.A.Mcmahan@usace.army.mil>; HEINLY, Robert W CIV USARMY CESWG (USA) <Robert.W.Heinly@usace.army.mil>; Hudson, Jayson M CIV USARMY CESWG (USA) <Jayson.M.Hudson@usace.army.mil>
Subject: SWG-2016-01027 Dow Chemical Company Virtual Agency Scoping Meeting

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Please respond to this email to confirm your agency's attendance.

Jayson M Hudson
Regulatory Project Manager
Policy Analysis Branch
Galveston District
409.766.3108

Please tell me how I am doing by completing the survey found at:
http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0



SWCA ENVIRONMENTAL CONSULTANTS

DOW CHEMICAL HARRIS RESEVOIR EXPANSION PROJECT

ARCHAEOLOGICAL HISTORIC PROPERTIES MAP
BRAZORIA COUNTY, TEXAS

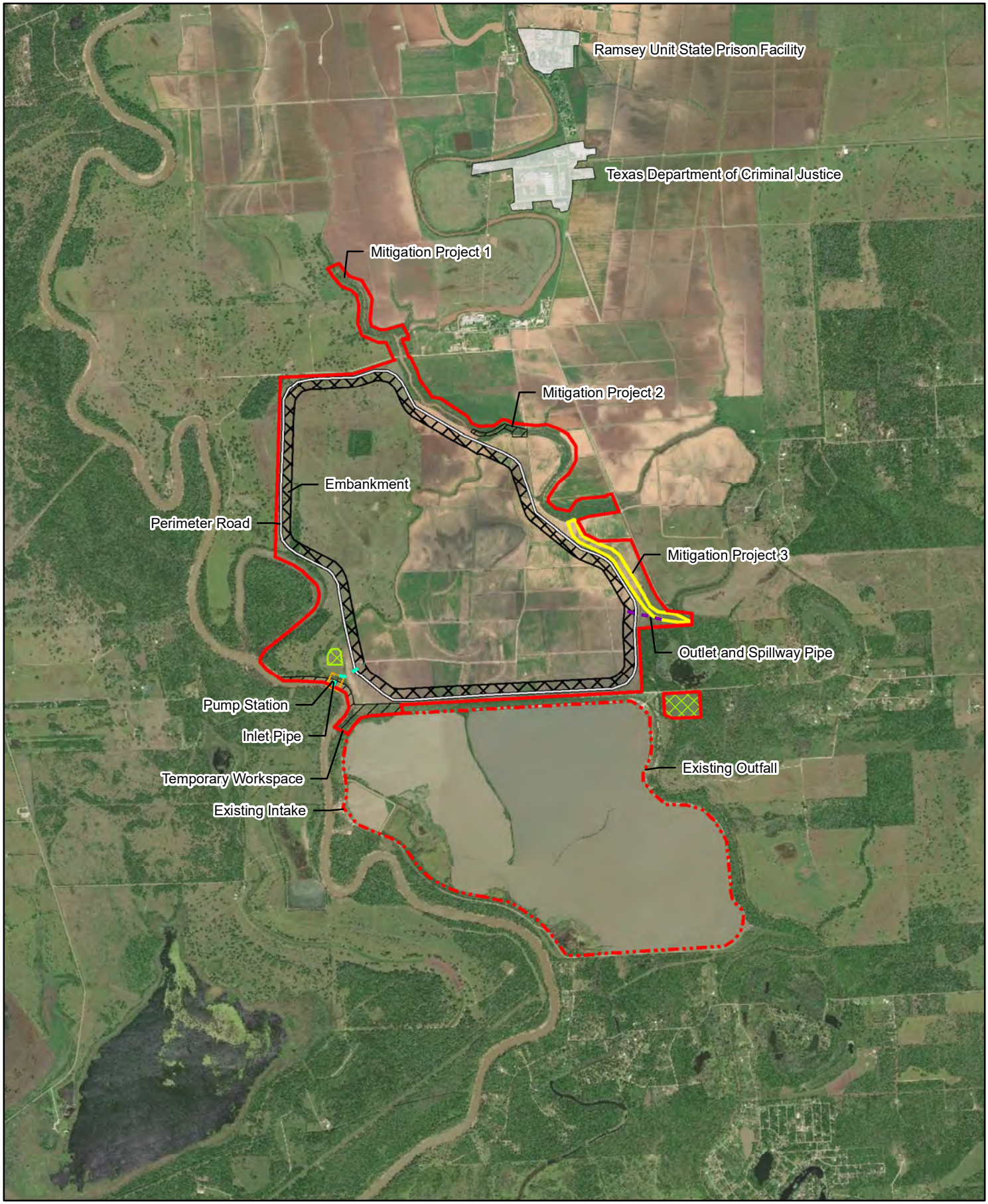
FIGURE X

Project Boundary
Cemetery
Archaeological Site

1:30,000

Created By: K. Shields
Project Number: 52872
Date: 1/6/2020
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 500 1,000 1,500 2,000 Feet
0 150 300 450 600 Meters



SWCA ENVIRONMENTAL CONSULTANTS

DOW CHEMICAL HARRIS RESEVOIR EXPANSION PROJECT

VISUAL ANALYSIS MAP
BRAZORIA COUNTY, TEXAS

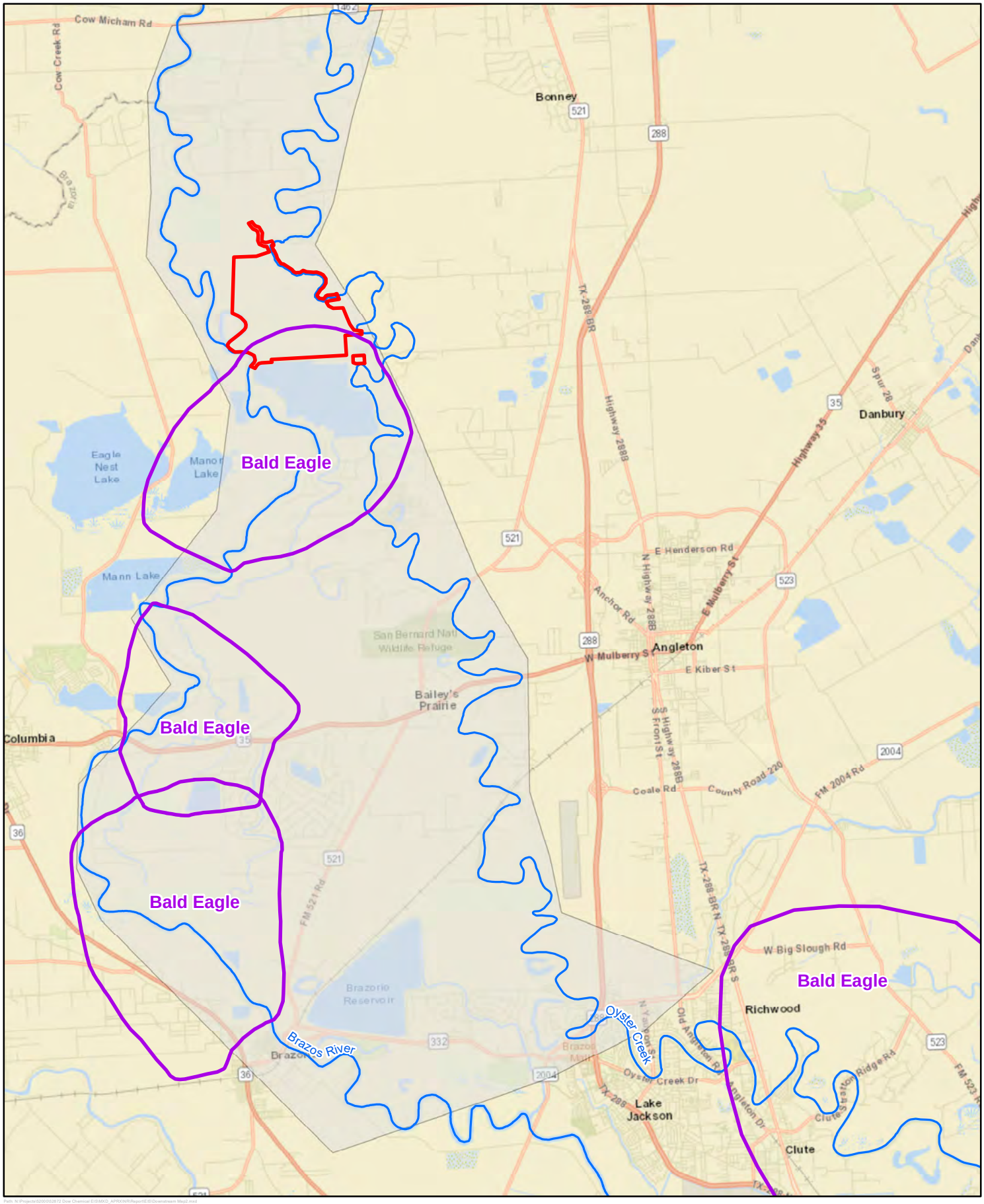
FIGURE 2

Project Site
Existing Harris Reservoir
Intake Pipe
Spillway Pipe
Embankment
Outfall
Perimeter Road
Pump Station
Staging Area
Temporary Workspace
Correctional Facility

1:50,000

Created By: CM
Project Number: 52872
Date: 2/6/2020
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 1,000 2,000 3,000 4,000 Feet
0 300 600 900 1,200 Meters



SWCA ENVIRONMENTAL CONSULTANTS

DOW CHEMICAL HARRIS RESEVOIR EXPANSION PROJECT

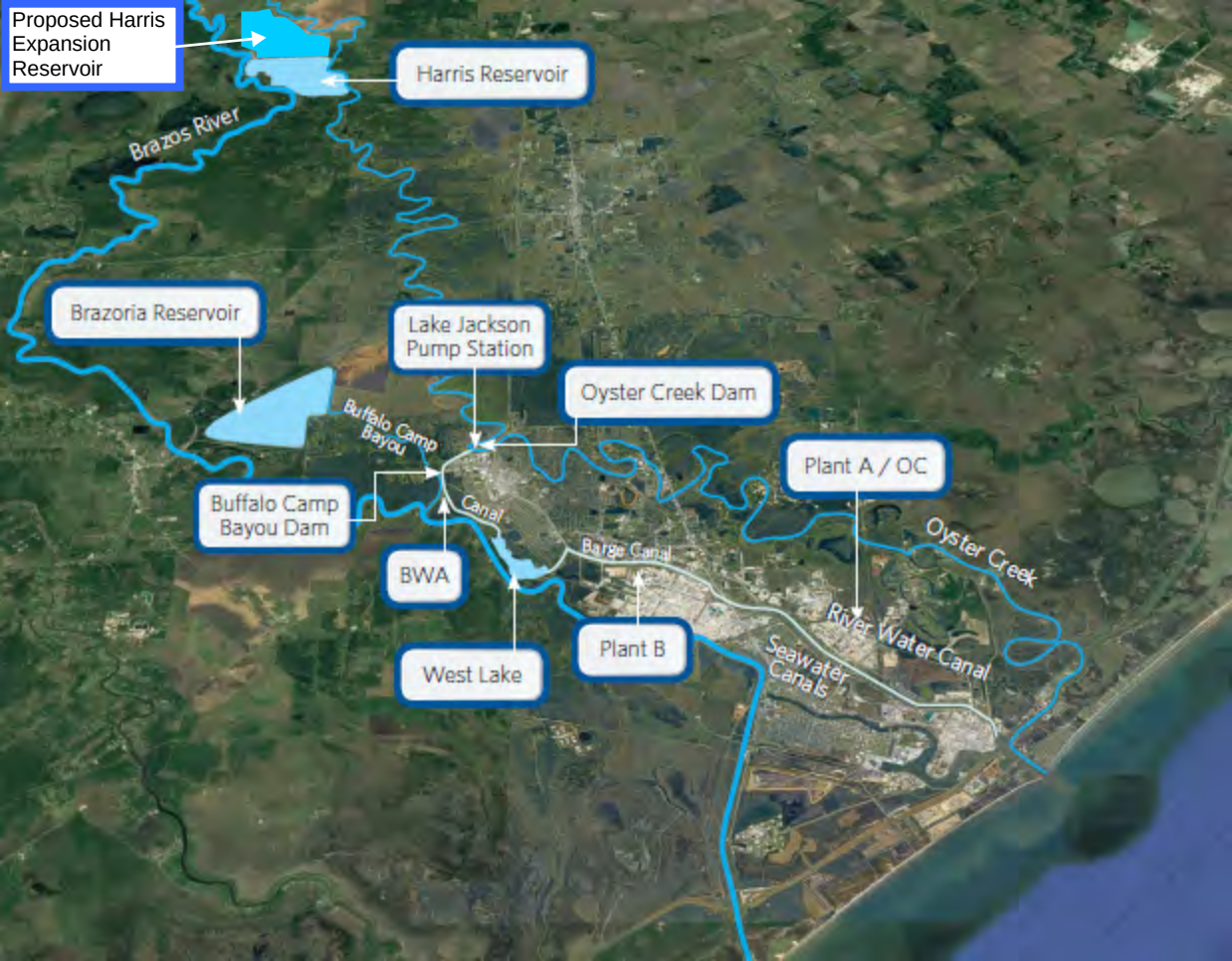
BALD EAGLE (STATE-LISTED SPECIES) MAP
BRAZORIA COUNTY, TEXAS

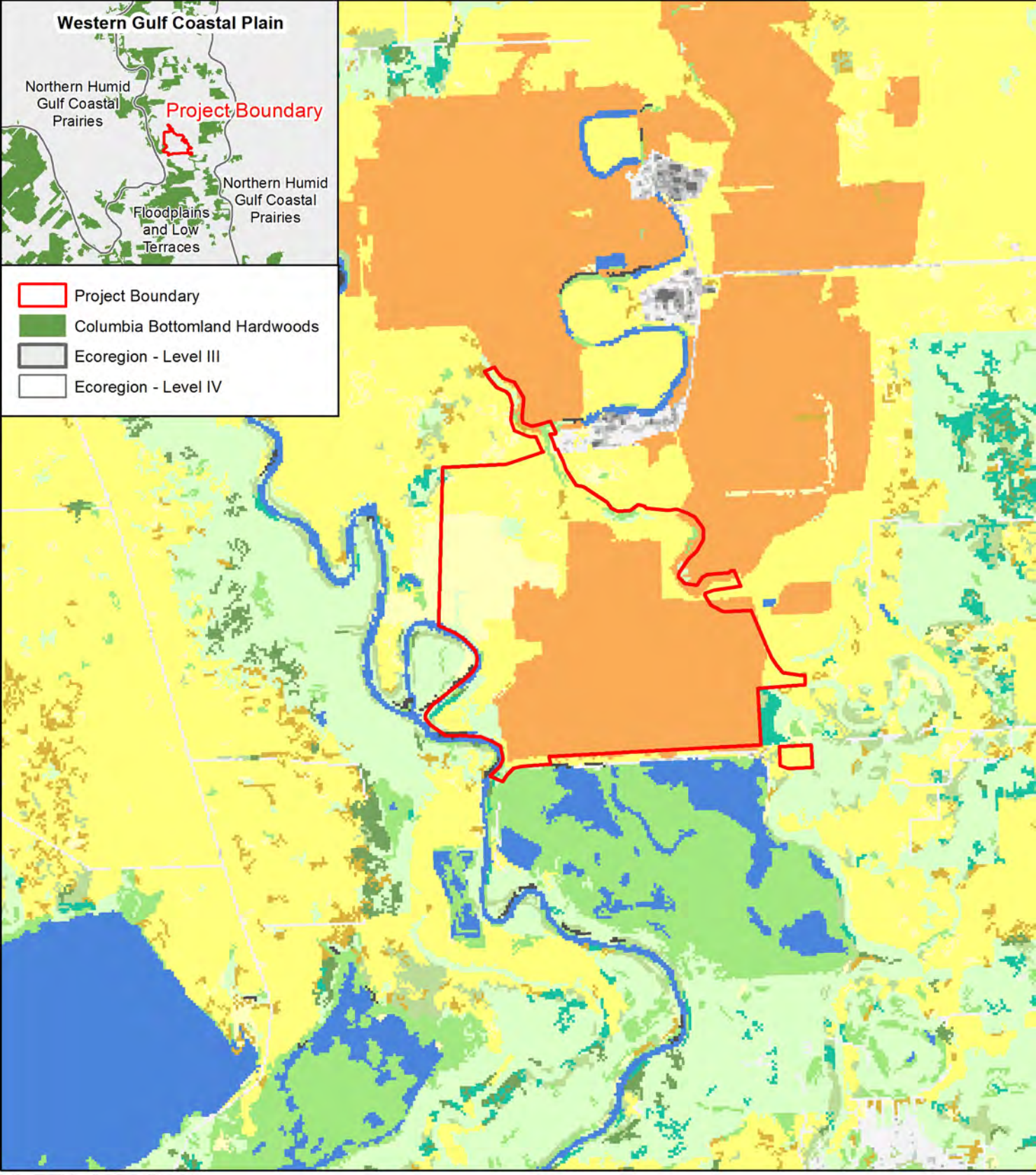
Project Site
Affected Environment Boundary
TXNDD
River

1:160,000

Created By: K. Shields
Project Number: 52872
Date: 5/4/2020
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 0.5 1 1.5 2 2.5 Miles
0 1 2 3 4 Kilometers


Proposed Harris Expansion Reservoir
Harris Reservoir
Brazos River
Brazoria Reservoir
Lake Jackson Pump Station
Oyster Creek Dam
Buffalo Camp Bayou
Buffalo Camp Bayou Dam
Canal
BWA
West Lake
Barge Canal
Plant B
Plant A / OC
Oyster Creek
River Water Canal
Seawater Canals



SWCA ENVIRONMENTAL CONSULTANTS

DOW CHEMICAL HARRIS RESEVOIR EXPANSION PROJECT

LAND COVER MAP
BRAZORIA COUNTY, TEXAS

FIGURE 3-1

Project Boundary

Land Cover

- Open Water
- Open Space Developed
- Low Intensity Developed
- Medium Intensity Developed
- High Intensity Developed
- Barren Land (Rock/Sand/Clay)
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland
- Pasture/Hay
- Cultivated Crops
- Woody Wetland
- Emergent Herbaceous Wetland

1:60,000

Created By: K. Shields
Project Number: 52872
Date: 12/13/2019
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

Kara Giblin

From: Whitney Fiore
Sent: Wednesday, May 6, 2020 3:08 PM
To: Hudson, Jayson M CIV USARMY CESWG (USA); Ardizzone,Charles; Houston.robert@epa.gov; Samson, Yvonne (Y); Roco, Coleen; Allison Buchtien; Kaspar, Paul; Jenna.Lueg@tceq.texas.gov; 401CERTS; Bill.Martin@thc.state.tx.us; Amy Nunez; Hoth, David
Cc: Christine Hartmann; Kara Giblin; McMahan, Joseph A CIV USARMY CESWG (USA); HEINLY, Robert W CIV USARMY CESWG (USA)
Subject: RE: SWG-2016-01027 Dow Chemical Company Virtual Agency Scoping Meeting - Maps File 2 of 2

Follow Up Flag: Follow up
Flag Status: Completed

All, Here is the second zip file containing maps and figures.

Whitney

Whitney Fiore
C 310.387.7755

-----Original Message-----
From: Whitney Fiore
Sent: Wednesday, May 6, 2020 3:06 PM
To: Hudson, Jayson M CIV USARMY CESWG (USA) <Jayson.M.Hudson@usace.army.mil>; Ardizzone,Charles <chuck_ardizzone@fws.gov>; Houston.robert@epa.gov; Samson, Yvonne (Y) <ysamson@dow.com>; Roco, Coleen <Colleen.Roco@tpwd.texas.gov>; Allison Buchtien <Allison.Buchtien@GLO.TEXAS.GOV>; Kaspar, Paul <kaspar.paul@epa.gov>; Jenna.Lueg@tceq.texas.gov; 401CERTS <401CERTS@tceq.texas.gov>; Bill.Martin@thc.state.tx.us; Amy Nunez <Amy.Nunez@GLO.TEXAS.GOV>; Hoth, David <david_hoth@fws.gov>
Cc: Christine Hartmann <Christine.Hartmann@swca.com>; Kara Giblin <KGiblin@swca.com>; McMahan, Joseph A CIV USARMY CESWG (USA) <Joseph.A.Mcmahan@usace.army.mil>; HEINLY, Robert W CIV USARMY CESWG (USA) <Robert.W.Heinly@usace.army.mil>
Subject: RE: SWG-2016-01027 Dow Chemical Company Virtual Agency Scoping Meeting - Maps File 1 of 2

Good afternoon, SWCA is supporting USACE in preparing the EIS for the above-referenced project. We have attached a zip file with maps and figures intended to facilitate project understanding for next Tuesday's meeting.

Because some of you may have limited capacity related to file sizes, we are sending the maps and figures in two 5 MB zip files so another email will be sent shortly.

Thank you. I look forward to speaking with you all next week.

Whitney Fiore
Dow Reservoir EIS Project Manager

Whitney Fiore
C 310.387.7755

-----Original Message-----
From: Hudson, Jayson M CIV USARMY CESWG (USA) <Jayson.M.Hudson@usace.army.mil>

Sent: Tuesday, May 5, 2020 11:14 AM
To: Ardizzone,Charles <chuck_ardizzone@fws.gov>; Houston.robert@epa.gov; Samson, Yvonne (Y) <ysamson@dow.com>; Roco, Coleen <Colleen.Roco@tpwd.texas.gov>; Allison Buchtien <Allison.Buchtien@GLO.TEXAS.GOV>; Kaspar, Paul <kaspar.paul@epa.gov>; Jenna.Lueg@tceq.texas.gov; 401CERTS <401CERTS@tceq.texas.gov>; Bill.Martin@thc.state.tx.us; Amy Nunez <Amy.Nunez@GLO.TEXAS.GOV>; Hoth, David <david_hoth@fws.gov>
Cc: Whitney Fiore <wfiore@swca.com>; Christine Hartmann <Christine.Hartmann@swca.com>; Kara Giblin <KGiblin@swca.com>; McMahan, Joseph A CIV USARMY CESWG (USA) <Joseph.A.Mcmahan@usace.army.mil>; HEINLY, Robert W CIV USARMY CESWG (USA) <Robert.W.Heinly@usace.army.mil>
Subject: RE: SWG-2016-01027 Dow Chemical Company Virtual Agency Scoping Meeting

EXTERNAL: This email originated from outside SWCA. Please use caution when replying.

Correction, Tuesday May 12th.

Jayson M Hudson
Regulatory Project Manager
409.766.3108

Please tell me how I am doing by completing the survey found at:
http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

-----Original Message-----
From: Hudson, Jayson M CIV USARMY CESWG (USA)
Sent: Tuesday, May 5, 2020 10:12 AM
To: Ardizzone,Charles <chuck_ardizzone@fws.gov>; Houston.robert@epa.gov; Samson, Yvonne (Y) <YSamson@dow.com>; Roco, Coleen <Colleen.Roco@tpwd.texas.gov>; Allison Buchtien <Allison.Buchtien@GLO.TEXAS.GOV>; Kaspar Paul <Kaspar.Paul@epa.gov>; Jenna.Lueg@tceq.texas.gov; 401CERTS <401CERTS@tceq.texas.gov>; Bill.Martin@thc.state.tx.us; Amy Nunez <Amy.Nunez@GLO.TEXAS.GOV>; Hoth, David <david_hoth@fws.gov>
Cc: Whitney Fiore <wfiore@swca.com>; Christine Hartmann <Christine.Hartmann@swca.com>; Kara Giblin <KGiblin@swca.com>; McMahan, Joseph A CIV USARMY CESWG (USA) <Joseph.A.Mcmahan@usace.army.mil>; HEINLY, Robert W CIV USARMY CESWG (USA) <Robert.W.Heinly@usace.army.mil>
Subject: RE: SWG-2016-01027 Dow Chemical Company Virtual Agency Scoping Meeting

Hello,

I just wanted to send a reminder that the Corps will be hosting the Agency Scoping Meeting for the Dow Harris Reservoir Expansion EIS on Monday May 12th. If you plan to attend but have not RSVP'd, please let me know.

Thank you,

Jayson M Hudson
Regulatory Project Manager
409.766.3108

Please tell me how I am doing by completing the survey found at:
http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

-----Original Message-----
From: Hudson, Jayson M CIV USARMY CESWG (USA)
Sent: Tuesday, April 28, 2020 3:39 PM
To: Ardizzone,Charles <chuck_ardizzone@fws.gov>; Houston.robert@epa.gov; Samson, Yvonne (Y) <YSamson@dow.com>; Roco, Coleen <Colleen.Roco@tpwd.texas.gov>; Allison Buchtien <Allison.Buchtien@GLO.TEXAS.GOV>; Kaspar Paul <Kaspar.Paul@epa.gov>; Jenna.Lueg@tceq.texas.gov; 401CERTS <401CERTS@tceq.texas.gov>; Bill.Martin@thc.state.tx.us; Amy Nunez <Amy.Nunez@GLO.TEXAS.GOV>
Cc: Whitney Fiore <wfiore@swca.com>; Christine Hartmann <Christine.Hartmann@swca.com>; Kara Giblin <KGiblin@swca.com>; McMahan, Joseph A CIV USARMY CESWG (USA) <Joseph.A.Mcmahan@usace.army.mil>; HEINLY, Robert W CIV USARMY CESWG (USA) <Robert.W.Heinly@usace.army.mil>; Hudson, Jayson M CIV USARMY CESWG (USA) <Jayson.M.Hudson@usace.army.mil>
Subject: SWG-2016-01027 Dow Chemical Company Virtual Agency Scoping Meeting

The U.S. Army Corps of Engineers will be hosting a Virtual Agency Scoping Meeting for the Dow Chemical Company's Harris Reservoir Expansion EIS on May 12th from 9-11:30am. The purpose of the public scoping process is to identify relevant issues that will influence the scope of the environmental analysis and EIS alternatives.

The meeting will be hosted online at:
https://usace.webex.com/meet/jayson.m.hudson

You may use the website audio or call in on a telephone at:
Phone: 877-336-1839
Access: 426 9357#
Code: 1027#

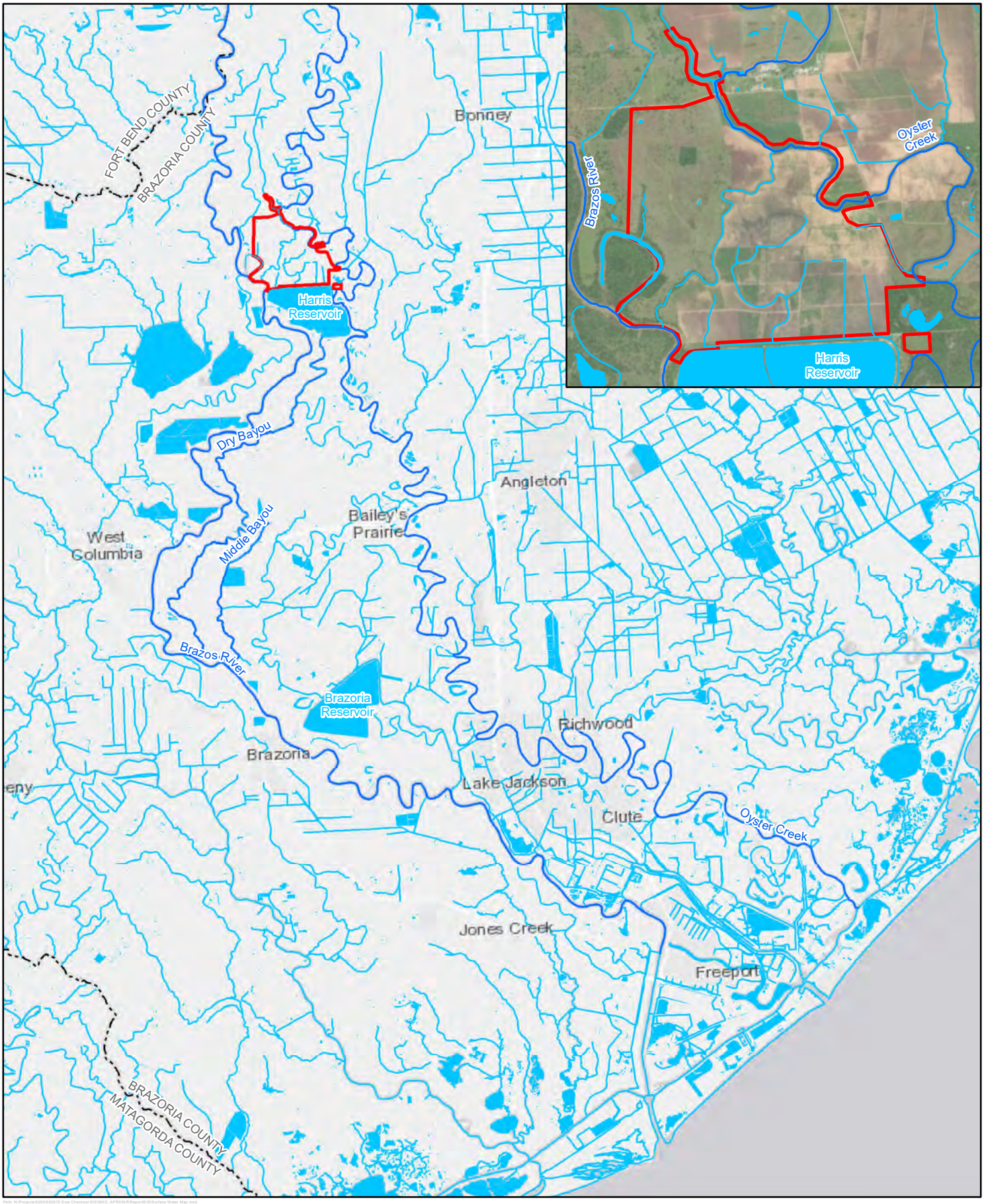
If you call in from a telephone, please make sure to include your participant ID provided by the website when logging in. The participant ID will assist in facilitating the meeting. The meeting will be recorded for transcription into the administrative record.

For additional information on the project, including the initial public notice and the significance determination, please visit: https://www.swg.usace.army.mil/Business-With-Us/Regulatory/Special-Projects-Environmental-Impact-Statements/

Please respond to this email to confirm your agency's attendance.

Jayson M Hudson
Regulatory Project Manager
Policy Analysis Branch
Galveston District
409.766.3108

Please tell me how I am doing by completing the survey found at:
http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0



SWCA ENVIRONMENTAL CONSULTANTS

DOW CHEMICAL HARRIS RESEVOIR EXPANSION PROJECT

SURFACE WATER MAP
BRAZORIA COUNTY, TEXAS

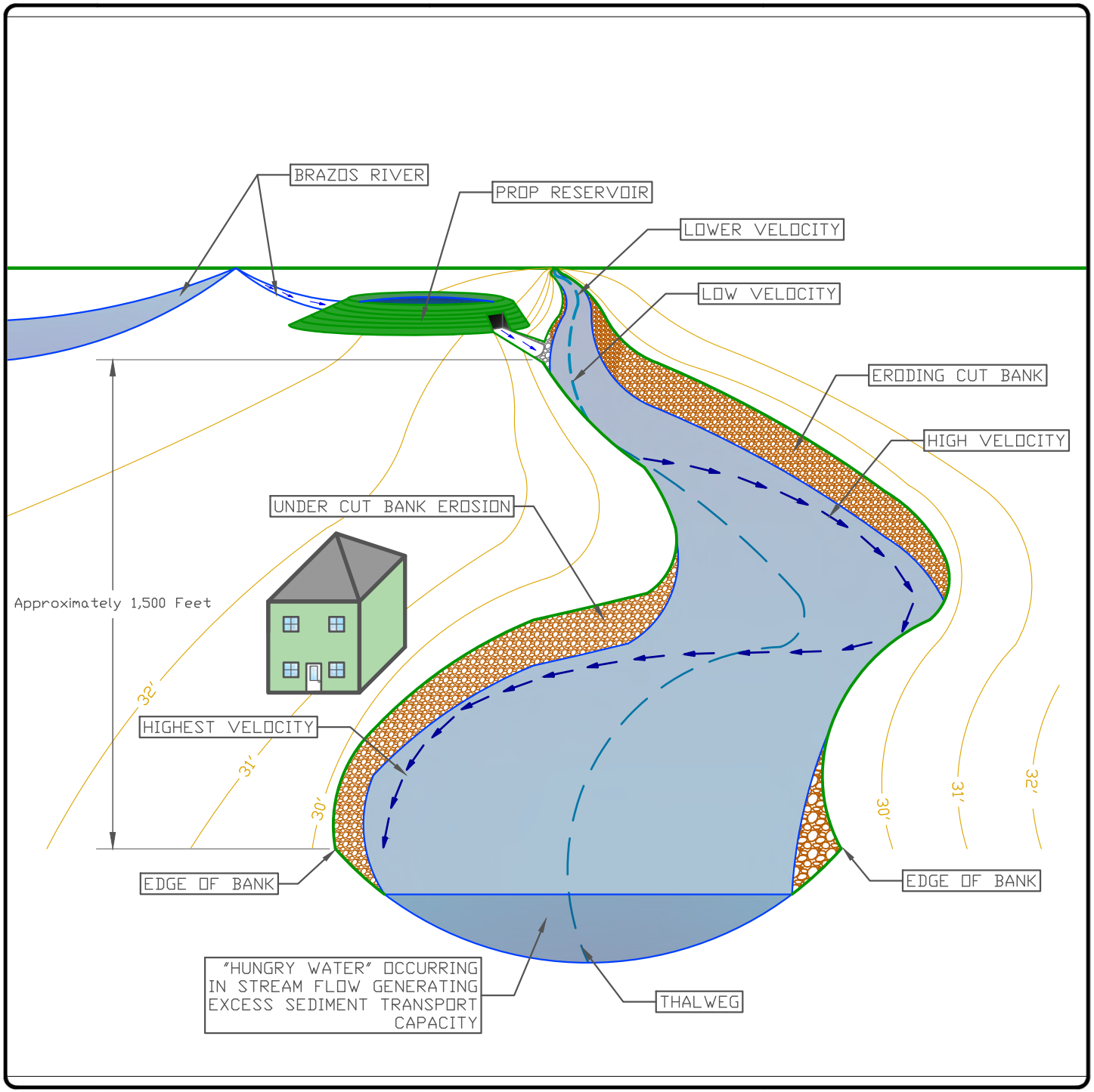
FIGURE X

Project Site
County Boundary
NHD
Waterbody

1:240,000

Created By: K. Shields
Project Number: 52672
Date: 2/4/2020
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 1 2 3 Miles
0 1 2 3 4 5 Kilometers



OYSTER CREEK HYDROMODIFICATION

FIGURE 2

HARRIS RESERVOIR EXPANSION EIS
EXISTING CONDITIONS BRAZOS RIVER

Drawn By:	CB
Approved By:	JL
Drawing Date:	APRIL 30, 2020

N

LEGEND

- RIVER
- EARTHEN LAND DETAIL
- STRUCTURE
- CONTOUR LINE
- HIGHEST ENERGY FLOW PATH



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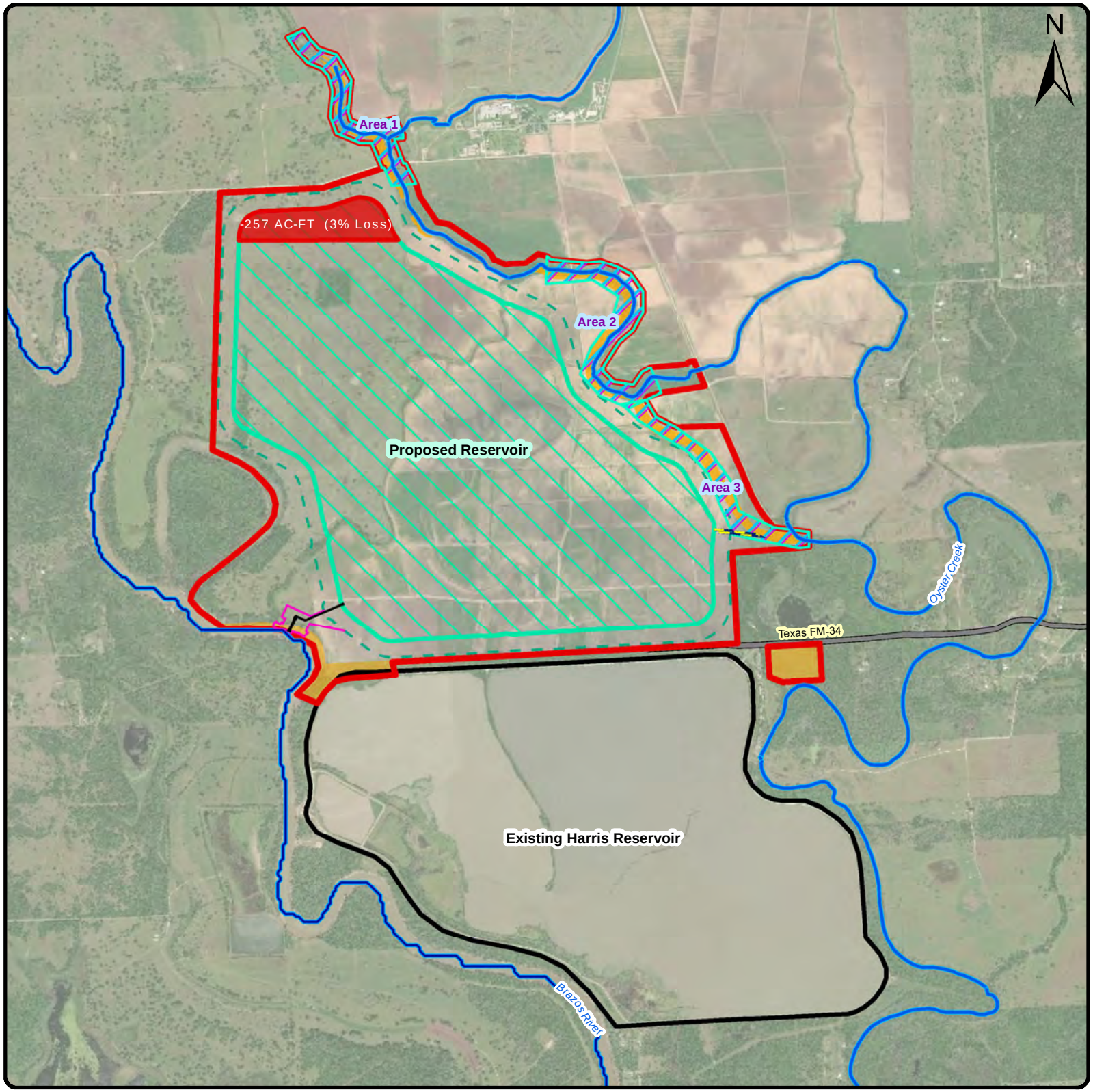
Water Resources • Environmental • Green Infrastructure



UNACCOUNTED FLOODPLAIN STORAGE LOSS

FIGURE 1

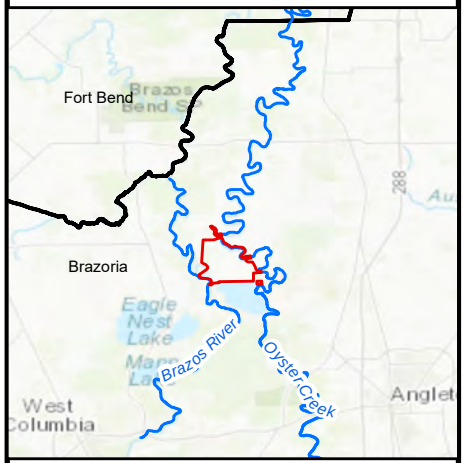
HARRIS RESERVOIR EXPANSION EIS
EXISTING CONDITIONS BRAZOS RIVER

Drawn By:	CB
Approved By:	JL
Drawing Date:	APRIL 30, 2020

1 inch = 3,000 feet

Legend

- Inlet Pipe
- Spillway
- Pump Station
- Oyster Creek
- Brazos River
- Mitigated Floodplain Storage Loss
- Proposed Reservoir Outer Embankment
- Unaccounted Floodplain Storage Loss
- Proposed Reservoir
- Project Boundary
- Proposed Grading Boundary
- Roads
- Existing Harris Reservoir



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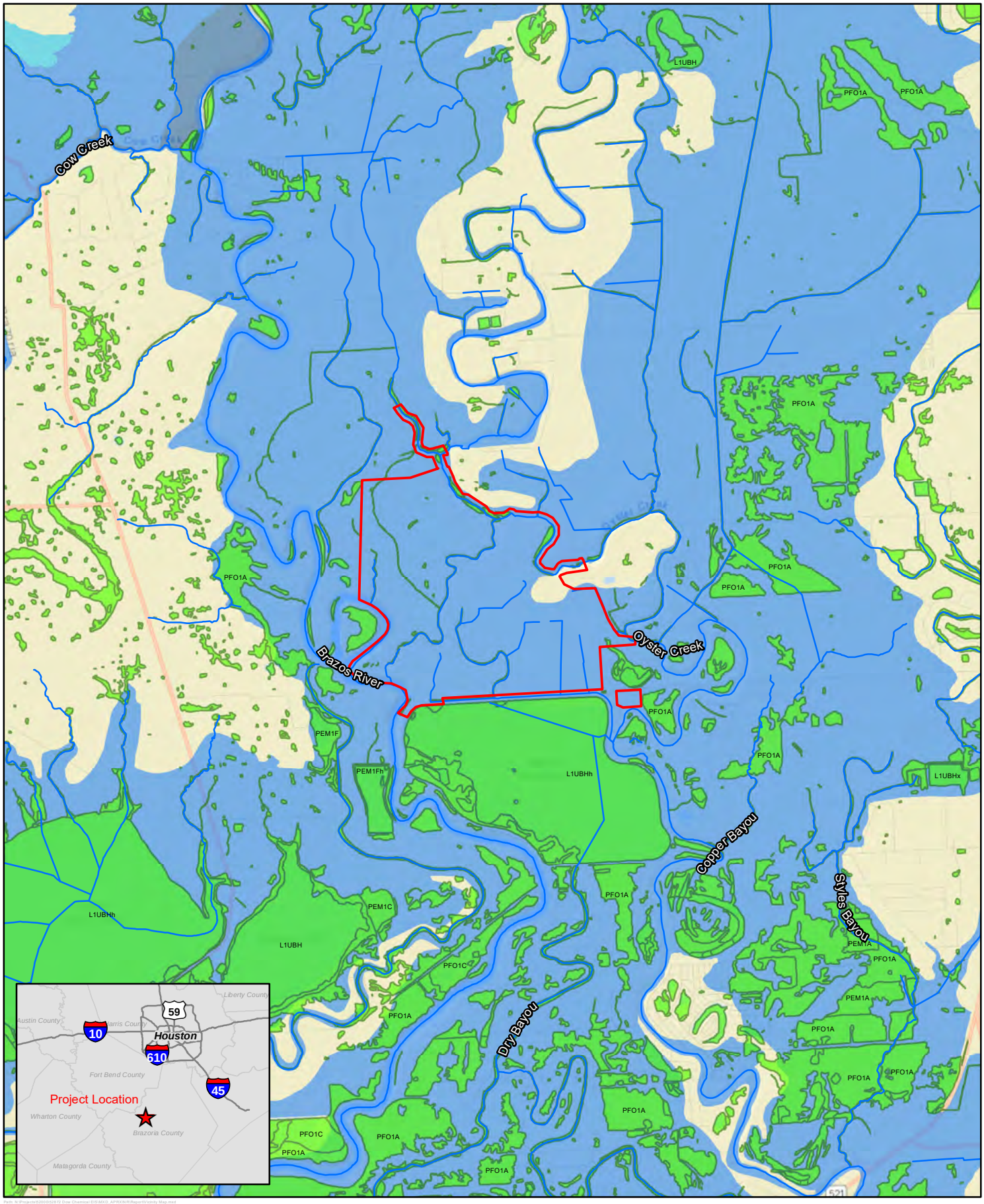


SWCA ENVIRONMENTAL CONSULTANTS

DOW CHEMICAL HARRIS RESEVOIR EXPANSION PROJECT

VICINITY MAP
BRAZORIA COUNTY, TEXAS

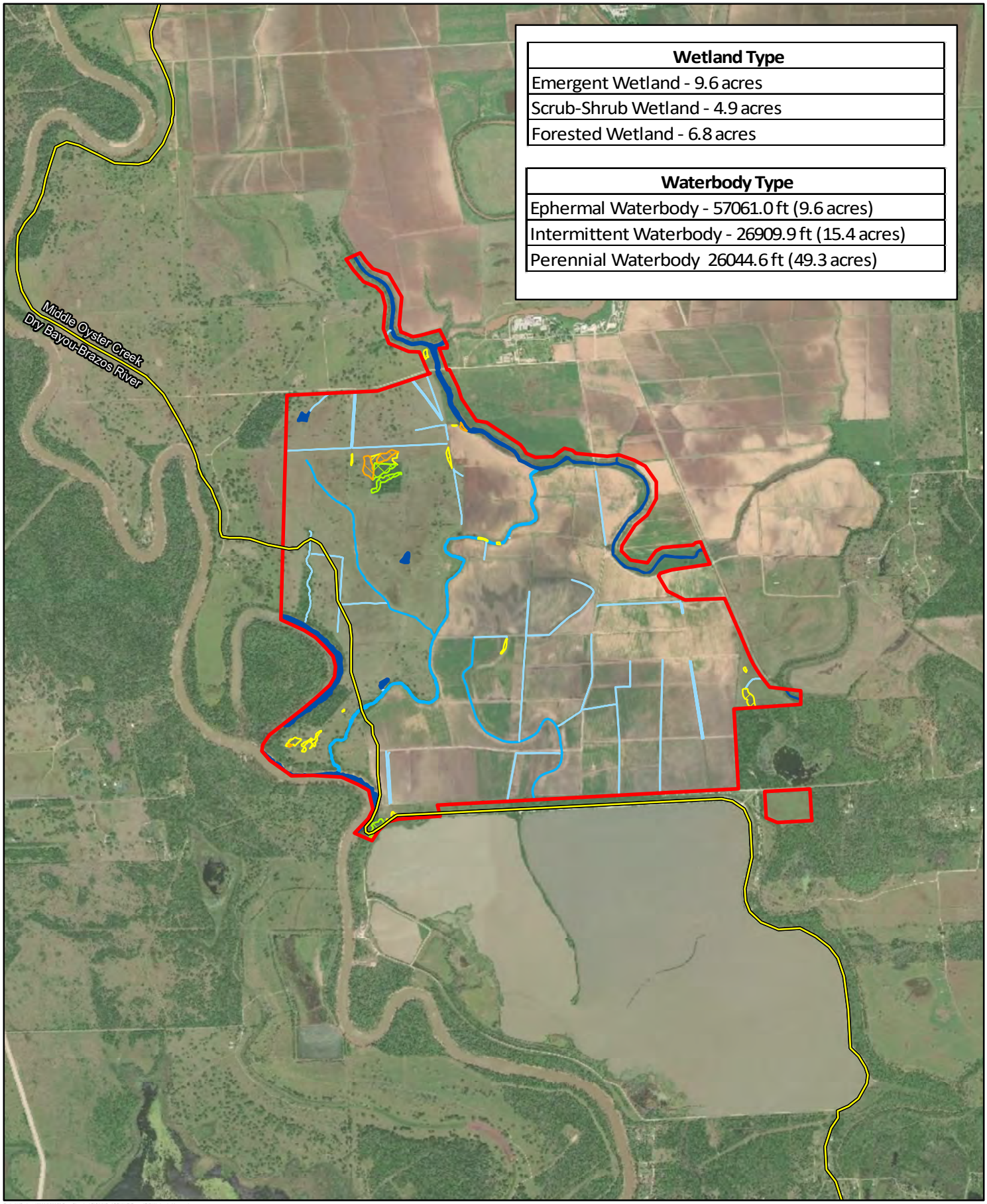
FIGURE 1

Project Boundary
Named NHD Stream
NWI Wetlands
100-Year Floodplain (Floodway)
100-Year Floodplain
500-Year Floodplain

1:75,000

Created By: CM
Project Number: 52872
Date: 7/30/2019
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 1,000 2,000 3,000 4,000 5,000 6,000 Feet
0 200 400 600 800 1,000 1,200 1,400 Meters



Wetland Type
Emergent Wetland - 9.6 acres
Scrub-Shrub Wetland - 4.9 acres
Forested Wetland - 6.8 acres

Waterbody Type
Ephermal Waterbody - 57061.0 ft (9.6 acres)
Intermittent Waterbody - 26909.9 ft (15.4 acres)
Perennial Waterbody 26044.6 ft (49.3 acres)

SWCA ENVIRONMENTAL CONSULTANTS

DOW CHEMICAL HARRIS RESEVOIR EXPANSION PROJECT

WETLANDS MAP
BRAZORIA COUNTY, TEXAS

Project Site
Ephemeral Waterbody
Intermittent Waterbody
Perennial Waterbody
Emergent Wetland
Scrub-Scrub Wetland
Forested Wetland
Watershed Boundary

1:40,000

Created By: K. Shields
Project Number: 52872
Date: 5/4/2020
NAD 1983 StatePlane Texas South Central FIPS 4204 Feet

0 1,000 2,000 3,000 Feet
0 300 600 900 Meters

Appendix C

Meeting Materials

Dow Chemical Company's Harris Reservoir Expansion Environmental Impact Statement (SWG-2016-01027)

Interagency Scoping Meeting

Agenda

1. Roll Call
2. Introduction by COL Vail.
3. Dow project presentation
4. Corps process presentation
5. Solicitation of comments from state and federal agencies.

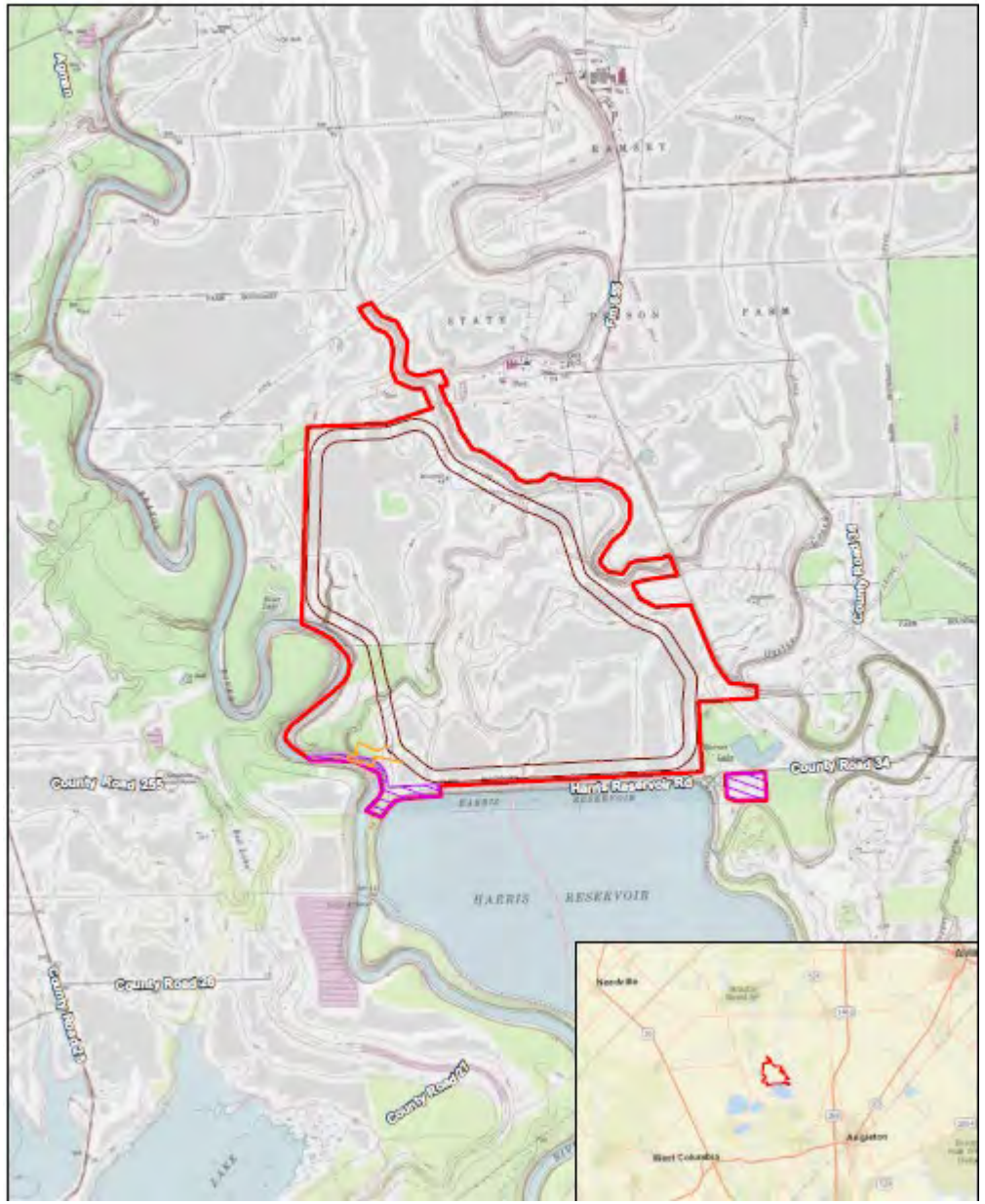
Harris Reservoir Expansion Project



Date: 30-Apr-20
Greg Bond

High Level Scope

- The project is to construct a new off channel reservoir and pump station
- The facility will be located at Angleton, TX directly north of the existing Harris Reservoir
- The new reservoir will expand storage capacity by approximately 50,000 acre-ft and will add a new 150,000 GPM Pump Station which will improve reliability during drought.



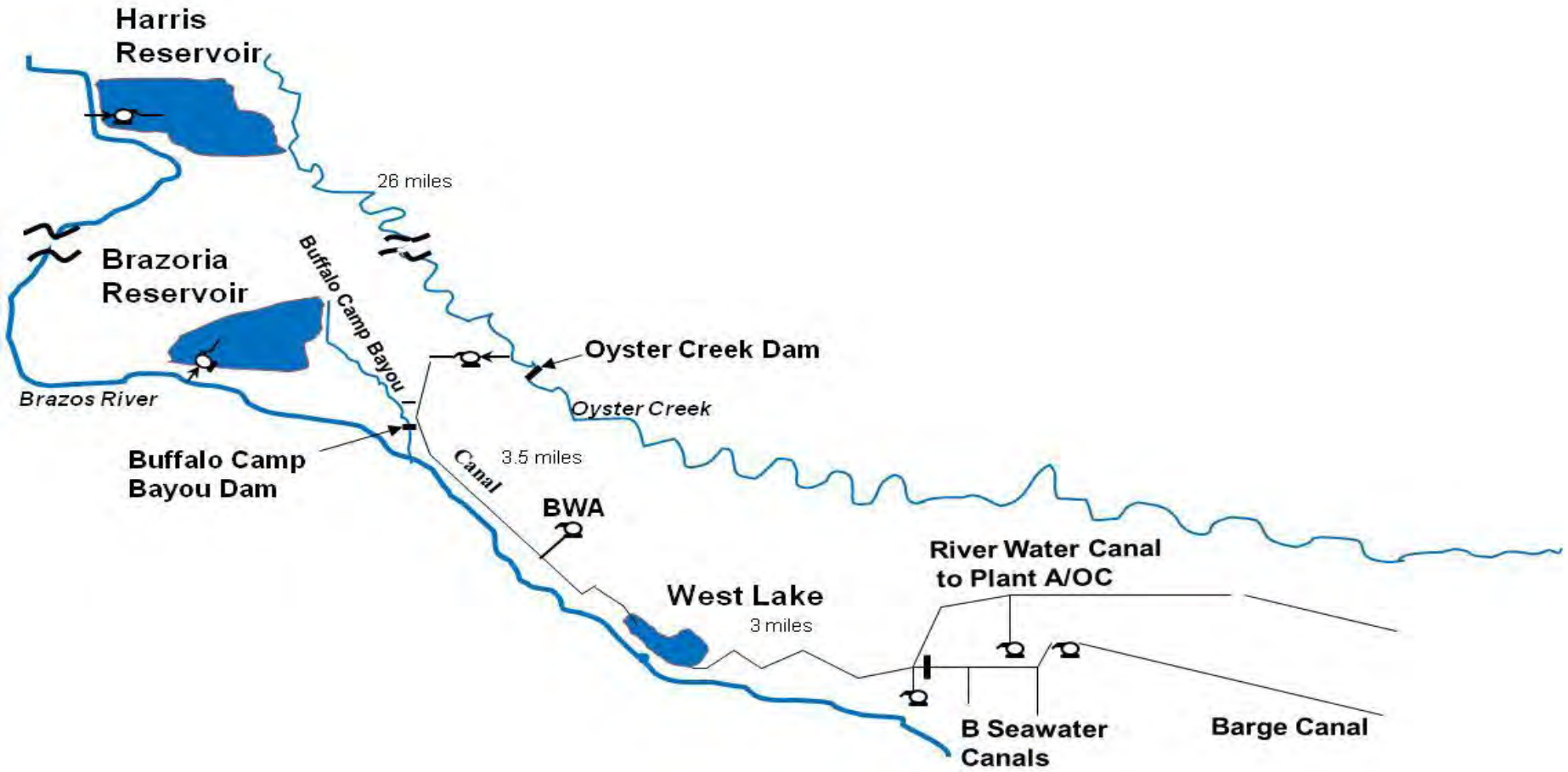
Overall Vicinity Map

Why?

- The additional pumping and storage capacity is required to provide adequate protection against seasonal drought events for Dow Texas Operations and other industrial and municipal users
- Extreme drought events, similar to those experienced in 2009 and 2011, resulting in low flows along the Brazos River have occurred at a frequency that can be expected to impact Dow's ability to supply regional fresh water demands 6-12% of the time without action.
- Project will allow region to meet TCEQ recommendations that 180 days of stored water is needed to provide adequate protection against these seasonal drought events. The current reservoir system including Brazoria and Harris reservoirs holds approximately 2 months of river water supply for Dow Texas Operations and regional partners. The proposed reservoir will add the recommended additional 4 months of river water supply.
- Dow has previously relied on the underutilized stored water resources of others, primarily contracted Brazos River Authority reserves, as a water supply supplement during these low flow events. Increasing basin wide demand and the increased awareness of drought susceptibility, brought on by recent drought events, have reduced and could soon entirely eliminate the availability of these supplemental supplies.
- Current water rights will not change with installation of new reservoir.

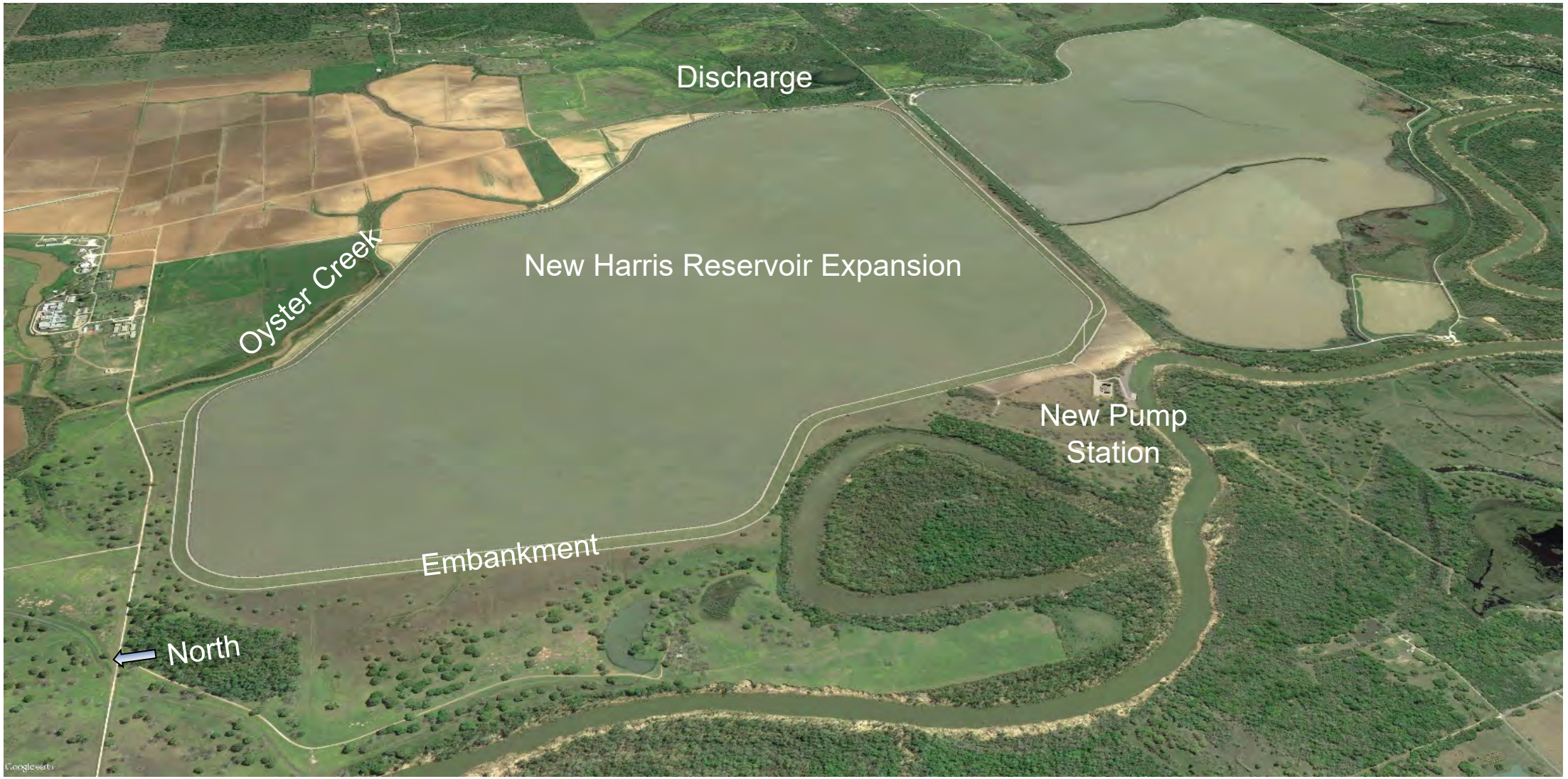
Technology Being Used

- Technology
  - Harris Reservoir Expansion will be installed directly north of existing Harris Reservoir
    - Water will siphon into Oyster Creek and follow the same path as the water from the existing Harris Reservoir



Reproduced with permission from Dow.

Technology Being Used

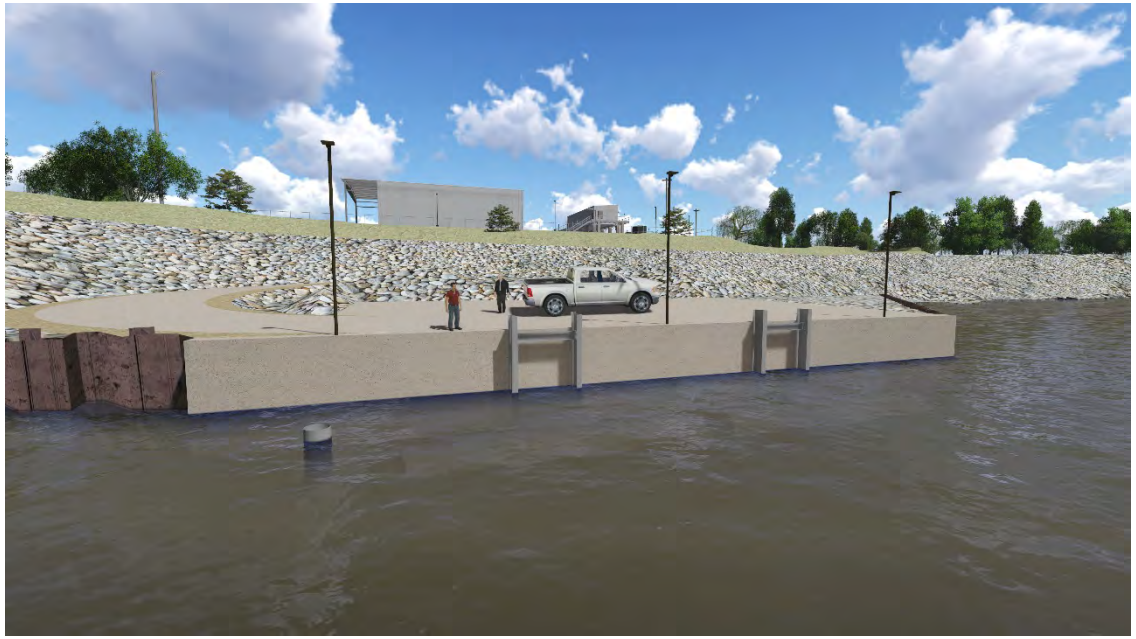


Overall Plot Plan

Technology Being Used – Brazos River Intake



- Technology
  - Intake screen with mechanical cleaning
    - Compliant with requirements



Side View of Brazos River Intake



Aerial view of Brazos River Intake

Technology Being Used – Pump Station

- Technology
  - Pump station is based on Brazoria Reservoir pump station
    - Horizontal pumps with assorted foundations, pump house, piping, MCC building, etc.
    - Operations building





Aerial View of Operations Building (L), Pump Station (C), and MCC Building (R)

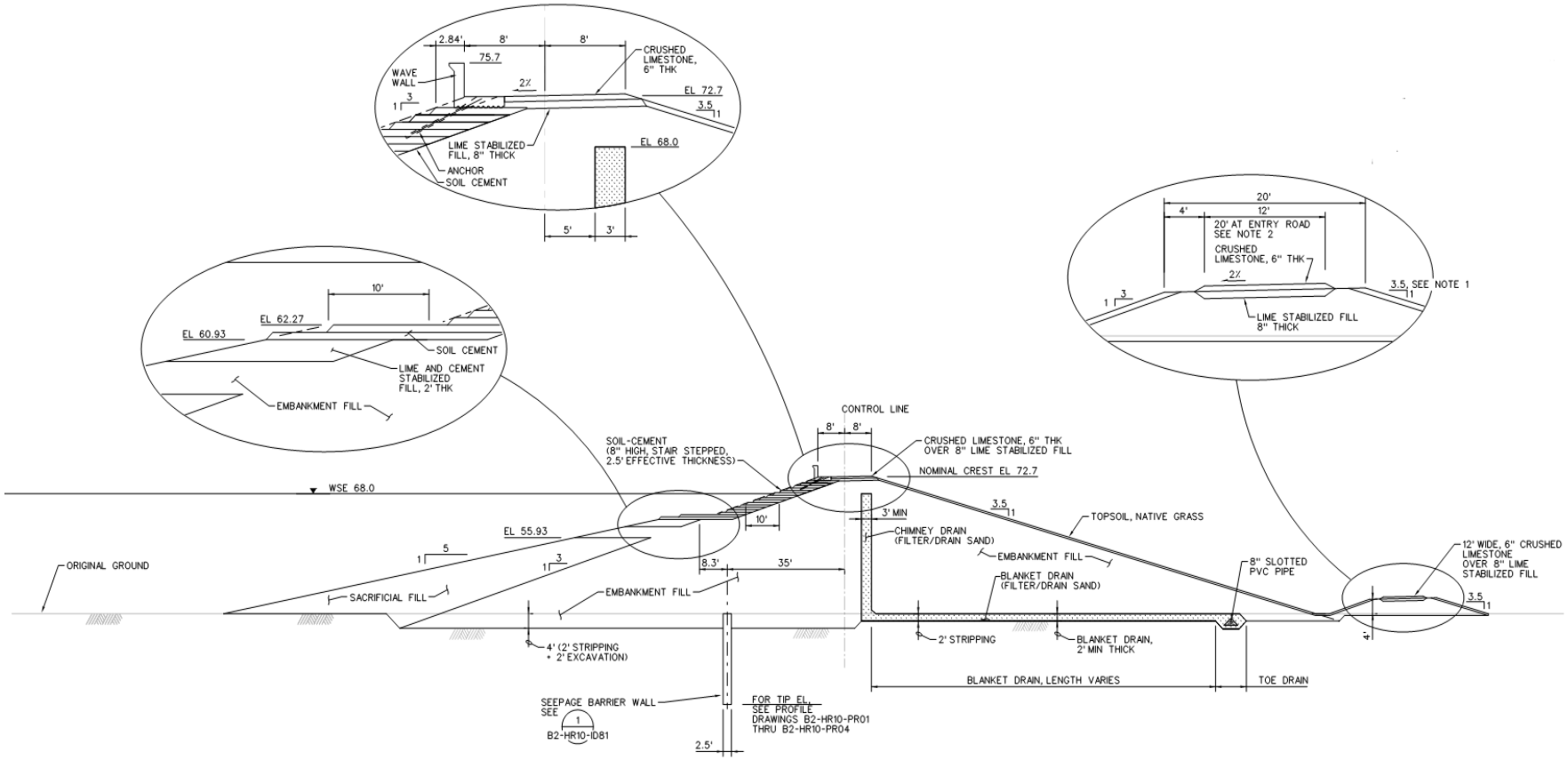


Internal View of Pump House

Technology Being Used - Embankment



- Technology (cont.)
  - Design of actual levee around reservoir
    - Review of design with TCEQ Dam Safety Board, other reservoirs, and outside technical review board.

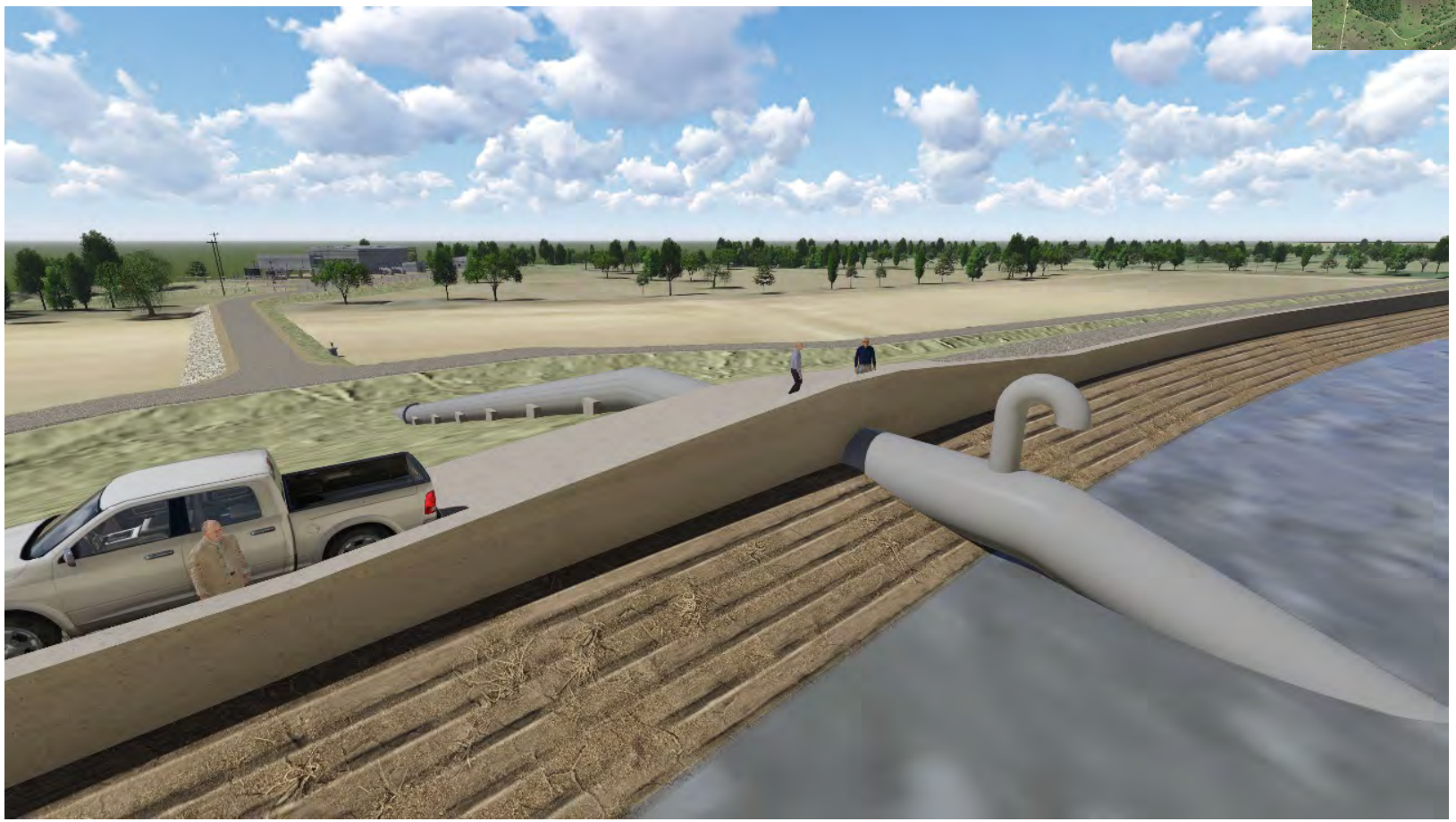


A TYPICAL EMBANKMENT SECTION
1"=15'

Technology – Reservoir Inlet Pipe



- Technology
  - Inlet piping with stilling basin in reservoir

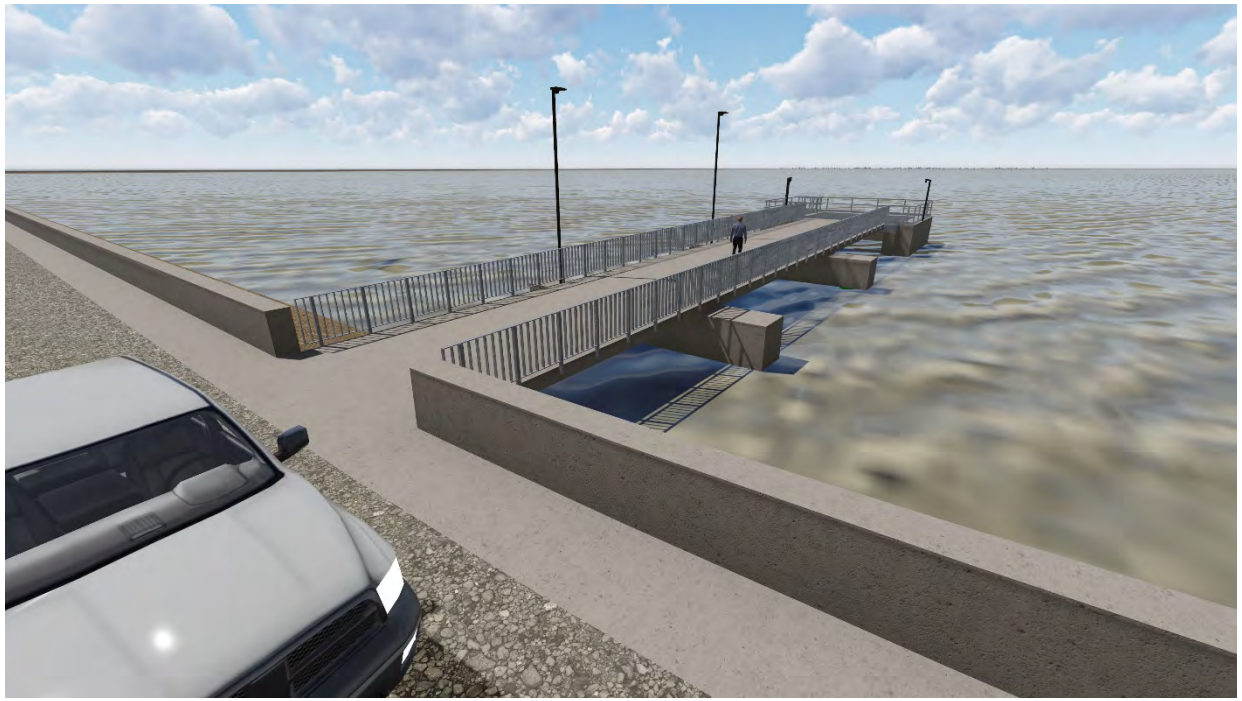


Reservoir inlet piping at crest of reservoir looking southwest with pump station area in background

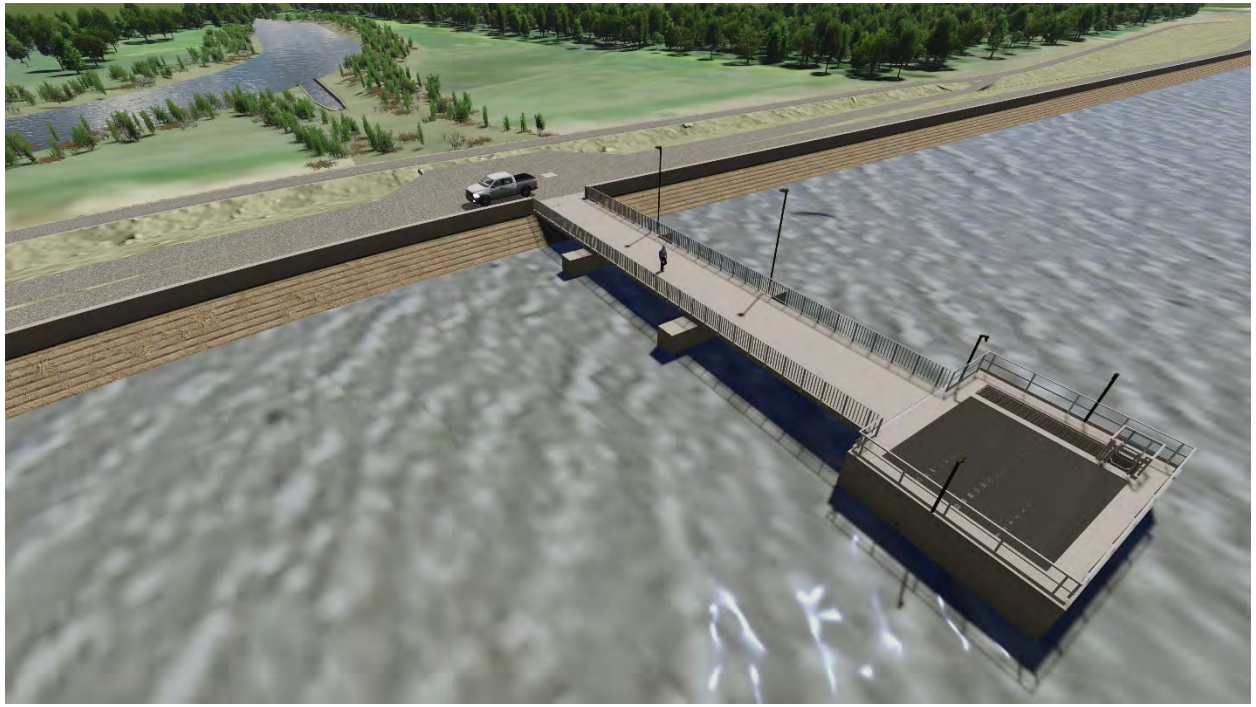
Technology Being Used – Discharge

- Technology
  - Combined emergency outlet/outlet structure





Combined Outlet Structure Looking Towards the Reservoir

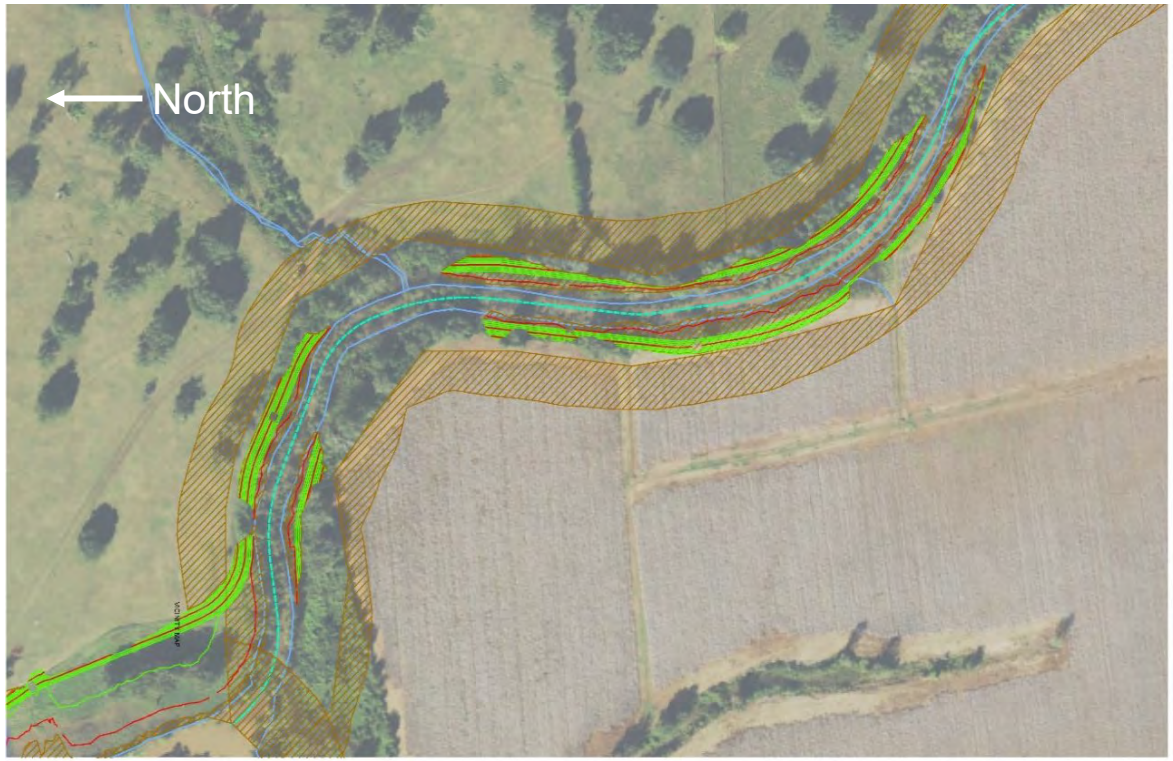


Combined Outlet Struture Looking Towards Oyster Creek

Technology Being Used – Flood Plain Mitigation

- Technology
  - Flood plain mitigation project #1
    - Aligns flow of channel with flood plain mitigation requirements
    - Flood mitigation and stream enhancement design to follow industry best practices
      - Approximately 2,400 feet of floodplain conveyance and storage improvements
      - Incorporation of a flood plain bench on both channel banks
      - Layback of channel banks
      - Preservation of existing riparian buffer



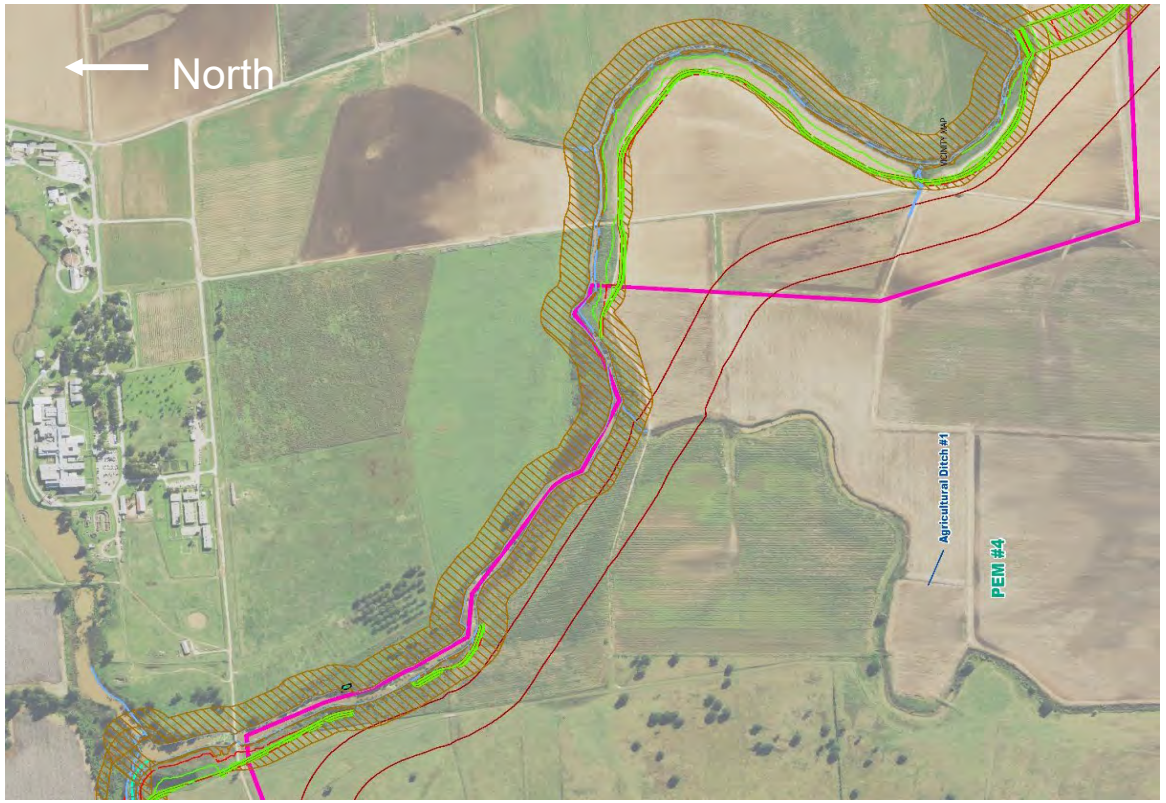


Flood Plain Mitigation Project #1

Technology Being Used – Flood Plain Mitigation

- Technology
  - Flood plain mitigation project #2
    - Aligns flow of channel with flood plain mitigation requirements
    - Flood mitigation and stream enhancement design to follow industry best practices
      - Approximately 7,800 feet of floodplain conveyance and storage improvements
      - Incorporation of a flood plain bench on west channel bank
      - Preservation of existing riparian buffer
      - Buffer re-establishment



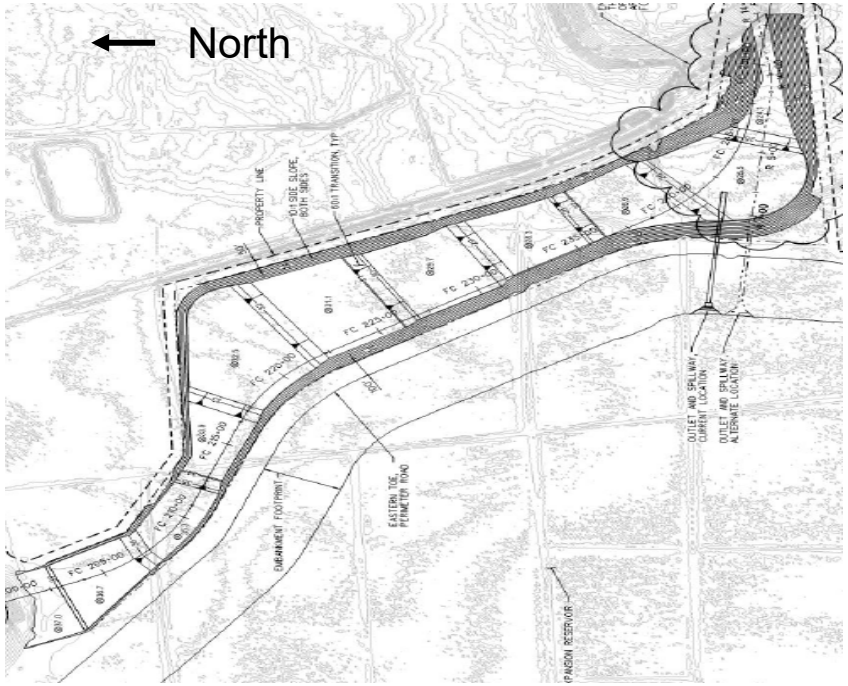


Flood Plain Mitigation Project #2

Technology Being Used – Flood Plain Mitigation

- Technology
  - Flood plain mitigation project #3
    - Aligns flow of channel with flood plain mitigation requirements
    - Flood mitigation and stream enhancement design to follow industry best practices
      - Re-establishes an ephemeral channel within the existing floodplain (i.e. channel creation)
      - Broad crested weir on south bank of Oyster Creek to maintain low flows in Oyster Creek
      - Conveys overflows from Oyster Creek during high flows (approximately 10-year or greater magnitude flood events
      - Will accommodate the reservoir outlet and spillway





Flood Plain Mitigation Project #3

Master Project Schedule (Milestones)

Key Milestone		Comments
FEL3 Project Kickoff	Nov. 2017	
Permit Submittal	Feb. 2018	
Detail Design Kickoff	Jan. 2021	Critical Path
Permit Approval	Apr. 2022	
Start Construction	Aug. 2022	Critical Path
Complete Detail Design	Mar. 2023	
Construction Complete	Aug. 2025	Critical Path
Release to Operations (RTO)	Sept. 2025	Critical Path
Reservoir Filling Complete	Jan. 2026	Critical Path

DOW CHEMICAL COMPANY'S HARRIS RESERVOIR EXPANSION ENVIRONMENTAL IMPACT STATEMENT (SWG-2016-01027)

INTERAGENCY SCOPING MEETING

May 12, 2020

Jayson Hudson – USACE Regulatory Project Manager

US Army Corps of Engineers®

U.S.ARMY

OBJECTIVES

- Overview of relevant laws, rules, regulations and executive orders
- Introduce project team
- Identify Purpose and Need and Potential Alternatives
- Review the EIS content and known environmental concerns

US Army Corps of Engineers

U.S.ARMY

APPLICABLE LAWS, RULES, REGULATIONS, AND EXECUTIVE ORDERS

US Army Corps Of Engineers

- Section 10 of the Rivers and Harbors Act of 1899
- Section 404 of the Clean Water Act
- Executive Order 13807 Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure

Cooperating/Participating

- Section 401 of the Clean Water Act
- The Coastal Zone Management Act
- Endangered Species Act
- National Historic Preservation Act

US Army Corps of Engineers

U.S.ARMY

E.O. 13807

E.O. 13807 - requires Federal agencies to process environmental reviews and authorization decisions for "major infrastructure projects" as One Federal Decision (OFD). That means that all Federal agencies with environmental review, authorization, or consultation responsibilities for major infrastructure projects to develop a single Environmental Impact Statement (EIS) for such projects, sign a single Record of Decision (ROD) and issue all necessary authorizations within 90 days of the ROD.

US Army Corps of Engineers

U.S.ARMY

DESCRIPTION OF PERMIT TIMELINE

- Initial Application Received:
  - February 21, 2018
- Initial Public Notice
  - March 29, 2018
- Significance Determination (EIS)
  - October 1, 2018
- Purpose and Need Concurrence
  - February 6, 2020
- Notice of Intent
  - April 7, 2020
- Agency Scoping Meeting
  - May 12, 2020
- Notice of Availability of Draft EIS
  - June 30, 2021
- Public Hearing & Comment Period
  - July 2021
- Notice of Availability of the Final EIS
  - February 7, 2022
- Notice of Record of Decision
  - April 7, 2022

US Army Corps of Engineers

U.S.ARMY

EIS TEAM AND ROLES

Lead Federal Agency for NEPA
U.S. Army Corps of Engineers, Galveston District

Cooperating Agencies
Environmental Protection Agency
US Fish and Wildlife Service

Participating Agencies
Texas Commission On Environmental Quality
Texas Parks and Wildlife Department
Texas Historical Commission

Applicant
Dow Chemical Company

Environmental Impact Statement Contractor
SWCA Environmental Consultants

US Army Corps of Engineers

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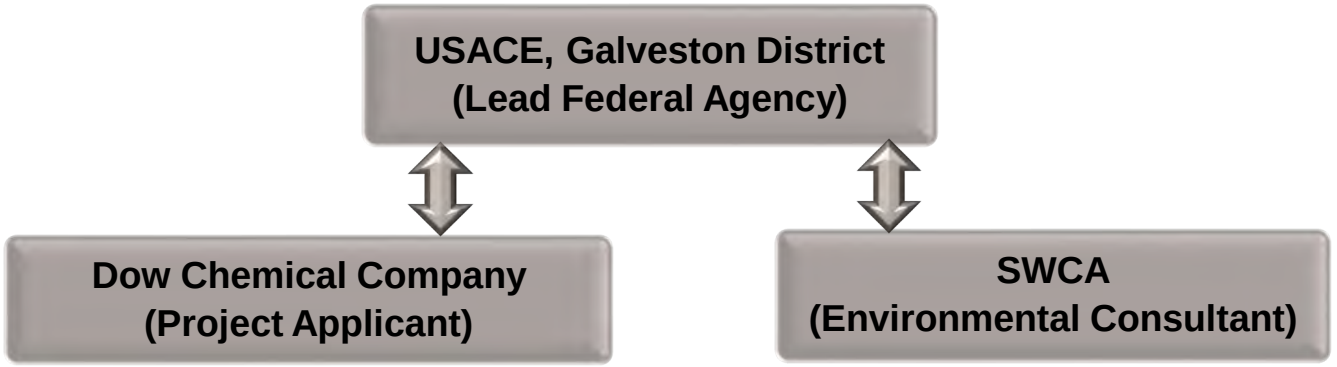
NEPA THIRD-PARTY CONTRACTING

- Lead Federal agency, project applicant, and environmental consultant enter into an agreement for preparation of NEPA compliance documentation (EIS)
- Project applicant pays environmental consultant for services related to preparation of documentation
- Environmental consultant prepares documentation under direction of the US Army Corps of Engineers
- Lead Federal agency is responsible for:
  - Guiding and participating in NEPA process and EIS preparation
  - Independent evaluation of the EIS prior to approval
  - Takes responsibility for the scope and contents of the EIS



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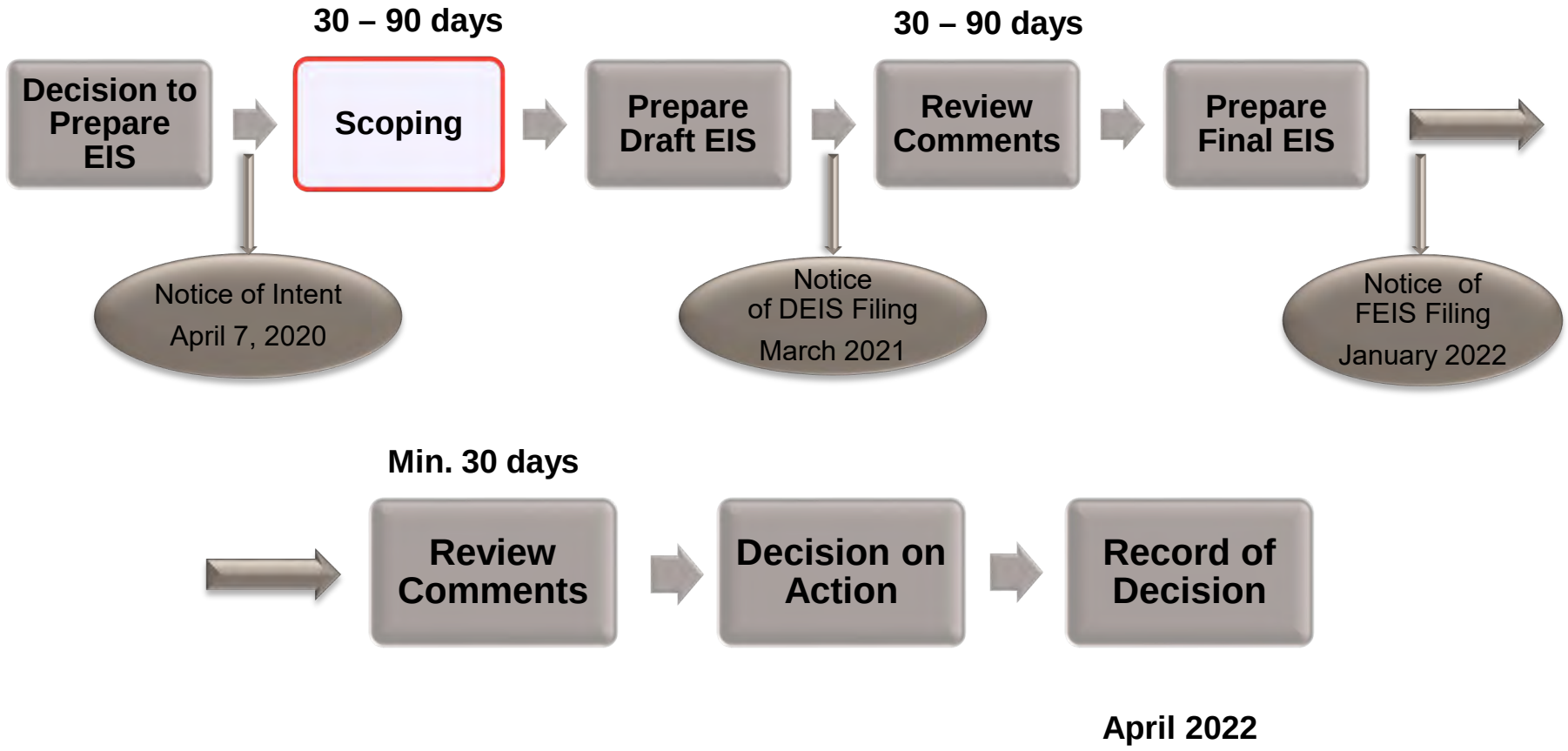
ENVIRONMENTAL IMPACT STATEMENT PROCESS



April 2022

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SCOPING PROCESS

The overall goal is to define the scope of issues to be addressed in depth in the analyses that will be included in the EIS. Specifically, the scoping process will:

- Identify people or organizations who are interested in the proposed action;
- Identify the significant issues to be analyzed in the EIS;
- Identify and eliminate from detailed review those issues that will not be significant or those that have been adequately covered in prior environmental review;
- Determine the roles and responsibilities of lead and cooperating agencies;
- Identify any related Environmental Assessments or EISs;
- Identify gaps in data and informational needs;
- Set time limits for the process and page limits for the EIS;
- Identify other environmental review and consultation requirements so they can be integrated with the EIS;
- Indicate the relationship between the development of the environmental analysis and the agency's tentative decision making schedule.

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EIS CONTENT

- Introduction, Purpose and Need
- Description and Evaluation of Alternatives
- Affected Environment/ Environmental Consequences
  - General Setting, Physiography, and Topography
  - Geology
  - Physical Oceanography
  - Coastal Processes
  - Water and Sediment Quality
  - Freshwater Inflow
  - Hydrology
  - Soils
  - Energy and Mineral Resources/ Hazardous, Toxic, and Radioactive Waste
  - Air Quality
  - Noise
  - Wetlands & Sea grasses
  - Aquatic Resources
  - Wildlife Resources
  - Threatened and Endangered Species
  - Cultural Resources
  - Socioeconomic Resources
  - Navigation

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SUPPORTING STUDIES

- EIS Appendices
  - Clean Water Act 404(b)(1) Evaluation
  - Endangered Species Biological Assessment
  - Texas Coastal Zone Consistency Determination
  - Hydrology & Hydraulic Studies
  - Planning-level floodplain storage analysis
  - Compensatory mitigation plan
  - Biological Assessment
  - Phase 2 Archaeological Study
- Geomorphic Assessment of Oyster Creek

PURPOSE AND NEED STATEMENT

Basic project purpose, as determined by the Corps: To improve the reliability of the water supply system that serves Dow's Texas Operations in Freeport during extended drought conditions.

Determination: The proposed project does not require access or proximity to, or siting within, a special aquatic site in order to fulfill its basic purpose. Alternatives that do not involve impacts to special aquatic sites are presumed to be available.

Overall project purpose, as determined by the Corps: To utilize Dow's existing run-of-river water rights from the Brazos River to improve reliability during extended drought conditions for the existing water supply system that serves Dow's Texas Operations in Freeport. Based on modeling, Dow estimates that 78,000 acre-feet of water storage capacity is necessary to provide Texas Commission on Environmental Quality's recommended 180 days of drought resilience.

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ALTERNATIVES FROM EARLY SCOPING

- No Action
  - Permit Denial
- Applicant's Preferred Alternative
  - Harris Reservoir Expansion
- Reservoir Alternatives
  - Deepening/Expanding Existing Reservoirs
  - Desalination Plant
- Oyster Creek Alternatives
  - On-site design alternatives that reduce impact.

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ENVIRONMENTAL CONCERNS FROM EARLY SCOPING

- Wetlands And Stream Impacts
- Threatened And Endangered Species
- Wildlife And Aquatic Species Impacts
- Archaeological And Cultural Resources
- Water Quality
- Sediment and Erosion
- Recreation And Recreational Resources
- Hazardous Waste And Materials
- Socioeconomics
- Public Benefit And Needs Of The People
- Cumulative Impacts

HOW TO SUBMIT WRITTEN COMMENTS

Written comments regarding the proposed EIS scope should be addressed to:

Mr. Jayson Hudson
USACE, Galveston District
Regulatory Division
P.O. Box 1229
Galveston, Texas 77553-1229.

Or

SWG201601027@usace.army.mil
Emailed comments, including attachments, should be provided in .doc, .docx, .pdf or .txt formats.

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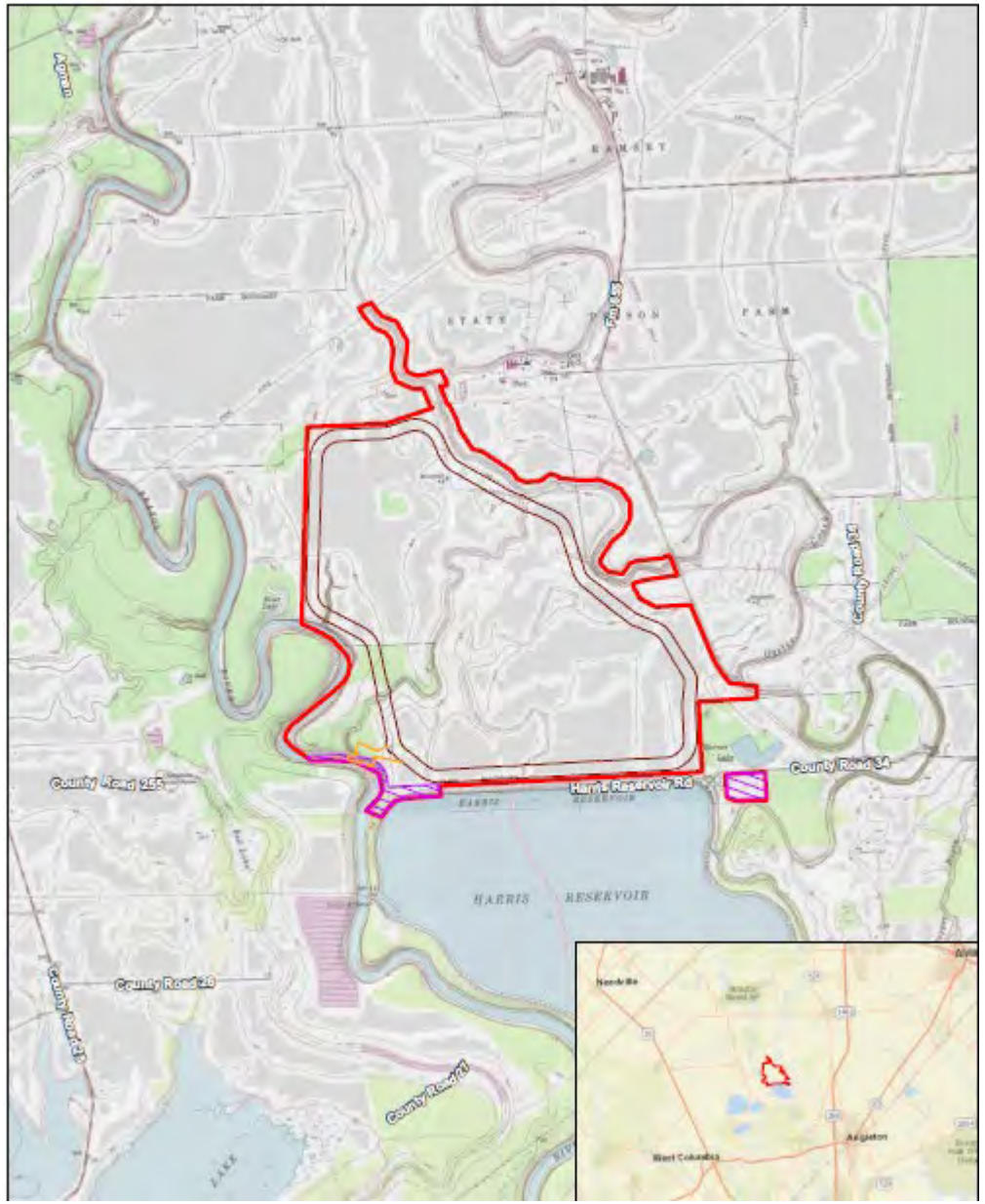
Harris Reservoir Expansion Project



Date: 30-Apr-20
Greg Bond

High Level Scope

- The project is to construct a new off channel reservoir and pump station
- The facility will be located at Angleton, TX directly north of the existing Harris Reservoir
- The new reservoir will expand storage capacity by approximately 50,000 acre-ft and will add a new 150,000 GPM Pump Station which will improve reliability during drought.



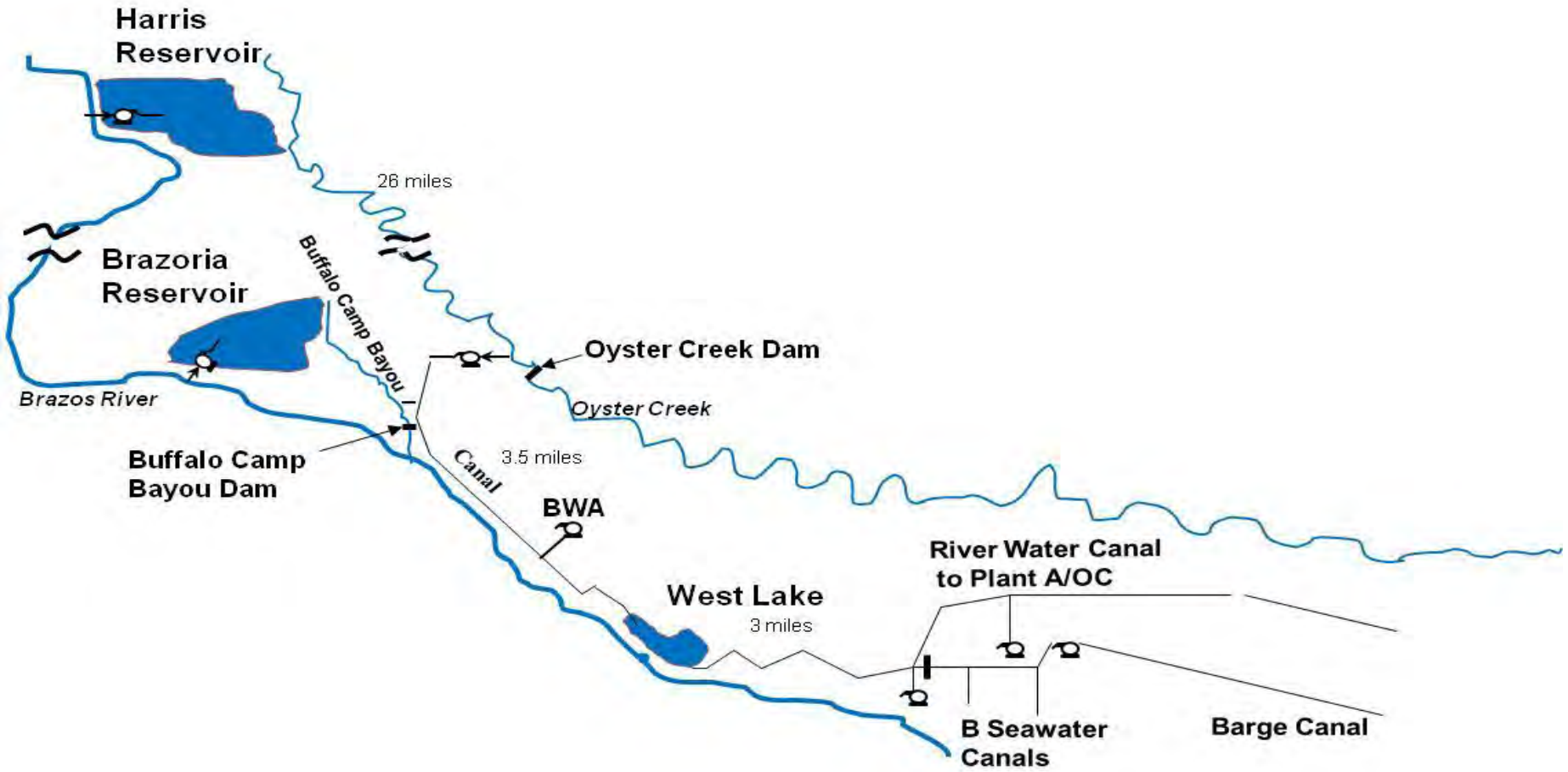
Overall Vicinity Map

Why?

- The additional pumping and storage capacity is required to provide adequate protection against seasonal drought events for Dow Texas Operations and other industrial and municipal users
- Extreme drought events, similar to those experienced in 2009 and 2011, resulting in low flows along the Brazos River have occurred at a frequency that can be expected to impact Dow's ability to supply regional fresh water demands 6-12% of the time without action.
- Project will allow region to meet TCEQ recommendations that 180 days of stored water is needed to provide adequate protection against these seasonal drought events. The current reservoir system including Brazoria and Harris reservoirs holds approximately 2 months of river water supply for Dow Texas Operations and regional partners. The proposed reservoir will add the recommended additional 4 months of river water supply.
- Dow has previously relied on the underutilized stored water resources of others, primarily contracted Brazos River Authority reserves, as a water supply supplement during these low flow events. Increasing basin wide demand and the increased awareness of drought susceptibility, brought on by recent drought events, have reduced and could soon entirely eliminate the availability of these supplemental supplies.
- Current water rights will not change with installation of new reservoir.

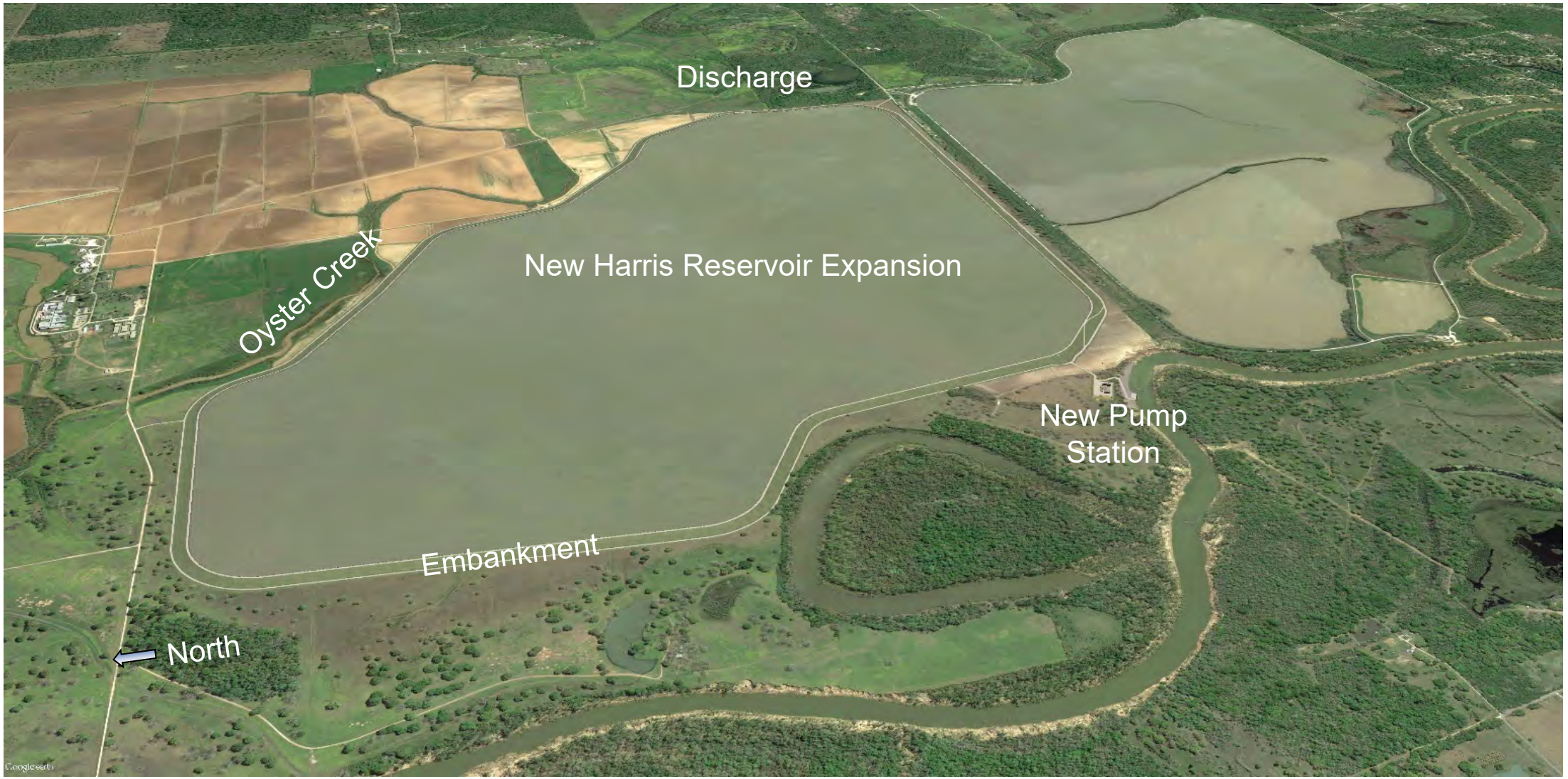
Technology Being Used

- Technology
  - Harris Reservoir Expansion will be installed directly north of existing Harris Reservoir
    - Water will siphon into Oyster Creek and follow the same path as the water from the existing Harris Reservoir



Reproduced with permission from Dow.

Technology Being Used

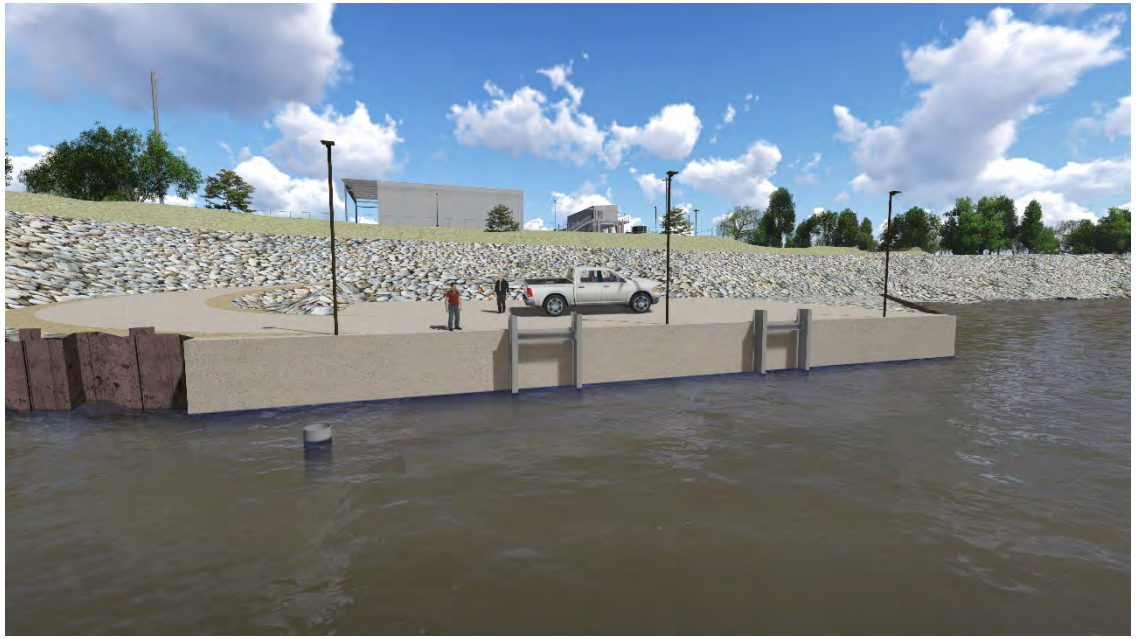


Overall Plot Plan

Technology Being Used – Brazos River Intake



- Technology
  - Intake screen with mechanical cleaning
    - Compliant with requirements



Side View of Brazos River Intake



Aerial view of Brazos River Intake

Technology Being Used – Pump Station

- Technology
  - Pump station is based on Brazoria Reservoir pump station
    - Horizontal pumps with assorted foundations, pump house, piping, MCC building, etc.
    - Operations building





Aerial View of Operations Building (L), Pump Station (C), and MCC Building (R)

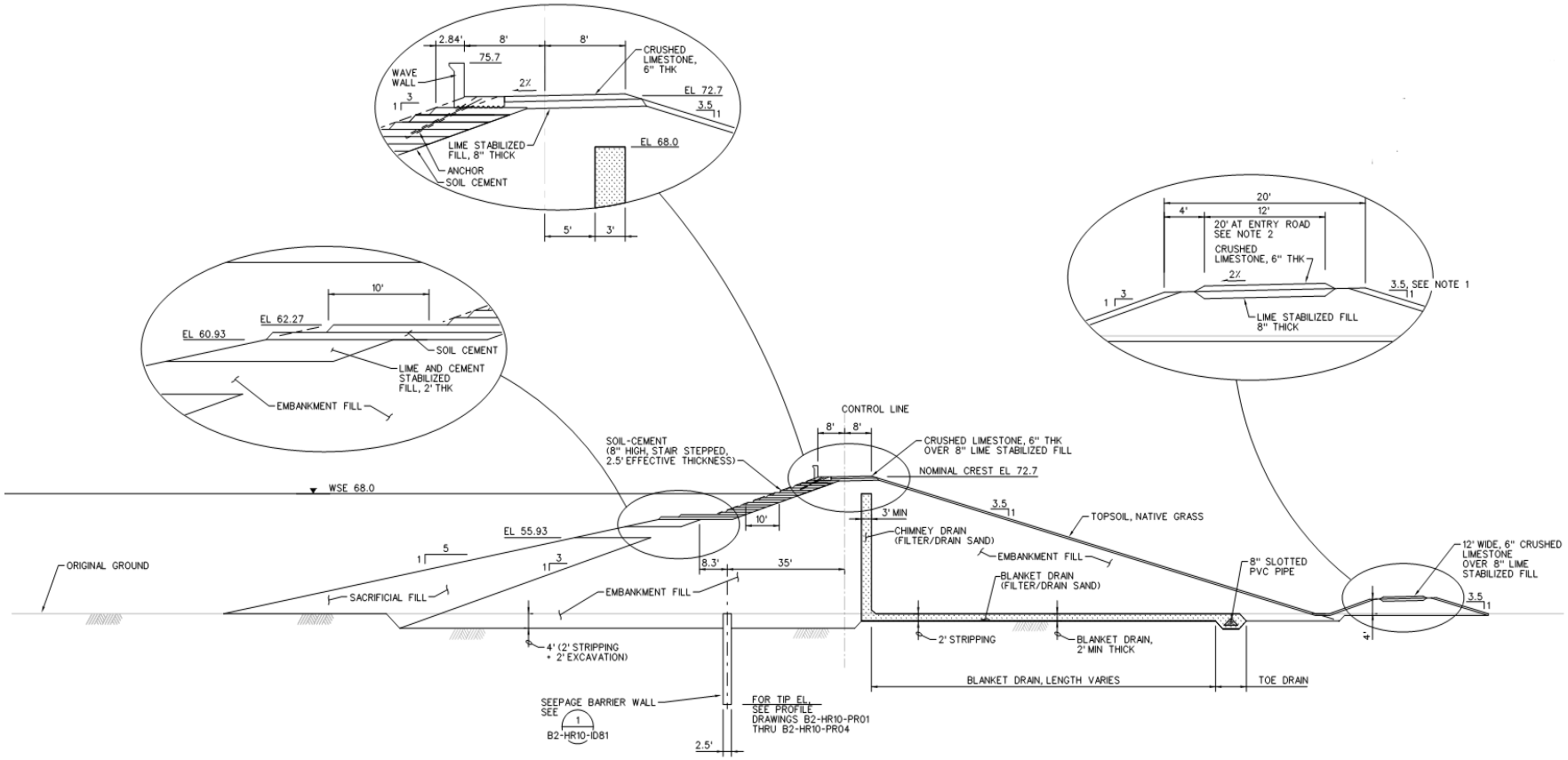


Internal View of Pump House

Technology Being Used - Embankment



- Technology (cont.)
  - Design of actual levee around reservoir
    - Review of design with TCEQ Dam Safety Board, other reservoirs, and outside technical review board.

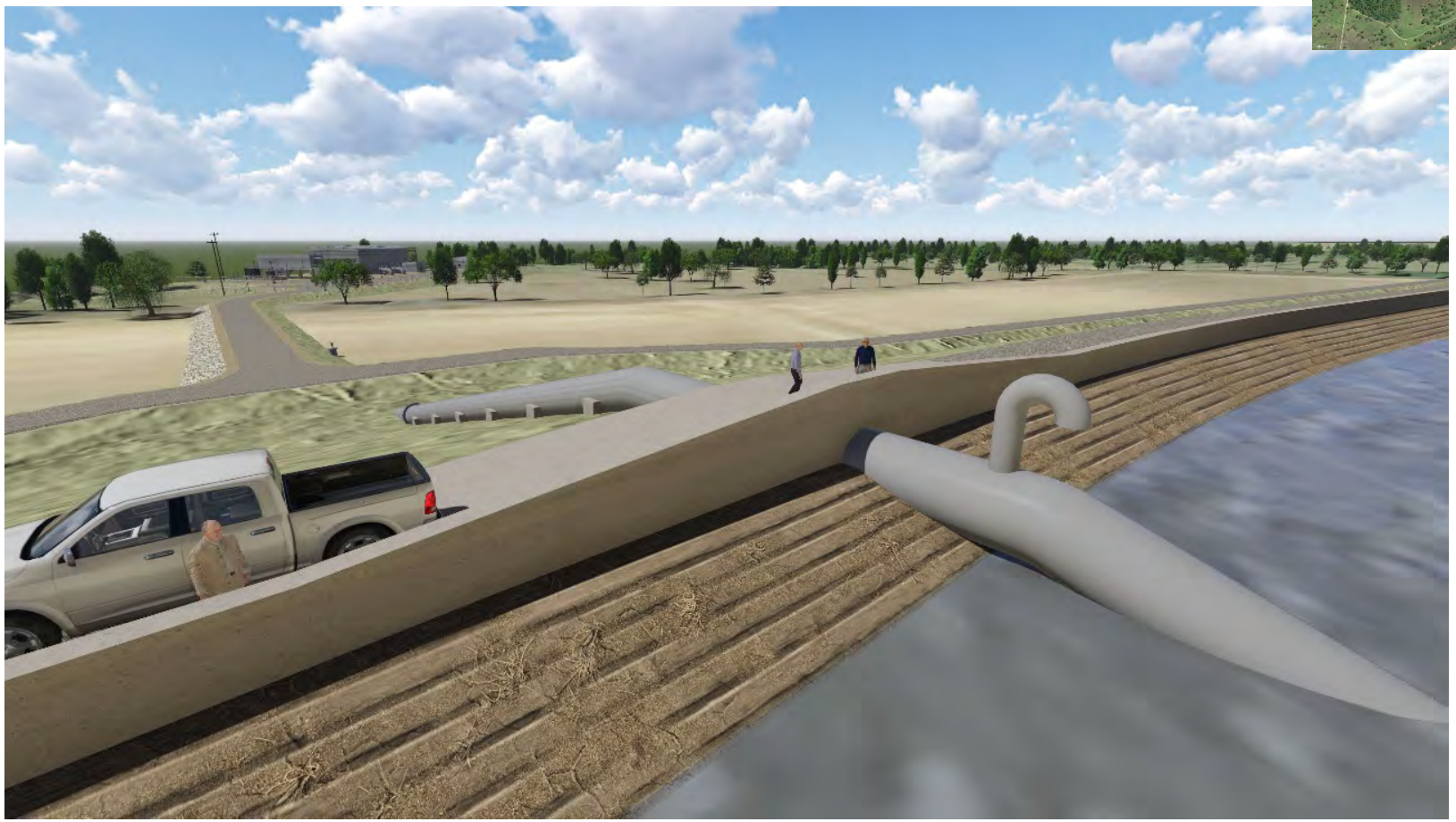


A TYPICAL EMBANKMENT SECTION
1"=15'

Technology – Reservoir Inlet Pipe



- Technology
  - Inlet piping with stilling basin in reservoir

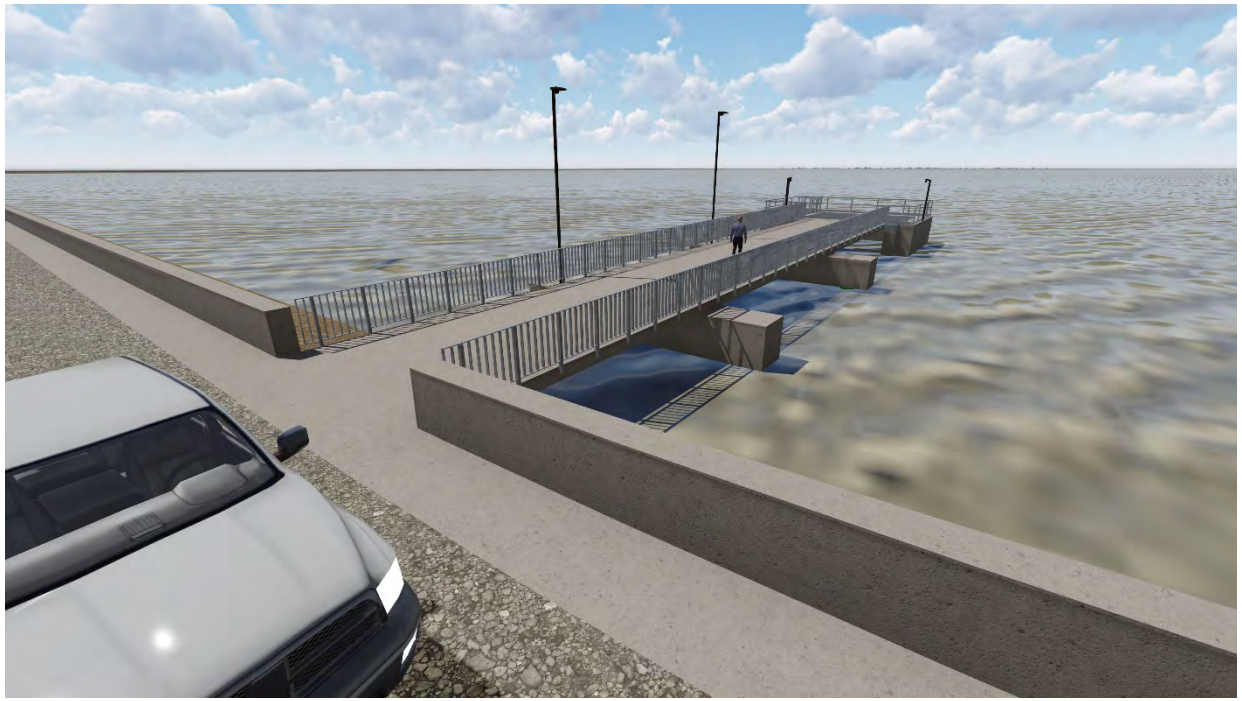


Reservoir inlet piping at crest of reservoir looking southwest with pump station area in background

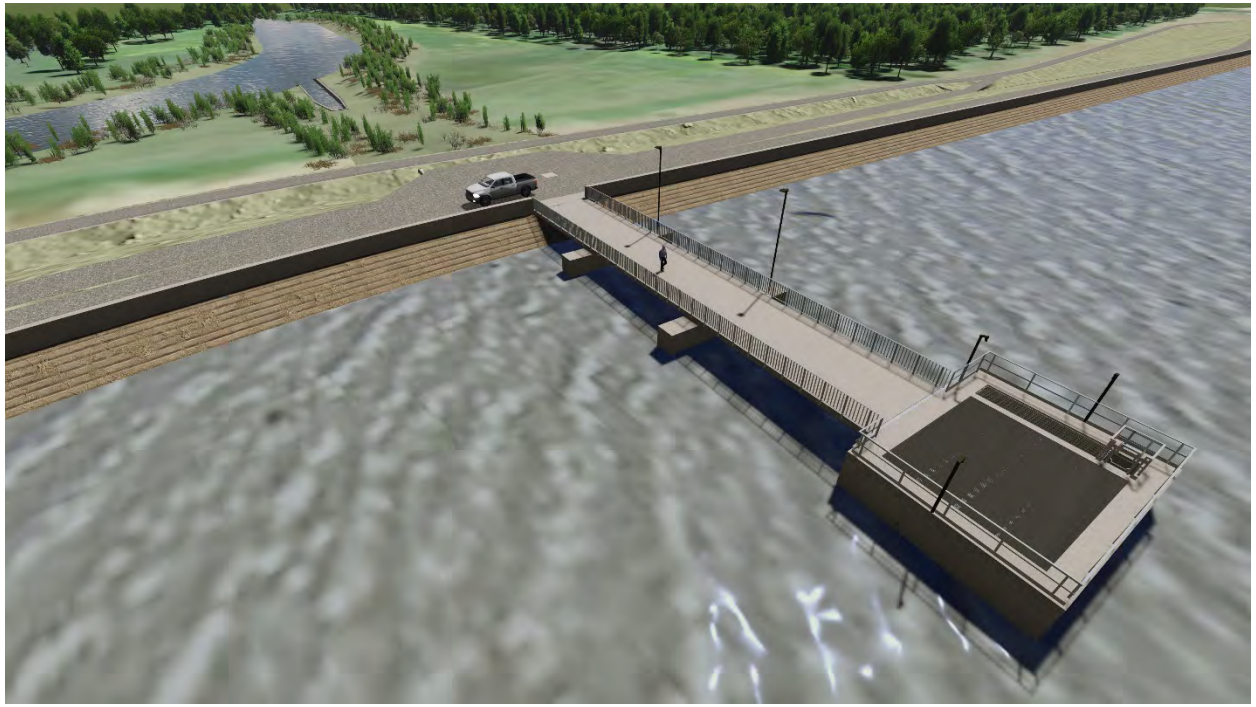
Technology Being Used – Discharge

- Technology
  - Combined emergency outlet/outlet structure





Combined Outlet Structure Looking Towards the Reservoir

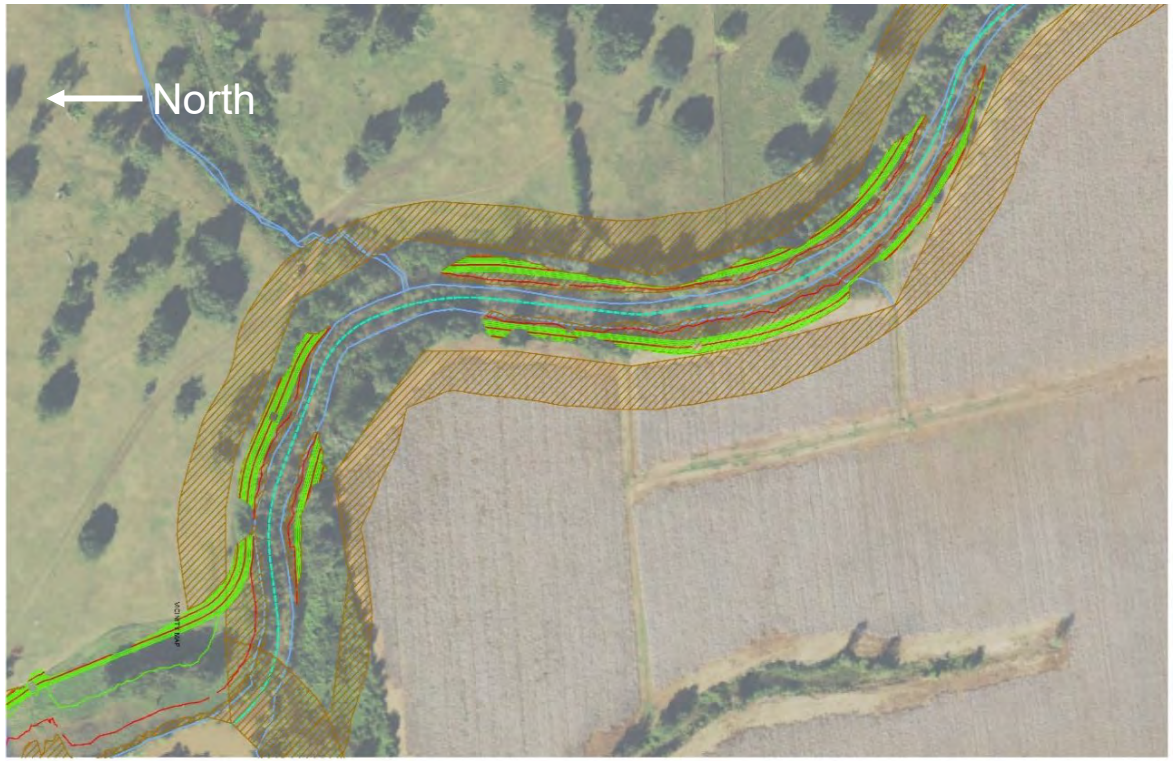


Combined Outlet Struture Looking Towards Oyster Creek

Technology Being Used – Flood Plain Mitigation

- Technology
  - Flood plain mitigation project #1
    - Aligns flow of channel with flood plain mitigation requirements
    - Flood mitigation and stream enhancement design to follow industry best practices
      - Approximately 2,400 feet of floodplain conveyance and storage improvements
      - Incorporation of a flood plain bench on both channel banks
      - Layback of channel banks
      - Preservation of existing riparian buffer



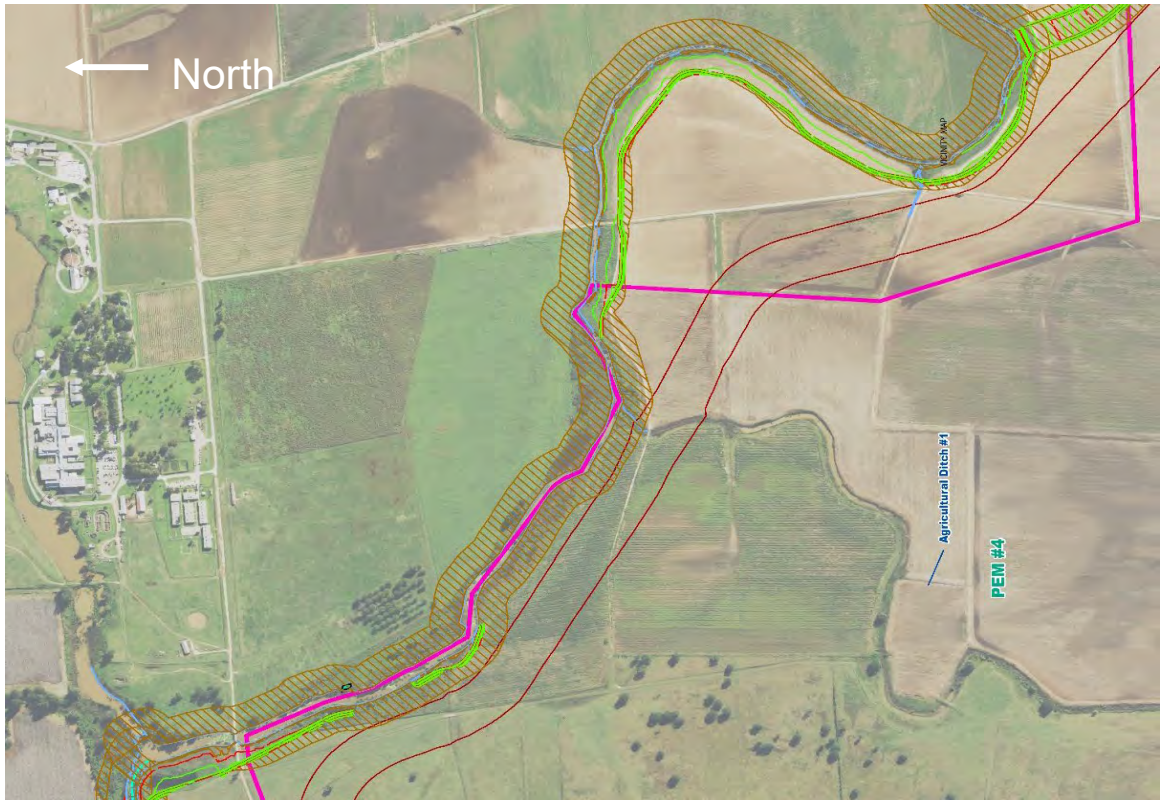


Flood Plain Mitigation Project #1

Technology Being Used – Flood Plain Mitigation

- Technology
  - Flood plain mitigation project #2
    - Aligns flow of channel with flood plain mitigation requirements
    - Flood mitigation and stream enhancement design to follow industry best practices
      - Approximately 7,800 feet of floodplain conveyance and storage improvements
      - Incorporation of a flood plain bench on west channel bank
      - Preservation of existing riparian buffer
      - Buffer re-establishment



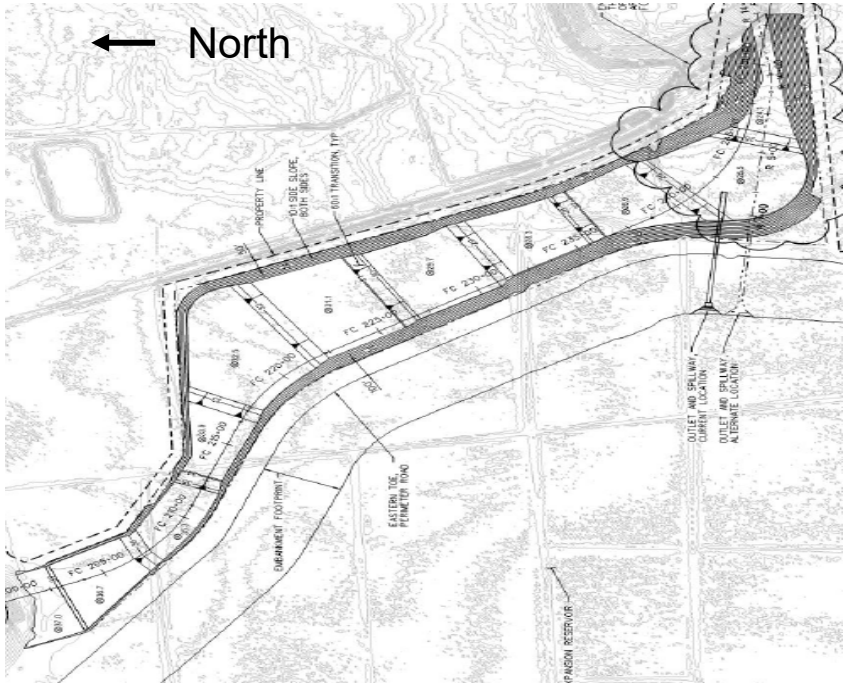


Flood Plain Mitigation Project #2

Technology Being Used – Flood Plain Mitigation

- Technology
  - Flood plain mitigation project #3
    - Aligns flow of channel with flood plain mitigation requirements
    - Flood mitigation and stream enhancement design to follow industry best practices
      - Re-establishes an ephemeral channel within the existing floodplain (i.e. channel creation)
      - Broad crested weir on south bank of Oyster Creek to maintain low flows in Oyster Creek
      - Conveys overflows from Oyster Creek during high flows (approximately 10-year or greater magnitude flood events
      - Will accommodate the reservoir outlet and spillway





Flood Plain Mitigation Project #3

Master Project Schedule (Milestones)

Key Milestone		Comments
FEL3 Project Kickoff	Nov. 2017	
Permit Submittal	Feb. 2018	
Detail Design Kickoff	Jan. 2021	Critical Path
Permit Approval	Apr. 2022	
Start Construction	Aug. 2022	Critical Path
Complete Detail Design	Mar. 2023	
Construction Complete	Aug. 2025	Critical Path
Release to Operations (RTO)	Sept. 2025	Critical Path
Reservoir Filling Complete	Jan. 2026	Critical Path

Appendix D

Scoping Comments

Dow Chemical Company Harris Reservoir Expansion Project
Agency Scoping Meeting Comment Database

Comment #	Commenter (Last Name/First Name)		Commenter Contact Information	Date Received	Category	Comment
1	Blanco	Arturo J.	Environmental Protection Agency Region 6 1201 Elm Street, Suite 500, Dallas, Texas 75270-2102	6/15/2020	Clean Water Act/Wetlands	The EPA recommends the EIS include an evaluation of a full range of alternatives for avoiding and minimizing the impacts to the waters of the U.S. As well as summarizing the criteria used to screen for reasonable alternatives, including the Clean Water Act. The EPA also recommends the Draft EIS identifies aquatic impacts and include a draft migation plan to address the need for compensatory mitigation for unavoidable impacts to aquatic resources. Differentiation between permanent vs. temporary impacts, and address potential temporal losses. Clearly define the project components along Oyster Creek as project infrastructure or activities intended as compensatory mitigation.
2	Blanco	Arturo J.	Environmental Protection Agency Region 6 1201 Elm Street, Suite 500, Dallas, Texas 75270-2102	6/15/2020	Air Quality	Recommends the adoption of a Construction Emissions Mitigation Plan in the Record of Division to reduce potential short-term air quality impacts. EPA recommends the follwoing to be considered for inclusion in the plan to reduce pollutants from construction-related activities: fugitive dust source controls, mobile/stationary source controls, and administrative controls
3	Blanco	Arturo J.	Environmental Protection Agency Region 6 1201 Elm Street, Suite 500, Dallas, Texas 75270-2102	6/15/2020	Socioeconomics/Land Use/Recreation/EJ	Recommends identifying and consulting with tribal governments affected by proposed action and address issues/concerns raised. Allow enough time for tribal governments to participate in consultation and coordination due to COVID-19 impacts.
4	Blanco	Arturo J.	Environmental Protection Agency Region 6 1201 Elm Street, Suite 500, Dallas, Texas 75270-2102	6/15/2020	Socioeconomics/Land Use/Recreation/EJ	An evaluation of environmental justice populations near the geographic scope of the project should be conducted. If EJ populations exists ceate a comprehensive communication strategy to inform the communities and encourage their participation. Reconmmends utilizing the Promising Pratice Report for considering and analyzing EJ populations.
5	Wolfe	Mark	Texas Historical Commission Jeff.Durst@thc.texas.gov	6/16/2020	Public Involvement	THC acknowledges receipt of notification of public scoping meeting regarding the Harris Reservoir Expansion Project.
6	Galindo	David	Texas Commission on Environment Quality (TCEQ)	7/2/2020	Clean Water Act/Wetlands	The EIS should include appropriate functional assessments performed on streams and wetlands to be impacted by the construction and operation of the reservoir. This should include areas affected by inundation as well as areas downstream of the proposed dam affected by changes in flow regime including Oyster Creek.
7	Galindo	David	Texas Commission on Environment Quality (TCEQ)	7/2/2020	Mitigation	The EIS should clearly account for losses of stream and wetland function due to direct fill impacts, as well as secondary impacts. Stream impacts should be provided in linear feet and distinguished by stream type. Impacts to aquatic resources should be mitigated in-kind.
8	Galindo	David	Texas Commission on Environment Quality (TCEQ)	7/2/2020	Mitigation	The EIS should include the name of the mitigation bank(s) that will be used, the number and resource type of credits to be secured, the availability of credits, and how the number and resource type of credits were determined.
9	Galindo	David	Texas Commission on Environment Quality (TCEQ)	7/2/2020	Mitigation	The EIS should explain the need for cutting a 4:1 slope on Oyster Creek and how this mitigates for impacts to streams impacted by the project. Widening or channelization of Oyster Creek can negatively affect stream function. This may be considered a stream impact rather than mitigation and may require mitigation to replace the lost functions in the channelized areas.
10	Galindo	David	Texas Commission on Environment Quality (TCEQ)	7/2/2020	Mitigation	The proposed mitigation may be insufficient to compensate for impacts to streams and wetlands. Based on the Galveston Stream Tool guidance, the impact factor for the impacted streams due to the reservoir should be higher than the proposed score of 1. Most or all the stream functions will be lost due to the reservoir. Based on the Reach Condition Index (RCI) score, it is likely that the impact factor score should be a 4 or 5. The EIS should revise the impact factor scores and required mitigation credits or explain in detail how the mitigation is sufficient.
11	Galindo	David	Texas Commission on Environment Quality (TCEQ)	7/2/2020	Water Quality/Sedimentation	The EIS should address all measures that will be taken to maintain water quality during and after reservoir construction.

Dow Chemical Company Harris Reservoir Expansion Project
Agency Scoping Meeting Comment Database

Comment #	Commenter (Last Name/First Name)		Commenter Contact Information	Date Received	Category	Comment
12	Galindo	David	Texas Commission on Environment Quality (TCEQ)	7/2/2020	Water Quality/Sedimentation	The EIS should address potential water quality impacts such as impacts due to changes in sediment transport downstream of the reservoir.
13	Ardizzone	Charles	United States Department of the Interior FISH AND WILDLIFE SERVICE Coastal Ecological Services Field Office 17629 El Camino Real, Suite 211 Houston, Texas 77058 281-286-8282	7/2/2020	Public Involvement	Requested all the updated reports concerning potential impacts to floodplains and hydrology In response to concerns regarding potential impacts to floodplains and hydrology, the Corps conducted several studies including a geomorphic assessment of Oyster Creek; a Level I and II stream assessment; a hydrology and hydraulic modeling report; modeling of areas downstream to confirm the floodplain storage; an updated interim hydrogeomorphic functional assessment to determine capacities of the waters of the U.S.; and, a Phase I Environmental Site Assessment1. As a cooperating agency, we request all updated reports be provided to our office for a thorough project review and comment. Concerns related to these potential impacts may include, but are not limited to: increase in flooding within the floodplain of the Brazos River and Oyster Creek; mitigation needs to offset impacts to the floodplain, loss or conversion of riparian habitat, and bottomland forested areas; and, impacts to water quality and quantity as it relates to our federally-listed and candidate species and migratory birds.
14	Ardizzone	Charles	United States Department of the Interior FISH AND WILDLIFE SERVICE Coastal Ecological Services Field Office 17629 El Camino Real, Suite 211 Houston, Texas 77058 281-286-8282	7/2/2020	Water Quality/Sedimentation	The Service is concerned with the clearing of the riparian zone where the pump/in-take station is proposed to be constructed on the Brazos River bank. The removal of the riparian zone along the banks of streams and rivers increases the risk and rate of erosion significantly causing water quality issues and habitat degradation. Impacts to this riparian zone can also alter flooding regimes and alter sensitive bottomland forested areas of habitat. The applicant should avoid and/or minimize impacts to riparian habitats to the maximum extent practical in the design of this Project, including any laydown and staging areas. We recommend implementing best management practices (attached) to minimize potential effects to the Brazos River, Oyster Creek, and their associated riparian zones and its delicate ecosystems.
15	Ardizzone	Charles	United States Department of the Interior FISH AND WILDLIFE SERVICE Coastal Ecological Services Field Office 17629 El Camino Real, Suite 211 Houston, Texas 77058 281-286-8282	7/2/2020	Mitigation	The proposed Project proposes to impact 12.19 acres of emergent wetlands, 4.15 acres of forested wetlands, and 20,486.3 linear feet (5.73 acres) of streams. Since the issuance of the public notice in 2018, both a functional and stream assessments were conducted in September 2019. The Corps verified the wetland delineation in October 2019 and plans to revise the conceptual mitigation plan based on these assessments. The applicant should develop a detailed stream mitigation plan pursuant to the requirements of 33 CFR 332.4 (c). We request that the Corps provide this plan to the Service and other resource agencies for review and comment prior to the issuance of this permit.
16	Ardizzone	Charles	United States Department of the Interior FISH AND WILDLIFE SERVICE Coastal Ecological Services Field Office 17629 El Camino Real, Suite 211 Houston, Texas 77058 281-286-8282	7/2/2020	Clean Water Act/Wetlands	We are concerned with temporal loss of forested wetland functions and values posed by the Project. Stream restoration and enhancement will likely require years to stabilize, become functional, and grow mature riparian zones. Loss of habitat for multiple generations could destabilize local populations of species with short life cycles (e.g. amphibians, birds, etc.). The applicant should conduct long-term monitoring of mitigation sites in order to capture the streams' timeframe of recovery, and as such, these details should be detailed in the mitigation planning documents.
17	Ardizzone	Charles	United States Department of the Interior FISH AND WILDLIFE SERVICE Coastal Ecological Services Field Office 17629 El Camino Real, Suite 211 Houston, Texas 77058 281-286-8282	7/2/2020	Vegetation/Wildlife Habitat	A plan that includes post-construction site restoration and management activities should be developed and provided to the Service for review and comment. Such a plan should address potential management strategies (i.e. mowing, herbicide use, plantings); ways to avoid/minimize the introduction of nonnative aquatic and plant species into the ecosystem; and, address measures to avoid and/or minimize impacts of such activities to our trust resources (e.g. federally-listed and candidate species, migratory birds, aquatic resources).

Dow Chemical Company Harris Reservoir Expansion Project
Agency Scoping Meeting Comment Database

Comment #	Commenter (Last Name/First Name)		Commenter Contact Information	Date Received	Category	Comment
18	Ardizzone	Charles	United States Department of the Interior FISH AND WILDLIFE SERVICE Coastal Ecological Services Field Office 17629 El Camino Real, Suite 211 Houston, Texas 77058 281-286-8282	7/2/2020	Threatened and Endangered Species	The applicant should conduct baseline and post-restoration assessments of macroinvertebrate (e.g. mussels), fish, and riparian zones within areas of the Project and the proposed in-stream mitigation sites. The Texas fawnsfoot (Truncilla macrodon) can potentially occur within the Colorado and Brazos River drainages. The species is currently a candidate and is under review by the Service to determine if protection under the Act is warranted.
19	Ardizzone	Charles	United States Department of the Interior FISH AND WILDLIFE SERVICE Coastal Ecological Services Field Office 17629 El Camino Real, Suite 211 Houston, Texas 77058 281-286-8282	7/2/2020	Vegetation/Wildlife Habitat	Per prior guidance, post-construction bank restoration strategies should strive to obtain a minimum surviving density of 400 stems/acre of trees and shrubs planted by year 3. Of those, 250 stems/acre should be six feet tall by year 7. As the stand matures and the canopy closes, light will be limited and competition will increase. This will lead to a decrease in population densities to between 100 and 250 stems/acre and producing, in concert with forest management strategies, a sustainable and productive community of native tree species.
20	Ardizzone	Charles	United States Department of the Interior FISH AND WILDLIFE SERVICE Coastal Ecological Services Field Office 17629 El Camino Real, Suite 211 Houston, Texas 77058 281-286-8282	7/2/2020	Clean Water Act/Wetlands	Recommended several best management practices to implement as the project has the potential to effect river, stream or tributary aquatic habits. In addition to these recommendations, the commenter suggested the project considers SMZ widths (chart provided) and additional permit requirements for fill materials and additional individual projects.
21	Geeslin	Dakus	Texas Parks & Wildlife 4200 Smith School Road Austin, TX 78744-3291 512-389-4800	7/2/2020	Vegetation/Wildlife Habitat	Texas Parks and Wildlife Department is concerned with potential impacts to environmentally critical habitats including wetlands, streams, coastal prairie, neotropical songbird nesting and foraging areas, and federal/state threatened and endangered species habitat. TPWD recommends the EIS include detailed descriptions and evaluations for all associated phases of the project relative to the items discussed in Attachment A and Attachment B.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1201 ELM STREET, SUITE 500
DALLAS, TEXAS 75270-2102

June 15, 2020

Mr. Jayson Hudson
U.S. Army Corps of Engineers
Galveston District, Regulatory Division
P.O. Box 1229
Galveston, TX 77553-1229

Dear Mr. Hudson:

The Region 6 office of the U.S. Environmental Protection Agency (EPA) has reviewed the U.S. Army Corps of Engineers – Galveston District (USACE) Scoping request to solicit input regarding the impacts associated with the proposed Harris Reservoir Expansion project and Draft Environmental Impact Statement (EIS).

To assist in the scoping process, we have identified the following areas for your attention in the preparation of USACE EIS:

Clean Water Act 404/Wetlands

It is recommended the EIS include an evaluation of a full range of alternatives with the goal of avoiding and minimizing the impacts to waters of the U.S. while meeting the purpose and need of the proposed action. It is important that the EIS summarizes criteria used to screen reasonable alternatives, including the Clean Water Act (CWA) regulatory criteria used to develop practicable alternatives, and consideration be given to environmental, logistical, technological and cost criteria. Providing the rationale and criteria used to eliminate alternatives is helpful in understanding the decision process. Any selected or preferred alternative should be consistent with CWA 404(b)(1) Guidelines, and demonstrate that such alternative is the least environmentally damaging practicable alternative.

It is also recommended the Draft EIS identify aquatic impacts and include a draft mitigation plan that addresses the need for compensatory mitigation for unavoidable impacts to aquatic resources. The project components along Oyster Creek should be clearly defined as project infrastructure or activities intended as compensatory mitigation to ensure sufficient in-kind mitigation is provided. In addition to quantity and quality of aquatic resources, permanent versus temporary impacts should be differentiated and potential temporal losses should be addressed.

Air Quality

EPA recommends that in order to reduce potential short-term air quality impacts associated with construction activities, the agencies responsible for the project should include a Construction Emissions Mitigation Plan, and adopt this plan in the Record of Decision (ROD). In addition to conducting construction and waste disposal activities in accordance with all applicable local, state, or federal requirements, the EPA recommends that fugitive dust source controls (e.g. stabilization of disturbed soils), mobile/stationary source controls (e.g. limitation of vehicle idling, maintenance of engines to

perform at EPA certification levels), and administrative controls (e.g. traffic/parking management plan to maintain traffic flow) be considered for inclusion (as applicable and practicable) in the Construction Emissions Mitigation Plan in order to reduce impacts associated with emissions of NOx, CO, PM, SO2, and other pollutants from construction-related activities.

Environmental Justice and Tribal Consultation

EPA recommends USACE identify and consult with tribal governments affected by the proposed action and address any issues and/or concerns raised. Due to COVID-19 impacts, please allow enough time for tribal governments to participate in consultation and coordination.

The USACE should conduct an evaluation of environmental justice (EJ) populations near the geographic scope of the project. If such populations exist, the potential for disproportionate adverse impacts to minority and low-income populations should be discussed along with the approaches used to foster public participation by these populations. There should be a comprehensive communication strategy to inform EJ communities and encourage participation. Finally, EPA recommends that USACE utilize the Promising Practice Report to supplement the applicable requirements for considering and analyzing EJ populations, which can be found at the following link: https://www.epa.gov/sites/production/files/2016-08/documents/nepa_promising_practices_document_2016.pdf.

We appreciate the opportunity to provide scoping comments on the Harris Reservoir Expansion project. We look forward to reviewing the EIS documents related to this effort. The staff contact for the review is Keith Hayden and he can be reached at 214-665-2133 or by e-mail at hayden.keith@epa.gov.

Sincerely,

Arturo J. Blanco
Director
Office of Communities, Tribes and
Environmental Assessment

From: noreply@thc.state.tx.us
To: SWG201601027; reviews@thc.state.tx.us
Subject: [Non-DoD Source] Project Review: 202013700
Date: Tuesday, June 16, 2020 4:12:40 PM

<Blockedhttp://www.thc.state.tx.us/public/upload/image/THC.png>

Re: Project Review under Section 106 of the National Historic Preservation Act and/or the Antiquities Code of Texas
THC Tracking #202013700
Harris Reservoir Expansion Project

Dear Client:
Thank you for your submittal regarding the above-referenced project. This response represents the comments of the State Historic Preservation Officer, the Executive Director of the Texas Historical Commission (THC), pursuant to review under Section 106 of the National Historic Preservation Act.

The review staff led by Jeff Durst has completed its review and has made the following determinations based on the information submitted for review:

We have the following comments: THC acknowledges receipt of notification of public scoping meeting regarding the Harris Reservoir Expansion Project.

We look forward to further consultation with your office and hope to maintain a partnership that will foster effective historic preservation. Thank you for your cooperation in this review process, and for your efforts to preserve the irreplaceable heritage of Texas. If you have any questions concerning our review or if we can be of further assistance, please email the following reviewers: Jeff.Durst@thc.texas.gov

This response has been sent through the electronic THC review and compliance system (eTRAC). Submitting your project via eTRAC eliminates mailing delays and allows you to check the status of the review, receive an electronic response, and generate reports on your submissions. For more information, visit Blockedhttp://thc.texas.gov/etrac-system.

Sincerely,
<Blockedhttp://www.thc.texas.gov/public/upload/images/reviewerSignatures/73.png>
For Mark Wolfe, State Historic Preservation Officer
Executive Director, Texas Historical Commission

Please do not respond to this email.

Jon Niermann, *Chairman*
Emily Lindley, *Commissioner*
Bobby Janecka, *Commissioner*
Toby Baker, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

July 2, 2020

Mr. Jayson Hudson, Project Manager
Galveston District CESWG-PE-RE
U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, Texas 77553-1229

Re: USACE Permit Application No. SWG-2016-01027

Dear Mr. Hudson:

As described in the Joint Public Notice for the Harris Ridge Reservoir Expansion Project Environmental Impact Statement (EIS) and Scoping Announcement dated May 27, 2020, the U. S. Army Corps of Engineers (USACE) announced the preparation of an EIS to analyze potential impacts associated with the construction and operation of the Harris Reservoir Expansion Project proposed by the Dow Chemical Company (Dow).
The proposed project would include the construction of a 1,929-acre impoundment with a nominal storage capacity of 50,000 acre-feet, an intake and pump station to divert Dow's existing surface water rights from the Brazos River, an outlet to Oyster Creek, and an emergency spillway. The Project would also include floodplain enhancements on Oyster Creek, stream restoration, and temporary construction staging and laydown areas. The project is adjacent to the existing Dow Chemical Harris Reservoir in Angleton, Brazoria County, Texas.

The Texas Commission on Environmental Quality (TCEQ) appreciates the opportunity to comment on the scope of the EIS and has the following comments and recommendations.

1. The EIS should include appropriate functional assessments performed on streams and wetlands to be impacted by the construction and operation of the reservoir. This should include areas affected by inundation as well as areas downstream of the proposed dam affected by changes in flow regime including Oyster Creek.

2. The EIS should clearly account for losses of stream and wetland function due to direct fill impacts, as well as secondary impacts. Stream impacts should be provided in linear feet and distinguished by stream type. Impacts to aquatic resources should be mitigated in-kind.

3. The EIS should include the name of the mitigation bank(s) that will be used, the number and resource type of credits to be secured, the availability of credits, and how the number and resource type of credits were determined.

4. The EIS should explain the need for cutting a 4:1 slope on Oyster Creek and how this mitigates for impacts to streams impacted by the project. Widening or channelization of Oyster Creek can negatively affect stream function. This may be considered a stream impact rather than mitigation and may require mitigation to replace the lost functions in the channelized areas.

5. The proposed mitigation may be insufficient to compensate for impacts to streams and wetlands. Based on the Galveston Stream Tool guidance, the impact factor for the impacted streams due to the reservoir should be higher than the proposed score of 1. Most or all the stream functions will be lost due to the reservoir. Based on the Reach Condition Index (RCI) score, it is likely that the impact factor score should be a 4 or 5. The EIS should revise the impact factor scores and required mitigation credits or explain in detail how the mitigation is sufficient.

6. The EIS should address all measures that will be taken to maintain water quality during and after reservoir construction.

7. The EIS should address potential water quality impacts such as impacts due to changes in sediment transport downstream of the reservoir.

The TCEQ appreciates the opportunity to comment and looks forward to receiving and evaluating other agency or public comments. Please provide any agency comments, public comments, as well as the applicant's comments, to Ms. Jenna R. Lueg of the Water Quality Division MC-150, P.O. Box 13087, Austin, Texas 78711-3087. Ms. Lueg may also be contacted by e-mail at *jenna.lueg@tceq.texas.gov*, or by telephone at (512) 239-4590.

Sincerely,

David W Galindo

David W. Galindo, Director
Water Quality Division
Texas Commission on Environmental Quality

DWG/JL/fc

cc: Ms. Allison Buchtien via e-mail at Federal.Consistency@GLO.TEXAS.GOV

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T. Dan Friedkin
Chairman-Emeritus
Houston

Carter P. Smith
Executive Director

July 2, 2020

Mr. Jayson Hudson
USACE Galveston District
Regulatory Branch
P.O. Box 1229
Galveston TX 77553-1229

Re: USACE Notice of Intent to Prepare an Environmental Impact Statement and Public Scoping Meeting for DOW Chemical Company's Harris Reservoir Expansion Project, Brazoria County, Texas
Permit Number SWG-2016-01027

Dear Mr. Hudson:

Texas Parks and Wildlife Department (TPWD) is submitting comments and concerns which we request be considered and assessed in the Environmental Impact Statement (EIS) for the proposed DOW Chemical Company Harris Reservoir Expansion Project. The proposed project would include construction of a 1,929-acre impoundment with a nominal storage capacity of 50,000 acre-feet. An intake and pump station would be utilized to divert water from the Brazos River to the reservoir, while an outlet and emergency spillway will be constructed to transfer water from the reservoir to Oyster Creek and then to end users in the Brazosport area. The project also includes proposed floodplain enhancements in Oyster Creek, along with stream restoration, and temporary construction staging and laydown areas. The project site is located between the Brazos River and Oyster Creek, approximately eight miles northwest of the City of Angleton, and abuts the Brazos River in Brazoria County, Texas.

On March 2, 2018 the U. S. Army Corps of Engineers (USACE) placed the permit application for this project on Public Notice (PN) for review and comment. TPWD provided a response to the PN on April 30, 2018. Due to the scope of this project, the USACE determined development of an EIS was necessary and invited TPWD by letter dated November 6, 2018 to participate as a member of an inter-agency work group. By Notice of Intent (NOI) issued April 9, 2020, the USACE publicly announced the intent to prepare an EIS in compliance with the National Environmental Policy Act (NEPA) to render a final decision on the permit application. The EIS will assess the potential social, economic, and environmental impacts of the construction and operation of the proposed project and is intended to be sufficient in scope to address federal, state, and local requirements; environmental and socioeconomic issues concerning the proposed action; and permit reviews.

4200 SMITH SCHOOL ROAD
AUSTIN, TEXAS 78744-3291
512.389.4800

www.tpwd.texas.gov

Under §12.0011 of the Parks and Wildlife (TPW) Code, TPWD is charged with "providing recommendations that will protect fish and wildlife resources to local, state, and federal agencies that approve, permit, license, or construct developmental projects" and "providing information on fish and wildlife resources to any local, state, and federal agencies or private organizations that make decisions affection those resources."

TPWD has reviewed a description of the proposed project, along with stream and wetland delineation and functional assessment reports, hydrology and floodplain analysis, and a conceptual mitigation plan furnished by the applicant in 2018. TPWD is concerned with potential impacts to environmentally critical habitats including wetlands, streams, coastal prairie, neotropical songbird nesting and foraging areas, and federal/state threatened and endangered species habitat. TPWD recommends the EIS include detailed descriptions and evaluations for all associated phases of the project relative to the items discussed in Attachment A and Attachment B.

TPWD appreciates the opportunity to contribute scoping comments for this NOI. Prior to issuance of a Final EIS, TPWD recommends that the U.S. Army Corps of Engineers coordinate closely with TPWD and other resource agencies to address concerns.

Questions can be directed to Ms. Colleen Roco of the Upper Coast Ecosystem Resources Program at (281) 534-0139 or Colleen.Roco@tpwd.texas.gov or to Rachel Lange of the Wildlife Habitat Assessment Program at (979) 732-4213 or Rachel.Lange@tpwd.texas.gov.

Sincerely,

Dakus Geeslin
Chief, Science and Policy Resources Branch
Coastal Fisheries Division

LK:CSR

Attachment A

SWG-2016-010207

TPWD recommends that the Environmental Impact Statement includes detailed descriptions, assessments, and evaluations for all associated phases of the project relative to the following:

- Potential hydrologic changes in the base flow regime and sediment deposition patterns associated with water withdrawal from the Brazos River.

- Potential impacts to aquatic/estuarine organisms and aquatic/estuarine habitats in the Brazos River and Brazos River estuary due to hydrologic changes associated with water withdrawal from the Brazos River (i.e. lower in-stream flows, reduced freshwater inflow, shifts in salinity gradients).

- Potential hydrologic changes in the base flow regime, sediment deposition patterns, and bank erosion potential due to the addition of water to Oyster Creek.

- Potential impacts to aquatic/estuarine organisms and aquatic/estuarine habitats in Oyster Creek, Buffalo Camp Bayou, and associated tidally-influenced waterbodies due to hydrologic changes associated with water transfer from the Brazos River (i.e. higher in-stream flows, increased freshwater inflow, shifts in salinity gradients, turbidity).

- Potential impacts to water quality in Oyster Creek, a stream that is on the Section 303(d) impaired water body list for elevated bacteria and depressed dissolved oxygen just downstream from the proposed project site. (H-GAC 2016).

- Potential to cause increased flooding along Oyster Creek downstream of the project site due to the severing of a distributary channel between the creek and Brazos River, removal of 1,929 acres from the 100-year floodplain, and the potential emergency discharge of water from the reservoir due to extreme weather events.

- Potential to cause increased flooding along the Brazos River downstream of the project site during extreme flooding events due to removal of 1,929 acres from the 500-year floodplain (note Google Earth aerial imagery dated 08/2017).

- Provide a comprehensive hydrological analysis of any associated flood control project that may be necessary to mitigate for impacts to the floodplain.

- Potential direct and secondary impacts to riparian habitat and bottomland forested areas along the Brazos River and Oyster Creek due to altered flooding hydrology resulting from interbasin transfer of water and removal of land from the floodplains. (Note that

freshwater wetlands and Columbia Bottomlands are identified as priority habitats in the 2012 TPWD Texas Conservation Action Plan.)

- Potential magnitude of impacts to egg, larval, and adult stages of fish and other aquatic organisms due to impingement, entrainment, and movement of water associated with all project design components.

- Assess the potential introduction of non-native invasive aquatic organisms and/or plants into the Oyster Creek watershed via the proposed project and evaluate mechanisms that can be implemented to prevent their transfer.

- Assess the potential impacts to migratory or nesting avian species due to disturbance, machinery use, or destruction of habitat during and following construction of the proposed project.

- Potential impacts to all federal and state-listed rare, threatened, and endangered species and their habitat and evaluate mechanisms that can be implemented to prevent or attenuate impacts. (See Attachment B of Recommendations from TPWD Wildlife Division, Habitat Assessment Program.)

- Potential impacts to native freshwater mussels and their habitats in the Brazos River, Oyster Creek and any tributary streams of those waterbodies.

- Provide detailed plans of the intake structure and construction methods, including any plans to dewater an area within a cofferdam.

- Formulate and provide TPWD with an Aquatic Resources Relocation Plan for all organisms in any waterbody that will be dewatered or destroyed.

- Assess the necessity of obtaining a Sand and Gravel Permit from TPWD for proposed disturbance to the Brazos River and Oyster Creek streambeds.

- Provide wetland delineation data, Level I Stream Assessment data, and detailed iHGM and stream assessment calculations.

- Assess all stream and wetland impacts at the project site and provide compensatory mitigation for all special aquatic sites.

- Provide detailed PRM plans for stream mitigation demonstrating hydraulic assessment, geomorphic assessment, and natural channel design (Rosgen 1996). Include detailed species lists for all proposed riparian buffer plantings and a monitoring plan that spans 10 years for evaluation of stream function and 15 years for evaluation of establishment of forested riparian buffers.

References:

Houston-Galveston Area Council (HGAC). 2016. Basin Summary Report, Oyster Creek Above-Tidal, Segment 1110. Accessed from:

http://www.bsr2016.com/watershedsummaries/documents/1110_Oyster%20Creek%20Above%20Tidal.pdf

Rosgen, D. 1996. Applied river morphology. Wildlife Hydrology. Pagosa Springs, CO.

Attachment B

SWG-2016-010207

TPWD recommends that the Environmental Impact Statement address best management practices and observance of Federal and State regulations to minimize impacts to wildlife and natural resources.

General Construction Recommendations

Recommendation: Where trenching or other excavation is involved in construction TPWD recommends that contractors keep trenching/excavation and backfilling crews close together to minimize the amount of trenches/excavation areas left open at any given time during construction. TPWD recommends that any open trenches or excavation areas be covered overnight and/or inspected every morning to ensure no wildlife species have been trapped. Trenches left open for more than two daylight hours should be inspected for the presence of trapped wildlife prior to backfilling. If trenches/excavation areas cannot be backfilled the day of initial excavation, then escape ramps should be installed at least every 90 meters (approximately 295 feet). Escape ramps can be short lateral trenches or wooden planks sloping to the surface at an angle less than 45 degrees (1:1).

Recommendation: For soil stabilization and/or revegetation of disturbed areas within the proposed project area, TPWD recommends erosion and seed/mulch stabilization materials that avoid entanglement hazards to snakes and other wildlife species. Because the mesh found in many erosion-control blankets or mats pose an entanglement hazard to wildlife, TPWD recommends the use of no-till drilling, hydromulching and/or hydroseeding rather than erosion control blankets or mats due to a reduced risk to wildlife. If erosion control blankets or mats will be used, the product should contain no netting or contain loosely woven, natural fiber netting in which the mesh design allows the threads to move, therefore allowing expansion of the mesh openings. Plastic mesh matting should be avoided.

Recommendation: During construction, operation, and maintenance of the proposed facility, TPWD recommends observing slow (25 miles per hour, or less) speed limits within the project site. Reduced speed limits would allow personnel to see wildlife in the vehicle path and avoid harming them.

Recommendation: TPWD recommends providing contractor training on avoiding impacts to rare and protected species. Because a biological monitor cannot oversee all construction activity at the same time, it's important for the construction personnel to be able to identify protected species and to be on the lookout for them during construction.

Attachment B
SWG-2016-01027 Scoping Comments

Federal Laws

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) prohibits direct and affirmative purposeful action that reduce migratory birds, their eggs, or their nests, by killing or capturing, to human control, except when specifically authorized by the Department of the Interior. This protection applies to most native bird species, including ground nesting species. The U.S. Fish and Wildlife Service (USFWS) Migratory Bird Office can be contacted at (505) 248-7882 for more information on potential impacts to migratory birds.

Within the project area, potential impacts to migratory birds may occur during site preparation and grading activities through the disturbance of existing vegetation and bare ground that may harbor active bird nests, including nests that may occur in grass, shrubs and trees and on bare ground.

> **Recommendation:** TPWD recommends any vegetation clearing be scheduled outside of the general bird nesting season of March 15th to September 15th; however, if clearing must occur during nesting season, nest surveys should be conducted prior to clearing. Nest surveys should take place within 5 days of scheduled clearing in order to maximize the detection of active nests. If nests are observed during surveys, a vegetation buffer area of no less than 150-feet in diameter should remain around the nest until all young have fledged.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (BGEPA) prohibits anyone, without a permit issued by the Secretary of the Interior, from taking bald eagles (*Haliaeetus leucocephalus*) or golden eagles (*Aquila chrysaetos*), including their parts, nests, or eggs. The BGEPA provides criminal penalties for persons who "*take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof.*" The BGEPA defines "take" as to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb.

> **Recommendation:** When potential impacts to the bald eagle are anticipated, TPWD recommends consultation with USFWS – Clear Lake Ecological Services at (281) 286-8282 regarding compliance with the BGEPA.

Endangered Species Act

Federally-listed animal species and their habitat are protected from take on any property by the Endangered Species Act (ESA). Take of a federally-listed species can be allowed if it is incidental to an otherwise lawful activity and must be permitted in accordance with Section 7 or 10 of the ESA. Any take of a federally-listed species or its habitat without the required take permit (or allowance) from the USFWS is a violation of the ESA.

Based on the information provided, it appears that the project could negatively impact the black rail (*Laterallus jamaicensis*, proposed threatened). This species is also listed as state-threatened in Texas.

Recommendation: The USFWS should be contacted for species occurrence data, guidance, permitting, survey protocols, and mitigation for federally listed species. For the USFWS rare species lists by county please visit the USFWS Information for Planning and Consultation (IPaC) webpage.

State Laws

Parks and Wildlife Code – Chapter 64, Birds

Texas Parks and Wildlife (TPW) Code Section 64.002, regarding protection of nongame birds, provides that no person may catch, kill, injure, pursue, or possess a bird that is not a game bird. TPW Code Section 64.003, regarding destroying nests or eggs, provides that no person may destroy or take the nests, eggs, or young and any wild game bird, wild bird, or wild fowl. TPW Code Chapter 64 does not allow for incidental take and; therefore, is more restrictive than the MBTA.

Recommendation: Please review the *Federal Law: Migratory Bird Treaty Act* section above for recommendations as they are also applicable for Chapter 64 of the TPW Code compliance.

Parks and Wildlife Code, Section 68.015

TPW Code regulates state-listed threatened and endangered animal species. The capture, trap, take, or killing of state-listed threatened and endangered animal species is unlawful unless expressly authorized under a permit issued by USFWS or TPWD. A copy of TPWD Protection of State-Listed Species Guidelines, which includes a list of penalties for take of species, can be found online at the TPWD Wildlife Habitat Assessment Program: Laws and Regulations Applicable to TPWD Review webpage. For purposes of relocation, surveys, monitoring, and research, State-listed species may only be handled by persons with the appropriate authorization obtained through the TPWD Wildlife Permits Program. For more information on this authorization, please contact the Wildlife Permits Office at (512) 389-4647.

TPWD provides online access to state-listed species information through the TPWD Rare, Threatened, and Endangered Species of Texas by County (RTEST) application. This application provides county-level information regarding occurrence of protected species (federal- or state-listed threatened or endangered) and may be utilized to inform development project planning. Additionally, records of occurrence for these protected species are tracked within the Texas Natural Diversity Database (TXNDD) and are publicly available by request. In reviewing these data sources, aerial imagery, and project documents, TPWD has determined the project area appears to provide suitable habitat for multiple state-listed species, such as the following species:

- reddish egret (*Egretta rufescens*)
- white-faced ibis (*Plegadis chihi*)
- white-tailed hawk (*Buteo albicaudatus*)
- wood stork (*Mycteria americana*)
- Rafinesque's big-eared bat (*Corynorhinus rafinesquii*)
- alligator snapping turtle (*Macrochelys temminckii*)
- Texas fawnsfoot (*Truncilla macrodon*)

Birds

The reddish egret is a year-round resident within Texas, inhabiting marshes, shallow salt ponds, and tidal flats. The species may occur inland on rare occasions. Reddish egrets nest communally with other species of wading birds. Nests are constructed on the ground or in trees/bushes, often in the thickets of coastal islands.

The white-faced ibis inhabits marshes, swamps, ponds, and rivers. Freshwater systems are preferred. Isolated nesting colonies have been documented from Oregon to Kansas, but white-faced ibis are more commonly found in Utah, Texas, and Louisiana. In Texas, this species breeds and winters along the Gulf Coast; migrants may occur in the Texas panhandle and west Texas. The white-faced ibis is a colonial nesting species and will construct nests in beds of bulrushes, mats formed by dead vegetation, or trees. Nesting and hatching occurs in late spring through early summer. Colonial wading bird rookeries are documented in the project study area.

White-tailed hawks inhabit disjunct breeding areas from southern Texas to Argentina; in the United States, the species' range is restricted to Texas where it occurs year-round. Habitats utilized by this species include prairies, savannah, thornscrub, and woodland. Low trees and shrubs are utilized for nesting, and nests will be used more than once. White-tailed hawks eat a variety of prey items, and both sexes bring food to young.

The wood stork is associated with various habitats featuring shallow, standing water, such as prairie ponds, ditches, mudflats, flooded fields, and natural wetlands. This species will utilize both freshwater and saltwater systems, located in either open or forested areas. The wood stork roosts communally in snags, sometimes in association with other species of wading birds (e.g., herons). Colonial wading bird rookeries are documented in the project study area.

Rookeries

In general, nesting dates for herons and egrets range from early-February to late-August in Texas, depending on the species. Great blue herons (*Ardea herodias*) are usually the first to nest. If nesting great blue herons are disrupted and abandon nesting, other species of herons and egrets may not attempt to nest at the rookery that year. A reference that indicates nesting dates for Texas species within rookeries can be found in the TPWD publication, *Nuisance Heronries in Texas*.

> **Recommendation:** TPWD recommends a qualified biologist survey the selected alternative route corridor for rookeries prior to construction. If rookeries are encountered, TPWD recommends avoiding/minimizing disturbance during nesting. TPWD recommends a primary buffer area of 300 meters (984 feet) from the rookery periphery. TPWD recommends avoiding any vegetation clearing within this buffer area as a protection measure to protect the rookery species and their habitat. TPWD recommends a secondary buffer area of 1,000 meters (3,281 feet) from the rookery periphery to avoid clearing activities or construction using heavy machinery during the breeding season (courting and nesting). Construction and permanent easements that would encroach within this buffer area should be adjusted or narrowed to avoid clearing within this buffer area. Utilizing areas that have already been cleared within this buffer area may be acceptable depending on site-specific characteristics. Additionally, human foot traffic or machinery use should not occur within this buffer area during the nesting season.

Recommendation: If rookeries are identified in the project area and details regarding the rookeries are provided, TPWD staff can discuss the ability to feasibly meet the recommended setback distances. Details to aid in decision making includes the size of the rookery (number of nests and area of rookery), species utilizing the rookery, distance of rookery periphery from the construction area, and characteristics regarding the habitat within and surrounding the rookery.

Recommendation: TPWD recommends avoiding disturbance to habitats required by the above-listed birds. If disturbance of these habitats is anticipated, the applicant should coordinate with TPWD to determine avoidance, minimization, and mitigation strategies.

Mammals

The Rafinesque's big-eared bat is a cavity roosting bat species that is also known to utilize buildings and other infrastructure, like culverts, water wells, and bridges. Another important component of suitable habitat for the bats is a source of fresh drinking water, such as lakes, ponds, or streams. Rafinesque's big-eared bat is a non-migratory species and remains active nearly year-round in the southern part of its range. Within areas of suitable habitat, this species will segregate into bachelor and maternity colonies. Maternity colonies are established in late spring, and normally disband by October.

Recommendation: TPWD recommends avoiding disturbance of roost sites that may provide habitat for Rafinesque's big-eared bat. Where suitable roosts occur, TPWD recommends any necessary clearing occur outside of the young-rearing period of approximately May – October. Young bats cannot fly (nonvolant) for three weeks after parturition; thus, young bats are unable to escape and avoid habitat or roost impacts, such as those caused by the clearing of roost trees.

Reptiles

The alligator snapping turtle is the largest freshwater turtle in North America and inhabits both lentic and lotic systems within the southeastern United States. Perennial water is required by the alligator snapping turtle and this species is most often found within the deep-water portions of rivers, canals, oxbows, and swamps. Muddy, vegetated bottoms are preferred. Individual turtles are known to make movements of several river-miles. Nesting occurs in the spring, when female turtles will lay a single clutch of eggs on dry land not far from a water source. Nest sites typically include river berms, high banks, and artificial spoil mounds. Hatchling turtles emerge in the late summer.

While alligator snapping turtles can coexist with some degree of channel modification, negative effects of these activities include the removal of important habitat features (e.g., large woody debris), alteration of hydrology, disruption of nesting sites.

Recommendation: TPWD recommends the applicant and its contractors be aware that alligator snapping turtles or common snapping turtles, which are of similar appearance, may be encountered near water resources when they go on land to lay eggs.

Recommendation: TPWD recommends that the river intake and reservoir outlet structures be designed in a way that protects alligator snapping turtles from becoming lodged in or otherwise harmed during operation of the proposed facilities.

Recommendation: TPWD recommends avoiding disturbance of the waterways within the study area that may be inhabited by the alligator snapping turtle. An on-the-ground survey by a qualified biologist is recommended in areas of suitable habitat to determine if the species is present. If present, TPWD recommends the applicant incorporate actions into the project plans to avoid impacts to this species. TPWD recommends the applicant inform employees and contractors of the potential for the alligator snapping turtle to occur within or near waterbodies within the project area and to avoid harming this species if encountered.

Mussels

Freshwater mussels are one of the most imperiled groups of animals in the U.S. Texas hosts more than 50 species of native freshwater mussels; fifteen freshwater mussel species are listed as threatened in Texas. Populations of these invertebrates have declined precipitously across North America. Most species are very sensitive to disturbance due to their sedentary lifestyle and dependence upon good water quality. Habitat alteration and loss, illegal and over-harvesting, and competition from introduced species are some of the factors in their decline.

Recommendations: TPWD recommends use of BMPs for riparian areas to minimize impacts on mussels (as well as all fish species which may serve as the mussels' larval host). BMPs should include measures such avoiding construction during fish and mussel spawning periods, use of double silt fences, and doubling soil stabilization measures along the banks to avoid increasing the turbidity of waterways. If mussel populations are present within the limits of the proposed project area, those populations should be protected from disturbance to the greatest extent possible.

General Considerations:

Recommendation: TPWD recommends the applicant survey the project area to determine the potential of the site to support the aforementioned state-listed species or their habitat. Surveying the area prior to construction will provide an opportunity to adequately plan to avoid or minimize impacts to state-listed species. Please be aware that species not occurring during site surveys may utilize the habitat within the project area at times beyond those during which the survey was conducted, such as daily or seasonal activity cycles.

Recommendation: TPWD recommends avoiding disturbance to state-listed species during clearing, construction, operation and maintenance of the proposed reservoir. TPWD recommends a biological monitor be present during construction to assist in detecting state-listed species in the project area, especially in areas of suitable habitat including riparian woodlands, bottomland forest, and upland forest. For purposes of relocation, surveys, monitoring, and research, terrestrial state-listed species may only be handled by persons permitted through the TPWD Wildlife Permits Office.

Recommendation: A mixture of cover, food sources, and open ground is important to wildlife. TPWD recommends revegetating disturbed areas within suitable habitat with site-specific native, patchy vegetation rather than sod-forming grasses.

Species of Concern/Special Features

In addition to state and federally-protected species, TPWD tracks special features, natural communities, and rare species that are not listed as threatened or endangered. TPWD actively promotes

their conservation and considers it important to evaluate and, if necessary, minimize impacts to rare species and their habitat to reduce the likelihood of endangerment and preclude the need to list. These species and communities are tracked in the TXNDD.

Please note that the absence of TXNDD information in an area does not imply that a species is absent from that area. Given the small proportion of public versus private land in Texas, the TXNDD does not include a representative inventory of rare resources in the state. Although it is based on the best data available to TPWD regarding rare species, the data from the TXNDD do not provide a definitive statement as to the presence, absence or condition of special species, natural communities, or other significant features within your project area. These data are not inclusive and cannot be used as presence/absence data. This information cannot be substituted for on-the-ground surveys. The TXNDD is updated continuously. As the project progresses and for future projects, please request the most current and accurate information at TexasNatural.DiversityDatabase@tpwd.texas.gov.

> **Recommendation:** Please review the TPWD county list for Brazoria County, as rare species could be present depending upon habitat availability. These lists are available online using the TPWD RTEST web application. If during construction, the project area is found to contain rare species, natural plant communities, or special features, TPWD recommends that precautions be taken to avoid impacts to them. The USFWS should be contacted for species occurrence data, guidance, permitting, survey protocols, and mitigation for federally listed species.
>
> Determining the actual presence of a species in a given area depends on many variables including daily and seasonal activity cycles, environmental activity cues, preferred habitat, transiency and population density (both wildlife and human). The absence of a species can be demonstrated only with great difficulty and then only with repeated negative observations, taking into account all the variable factors contributing to the lack of detectable presence. If encountered during construction, measures should be taken to avoid impacting wildlife.

Data Reporting and the Texas Natural Diversity Database

TPWD maintains records of occurrence for protected and rare species, or SGCN, within the TXNDD and these data are publicly available by request. The TXNDD is intended to assist users in avoiding harm to rare species or significant ecological features. The TXNDD is updated continuously, and relies partially on information submitted by private parties, such as developers or their consultants. Given the small proportion of public versus private land in Texas, the TXNDD does not include a representative inventory of rare resources in the state.

Although it is based on the best data available to TPWD regarding rare species, the data from the TXNDD do not provide a definitive statement as to the presence, absence, or condition of special species, natural communities, or other significant features within a project area. Determining the actual presence of a species in a given area depends on many variables including daily and seasonal activity cycles, environmental activity cues, preferred habitat, transiency, and population density (both wildlife and human). The absence of a species can be demonstrated only with great difficulty, and then only with repeated negative observations, taking into account all the variable factors contributing to the lack of detectable presence. Please note that the absence of TXNDD information in an area does not imply that a species is absent from that area. These data are not inclusive and cannot be substituted for field surveys.

Recommendation: To aid in the scientific knowledge of a species' status and current range, TPWD encourages reporting encounters of protected and rare species to the TXNDD according to the data submittal instructions found at the TPWD Texas Natural Diversity Database: Submit Data webpage.

Thank you for considering potential impacts to Texas' wildlife and natural resources during project planning.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Coastal Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058
281/286-8282 / (FAX) 281/488-5882

In Reply Refer To:
FWS/R2/CESFO/
02ETTX00-2018-
CPA-0029

July 2, 2020

Colonel Timothy Vail
U.S. Army Corps of Engineers, Galveston District
Regulatory Division
Attn: Jayson Hudson
P.O. Box 1229
Galveston, Texas 77553-1229

Dear Colonel Vail:

Thank you for the opportunity to provide comments on the U.S. Army Corps of Engineers (Corps) permit application SWG-2016-01027 from Dow Chemical Company (Dow). Dow's Harris Reservoir Expansion Project (Project) includes the construction of a 1,929-acre impoundment with a storage capacity of 50,000 acre-feet; an intake and pump station from the Brazos River; an outlet to Oyster Creek; and, an emergency spillway. The Project includes floodplain enhancements on Oyster Creek, stream restoration, and temporary construction staging and laydown areas. The proposed Project is located between the Brazos River and Oyster Creek, approximately 8-miles northwest of the City of Angleton in Brazoria County, Texas.

The original permit was published on March 29, 2018, and the U.S. Fish and Wildlife Service (Service) provided comments on April 30, 2018. We participated in an agency site visit on May 10, 2018, and provided additional comments on May 30, 2018. In conjunction with those comments previously submitted to the Corps; information from the May 12, 2020 agency scoping meeting; and, the recent publication of the Notice of Intent to Prepare an Environmental Impact Statement[1], the Service is providing the following additional comments in accordance with the provisions of the Endangered Species Act (Act) of 1973 (16 U.S.C. 1531 et seq.) as amended; Sections 10 of the Rivers and Harbors Act of 1899; Section 404 of the Clean Water Act (33 U.S.C. 1251 et seq.); the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.); the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.); and, the Fish and Wildlife Coordination Act (16 U.S.C. 661-667(e)).

[1] Department of Army, U.S. Army Corps of Engineers. 2020. Notice of Intent to Prepare an Environmental Impact Statement and Public Scoping Meeting for Dow Chemical Company's Harris Reservoir Expansion Project, Brazoria County, Texas (Department of Army Permit SWG-2016-01027). Federal Register 85, No. 67; April 7, 2020. 19460-19462.

Colonel Vail

- In response to concerns regarding potential impacts to floodplains and hydrology, the Corps conducted several studies including a geomorphic assessment of Oyster Creek; a Level I and II stream assessment; a hydrology and hydraulic modeling report; modeling of areas downstream to confirm the floodplain storage; an updated interim hydrogeomorphic functional assessment to determine capacities of the waters of the U.S.; and, a Phase I Environmental Site Assessment[1]. As a cooperating agency, we request all updated reports be provided to our office for a thorough project review and comment. Concerns related to these potential impacts may include, but are not limited to: increase in flooding within the floodplain of the Brazos River and Oyster Creek; mitigation needs to offset impacts to the floodplain, loss or conversion of riparian habitat, and bottomland forested areas; and, impacts to water quality and quantity as it relates to our federally-listed and candidate species and migratory birds.

- The Service is concerned with the clearing of the riparian zone where the pump/in-take station is proposed to be constructed on the Brazos River bank. The removal of the riparian zone along the banks of streams and rivers increases the risk and rate of erosion significantly causing water quality issues and habitat degradation. Impacts to this riparian zone can also alter flooding regimes and alter sensitive bottomland forested areas of habitat. The applicant should avoid and/or minimize impacts to riparian habitats to the maximum extent practical in the design of this Project, including any laydown and staging areas. We recommend implementing best management practices (attached) to minimize potential effects to the Brazos River, Oyster Creek, and their associated riparian zones and its delicate ecosystems.

- The proposed Project proposes to impact 12.19 acres of emergent wetlands, 4.15 acres of forested wetlands, and 20,486.3 linear feet (5.73 acres) of streams. Since the issuance of the public notice in 2018, both a functional and stream assessments were conducted in September 2019. The Corps verified the wetland delineation in October 2019 and plans to revise the conceptual mitigation plan based on these assessments. The applicant should develop a detailed stream mitigation plan pursuant to the requirements of 33 CFR 332.4 (c). We request that the Corps provide this plan to the Service and other resource agencies for review and comment prior to the issuance of this permit.

- We are concerned with temporal loss of forested wetland functions and values posed by the Project. Stream restoration and enhancement will likely require years to stabilize, become functional, and grow mature riparian zones. Loss of habitat for multiple generations could destabilize local populations of species with short life cycles (e.g. amphibians, birds, etc.). The applicant should conduct long-term monitoring of mitigation sites in order to capture the streams' timeframe of recovery[2], and as such, these details should be detailed in the mitigation planning documents.

[2] According to 33 CFR 332.3(e) of the Mitigation Rule, streams are resources that are difficult to replace. The riparian zones of restored streams have also been found to take 25 years or longer to recover (Hasselquist *et al*. 2015).

Colonel Vail

- A plan that includes post-construction site restoration and management activities should be developed and provided to the Service for review and comment. Such a plan should address potential management strategies (i.e. mowing, herbicide use, plantings); ways to avoid/minimize the introduction of nonnative aquatic and plant species into the ecosystem; and, address measures to avoid and/or minimize impacts of such activities to our trust resources (e.g. federally-listed and candidate species, migratory birds, aquatic resources).

- The applicant should conduct baseline and post-restoration assessments of macroinvertebrate (e.g. mussels), fish, and riparian zones within areas of the Project and the proposed in-stream mitigation sites. The Texas fawnsfoot (*Truncilla macrodon*) can potentially occur within the Colorado and Brazos River drainages. The species is currently a candidate and is under review by the Service to determine if protection under the Act is warranted.

- Per prior guidance, post-construction bank restoration strategies should strive to obtain a minimum surviving density of 400 stems/acre of trees and shrubs planted by year 3. Of those, 250 stems/acre should be six feet tall by year 7. As the stand matures and the canopy closes, light will be limited and competition will increase. This will lead to a decrease in population densities to between 100 and 250 stems/acre and producing, in concert with forest management strategies, a sustainable and productive community of native tree species.

Thank you for the opportunity to review and provide comments on this permit. Should additional information be needed, please contact Amber Bearb at 281-212-1501. We anticipate future coordination with Corps regarding their request for informal Section 7 consultation received on June 23, 2020.

Sincerely,

Charles Ardizzone
Project Leader

Enclosures
Best Management Practices For Projects Affecting Rivers, Streams And Tributaries

Colonel Vail

ENCLOSURE

Best Management Practices For Projects Affecting Rivers,

Streams And Tributaries

The project crosses or potentially affects river, stream or tributary aquatic habitat. Therefore the Service recommends implementing the following applicable Best Management Practices:

1. Construct stream crossings during a period of low streamflow (e.g., July - September);
2. Cross streams, stream banks and riparian zones at right angles and at gentle slopes;
3. When feasible, directionally bore under stream channels;
4. Disturb riparian and floodplain vegetation only when necessary;
5. Construction equipment should cross the stream at one confined location over an existing bridge, equipment pads, clean temporary native rock fill, or over a temporary portable bridge;
6. Limit in-stream equipment use to that needed to construct crossings;
7. Place trench spoil at least 25 feet away landward from streambanks;
8. Use sediment filter devices to prevent movement of spoil off right-of-way when standing or flowing water is present;
9. Trench de-watering, as necessary, should be conducted to prevent discharge of silt laden water into the stream channel;
10. Maintain the current contours of the bank and channel bottom;
11. Do not store hazardous materials, chemicals, fuels, lubricating oils, and other such substances within 100 feet of streambanks;
12. Refuel construction equipment at least 100 feet from streambanks;
13. Revegetate all disturbed areas as soon as possible after construction to prevent unnecessary soil erosion. Use only native riparian plants to help prevent the spread of exotics;
14. Maintain sediment filters at the base of all slopes located adjacent to the streams until right-of- way vegetation becomes established;
15. Maintain a vegetative filtration strip adjacent to streams and wetlands. The width of a filter strip is based on the slope of the banks and the width of the stream. Guidance to determine the appropriate filter strip (stream management zone, SMZ) width is provided below; and
16. Direct water runoff into vegetated areas.

Colonel Vail

SMZ WIDTH

SMZ widths should consider watershed characteristics, risk of erosion, soil type, and stream width. SMZ widths are measured from the top of each bank and established on each side of the stream. Erosion risk is increased with sandy soil, steep slopes, large watersheds and increasing stream widths. Recommended primary (refers to ephemeral streams) and secondary SMZ (refers to intermittent, braided, and perennial streams, lakes, and ponds) widths are provided in the table below.

Stream Width (Feet)	Slope (Percent)	Primary SMZ (Feet)	Secondary SMZ (Feet)
<20	< 7	35	0
<20	7-20	35	50
<20	>20	Top of slope or 150	75
20-50	<7	50	0
20-50	7-20	50	50
20-50	> 20	Top of slope or 150	75
> 50	< 7	Width of stream or 100 max.	0
> 50	7-20	Width of stream or 100 max.	50
> 50	> 20	Top of slope or 150	75

PERMIT REQUIREMENTS

A permit may be required from the U.S. Army Corps of Engineers should fill material be placed in wetlands or other waters of the United States. Should such a permit be issued, the BMP's contained in this enclosure, as well as other conservation provisions, should become permit conditions. Additional permit requirements may apply, depending upon the nature of individual projects.

Literature Cited

Arkansas Forestry Commission. 2001. Draft Arkansas Forestry Best Management Practices for Water Quality Protection.

From: Hudson, Jayson M CIV USARMY CESWG (USA)
To: Whitney Fiore; Christine Hartmann; Kara Giblin
Subject: FW: [Non-DoD Source] Re: SPN - SWG-2016-01027 - Dow Chemical Company - Brazos River and Oyster Creek - Brazoria County, Texas
Date: Tuesday, April 14, 2020 3:36:40 PM

EXTERNAL: This email originated from outside SWCA. Please use caution when replying.

I received this from NMFS last Friday in response to our special public notice and NOI. Looks like we can check the box on NMFS and EFH.

Jayson M Hudson
Regulatory Project Manager
409.766.3108

Please tell me how I am doing by completing the survey found at:
http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0

-----Original Message-----
From: charrish stevens - NOAA Federal [mailto:charrish.stevens@noaa.gov]
Sent: Friday, April 10, 2020 11:26 AM
To: SWG201601027 <SWG201601027@usace.army.mil>; _NMFS ser HCDconsultations <nmfs.ser.hcdconsultations@noaa.gov>
Cc: Swafford, Rusty <rusty.swafford@noaa.gov>
Subject: [Non-DoD Source] Re: SPN - SWG-2016-01027 - Dow Chemical Company - Brazos River and Oyster Creek - Brazoria County, Texas

Hello Mr. Hudson,

The NMFS - HCD will not be commenting on the permit application, SWG-2016-01027, for the Harris Reservoir Expansion Project, since we do not have trust resources in this area. The project takes place in freshwater riverine systems and will not be acquiring any additional water rights. Therefore, no tidally influenced areas will be impacted by the proposed expansion of the Harris Reservoir.

Thank you for your coordination,

Charrish Stevens
Fishery Biologist
Habitat Conservation Division
NOAA National Marine Fisheries Service
4700 Av U, Galveston, TX 77551

Office Ph: (409) 766-3699
Fax: (409) 766-3575
Email: charrish.stevens@noaa.gov

<mailto:charrish.stevens@noaa.gov>

From:	charrish stevens - NOAA Federal
To:	Hinton, Michael E CIV USARMY CESWG (US); swg_public_notice; _NMFS ser HCDconsultations; SWG201601027
Cc:	Swafford, Rusty
Subject:	[Non-DoD Source] Re: Notice Of Public Scoping Meeting For Dow Chemical Company's Harris Reservoir Expansion Project, Brazoria County, Texas (Department Of The Army Permit Number SWG-2016-01027)
Date:	Friday, May 29, 2020 10:02:08 AM

Hello Mr. Hudson,

The NMFS - HCD's status on the Dow Chemical Company - Brazos River and Oyster Creek Harris Reservoir Expansion Project, permit application SWG-2016-01027 remains the same as our last response on April 10, 2020. We will not be providing comments on the aforementioned permit application, since we do not have any trust resources in this area. While the footprint of the reservoir is expanding, Dow will not be acquiring additional water rights to fill the proposed expansion. In addition, this proposed expansion occurs wholey in a freshwater riverine system. Therefore, not tidally influenced areas will be impacted by the proposed expansion of the Harris Reservoir.

Thank you,

Charrish Stevens
Fishery Biologist
Habitat Conservation Division
NOAA National Marine Fisheries Service
4700 Av U, Galveston, TX 77551

Office Ph: (409) 766-3699
Fax: (409) 766-3575
Email: charrish.stevens@noaa.gov
<mailto:charrish.stevens@noaa.gov>

On Fri, May 29, 2020 at 12:31 AM Hinton, Michael E CIV USARMY CESWG (US) <Michael.E.Hinton2@usace.army.mil <mailto:Michael.E.Hinton2@usace.army.mil> > wrote:

The U.S. Army Corps of Engineers, Galveston District has scheduled a Virtual Public Scoping Meeting on June 17, 2020 for the Dow Chemical Company's Harris Reservoir Expansion Project Environmental Impact Statement (EIS), for which you might be interested.

From:	charrish stevens - NOAA Federal
To:	SWG201601027; NMFS ser HCDconsultations
Cc:	Swafford, Rusty
Subject:	[Non-DoD Source] Re: SPN - SWG-2016-01027 - Dow Chemical Company - Brazos River and Oyster Creek - Brazoria County, Texas
Date:	Friday, April 10, 2020 11:26:47 AM

Hello Mr. Hudson,

The NMFS - HCD will not be commenting on the permit application, SWG-2016-01027, for the Harris Reservoir Expansion Project, since we do not have trust resources in this area. The project takes place in freshwater riverine systems and will not be acquiring any additional water rights. Therefore, no tidally influenced areas will be impacted by the proposed expansion of the Harris Reservoir.

Thank you for your coordination,

Charrish Stevens
Fishery Biologist
Habitat Conservation Division
NOAA National Marine Fisheries Service
4700 Av U, Galveston, TX 77551

Office Ph: (409) 766-3699
Fax: (409) 766-3575
Email: charrish.stevens@noaa.gov
<mailto:charrish.stevens@noaa.gov>

Environmental Impact Statement Scoping Report

Dow Chemical Company Harris Reservoir Expansion Project

Department of the Army Permit Application
SWG-2016-01027





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1. Introduction

The National Environmental Policy Act of 1969 (NEPA) requires an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. This process is referred to as scoping and is one of several public involvement aspects of the NEPA Environmental Impact Statement (EIS) process. NEPA is a statutory requirement triggered by major federal actions that could significantly affect the quality of the human environment. NEPA requires the identification and analysis of potential environmental effects before those actions take place and serves as a "full disclosure" law with provisions for public access to and public participation in the federal decision-making process.

Scoping is an opportunity for the U.S. Army Corps of Engineers (Corps) to introduce and explain the interdisciplinary approach to our environmental analysis as well as solicit public and agency comments regarding environmental resources, potential impacts, and alternatives that should be included. The Council on Environmental Quality's (CEQ) implementing regulations for scoping (40 C.F.R. § 1501.7(a)) require THE CORPS to:

- Identify people or organizations who are interested in the proposed action;
- Determine the roles and responsibilities of lead and cooperating agencies by identifying other environmental review and consultation requirements so they can be integrated with the EIS;
- Identify the significant issues to be analyzed in the EIS;
- Identify and eliminate from detailed review those issues that will not be significant or those that have been adequately covered in prior environmental review;
- Identify gaps in data and informational needs; and
- Identify any related Environmental Assessments or EIS's.

The CEQ's implementing regulations for scoping (40 C.F.R. § 1501.7(b)) also recommend, but do not require, the Corps to:

- Set page limits on environmental documents;
- Set time limits;
- Hold an early scoping meeting or meetings.

This Scoping Report has been developed for the Corps to share the types of comments/concerns that were received during the scoping period from the general public and the cooperating agencies. It documents outreach efforts during the scoping period and summarizes the primary issues of concern and suggested alternatives from the public. The Scoping Report will be used to develop alternatives for the EIS and identifies issues that are important to the public and should be considered in the analysis of the EIS.

1.1. Project Background

The Corps received a permit application for a U.S. Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act from Dow Chemical Company (Dow) for the proposed Project. The goal of the project is to utilize Dow's existing run-of-river water rights from the Brazos River to improve reliability for the existing Brazoria and Harris reservoir system during extended drought conditions.

The project includes the construction of an off-channel impoundment reservoir with a nominal storage capacity of 50,000-acre-feet that would be located directly upstream and adjacent to the existing Harris Reservoir. The proposed reservoir would cover approximately 2,000 acres and would include a pumped intake station on the Brazos River and a gravity outfall to Oyster Creek through the construction of a new bypass channel.

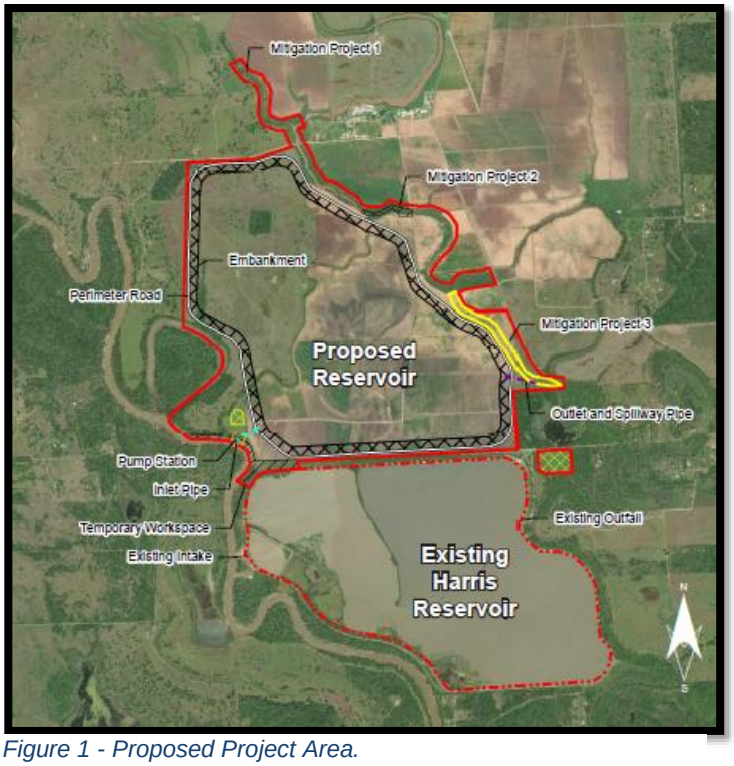

Figure 1 - Proposed Project Area.

The proposed reservoir would operate with the existing Harris and Brazoria reservoirs in a manner similar to current operations. During periods of drought, the proposed reservoir would be exhausted first, followed by the existing Harris Reservoir, and then the Brazoria Reservoir. As with current operations, emergency releases would occur due to severe weather, such as tropical storms and hurricanes exhibiting wind speeds that could potentially overtop the embankments.

The proposed Project includes plans for the mitigating of impacts via restoration projects, all on Oyster Creek. These three projects (referred to as Mitigation Projects 1, 2, and 3) to enhance the flood capacity and to provide restoration and enhancements of the plant habitats and communities along the river bank (riparian area). The proposed stream restoration includes creating flat or shallowly sloped areas above the bankfull height to slow high velocity flows during storm events (bankfull benching), 100-foot buffer preservation, and buffer re-establishment up to 200 feet.

- Mitigation Project 1 is located on a 3,600-linear-foot unnamed tributary to Oyster Creek.
- Mitigation Project 2 is located on a 12,860-linear-foot segment of Oyster Creek.
- Mitigation Project 3, located on an 11,200-linear-foot segment of Oyster Creek, would serve as a receiving channel conveying overflows from Oyster Creek during high flows by providing additional hydraulic conveyance capacity in the floodplain, and would provide additional flood storage capacity by receiving backwater from Oyster Creek at the downstream end of Project 3 during flood events.


Figure 2 – Example Proposed Project improvements

1.2. Purpose and Need for Proposed Project

The Corps is required to restate the purpose and need for the project from the public interest perspective. The Corps, after coordinating with the cooperating agencies, developed the following overall purpose to identify and screen alternatives to the applicant's proposed Project:

To utilize Dow's existing run-of-river water rights from the Brazos River to improve reliability during extended drought conditions for the existing water supply system that serves Dow's Texas Operations in Freeport as well as other industrial, community and potable water users that rely on Dow's water supply. Based on modeling, Dow estimates that a total of 78,000 acre-feet of water storage capacity is necessary to provide Texas Commission on Environmental Quality's recommended 180 days of drought resilience. The current combined storage capacity in the existing Brazoria and Harris reservoirs is approximately 29,000 acre-feet. Therefore, Dow will need to develop the Harris Reservoir Expansion Reservoir to provide an additional storage capacity of at least 49,000 to provide a reliable water supply during drought.

2. Scoping Process

2.1. Transition to Virtual Meetings

On March 24, 2020, the Corps issued a memorandum: *Interim Army Procedures for National Environmental Policy Act (NEPA)* in response to the coronavirus (COVID-19) pandemic. The memorandum established interim Army NEPA procedures in consideration of the COVID-19 public health emergency. These interim NEPA procedures apply to all Army NEPA proponents responsible for NEPA compliance. The memorandum directed the following actions related to public meetings and the NEPA process:

- NEPA public meetings will be transitioned to virtual meetings, postponed, or cancelled, as deemed appropriate by the Army NEPA proponent.
- Alternative means of public engagement will be implemented and documented in public participation plans. Virtual meetings may be conducted using online meeting / collaboration tools, teleconference, social media, or email, as appropriate.
- NEPA public and Federal Register notices will inform the public about these alternative participation procedures and how to obtain NEPA materials on the project web site or through the mail. Public notices will provide a contact phone number, email, website address, and mailing address.
- Project information, including, but not limited to, scoping materials, draft NEPA documents, and comment forms will be available on project websites. This includes materials normally presented at public meetings.
- Project information, including, but not limited to, scoping materials, draft NEPA documents, and comment forms will be sent through the mail as either hard copies or as printable compact discs (as requested). Mailed materials will include requested materials normally presented at public meetings and materials on the project website.
- Army NEPA proponents will ensure cooperating agencies are aware of these NEPA alternative participation procedures.

In response to this memorandum, the Corps determined that the scoping meeting for the proposed Project would be moved to a virtual platform in accordance with the above interim procedures.

2.2. Public Notification of Scoping

2.2.1. Notice of Intent

The Corps published a Notice of Intent (NOI) and initiated the scoping process on the Federal Register to notify the public of the intent to prepare a draft EIS (DEIS) on April 9, 2020. The NOI also provided information about the proposed Project and invited the public to attend and provide comments and information to better enable the Corps to make a reasonable decision on factors that affect the public interest. A copy of the NOI is included in **Appendix A**.

2.2.2. Mailed Notices

A total of 27 notices to interested parties and local, state, and federal elected officials were sent via mail on May 27, 2020, announcing the public meeting scheduled for June 17, 2020. The notices provided information about the proposed Project and invited the public to attend and provide comments and information to better enable the Corps to make a reasonable decision on factors that affect the public interest. A copy of the mailed notices and the stakeholder mailing list are included in **Appendix A**.

2.2.3. Newspaper Notice

A public notice announcing the virtual public scoping meeting on June 17, 2020, was published in English and Spanish as a legal advertisement in the following publications in May and June 2020.

- Houston Chronicle – May 27, 2020
- The Weekly Bulletin of Brazoria County – May 27, 2020
- La Voz (Spanish) – June 7, 2020

The public notice also included information about the proposed Project and information about how to access the virtual public scoping meeting. Copies of the public notices in English and Spanish are included in **Appendix A**.

2.2.4. Email Notices

A total of 59 notices were sent to interested parties and local, state, and federal elected officials via email on May 27, 2020, announcing the virtual public scoping meeting scheduled for June 17, 2020. The notices provided information about the proposed Project, provided a link to the project website and invited the public to attend and provide comments and information to better enable the Corps to make a reasonable decision on factors that affect the public interest. A copy of the email notices and the mailing list are included in **Appendix A**.

2.2.5. Affected Party Letter

An Affected Party Letter was mailed out to 25 affected parties on May 27, 2020, to provide information about the proposed Project, provide a link to the project website and invite the affected parties to attend and provide comments and information to better enable the Corps to make a reasonable decision on factors that affect the public interest. A copy of the Affected Party Letter is included in **Appendix A**.

2.2.6. Website

A third-party website (publicinput.com/Dow-Reservoir-EIS) was established in May 2020 for the virtual public scoping meeting process. The website provides overview information about the

proposed Project, the virtual public scoping meeting notice, meeting date, time, and access information. Available information materials such as Frequently Asked Questions, Project Factsheets, and informational videos about the proposed Project and the EIS process were also included on the website and are included in **Appendix B**. Additionally, the website provides information on the multiple ways of submitting comments for participants, including an online comment portal and the project phone line to submit voice and text message comments. Images of the website are included in **Appendix C**.

3. Public Scoping Meeting Summary

A virtual public scoping meeting, hosted by the Corps, Galveston District, for the proposed Project EIS was held online via Cisco WebEx Events on Wednesday, June 17, 2020.

The purpose of this virtual public scoping meeting was to provide the public with information about the proposed Project and to solicit comments and information to better enable the Corps to make a reasonable decision on factors affecting the public interest.

In consideration of the inability to hold a traditional meeting in-person and to comply with *U.S. Army Corps of Engineers Stakeholder Engagement, Collaboration, and Coordination Engineering Pamphlet 1105-2-57* and to accommodate public participation and access to the greatest extent practicable, the following measures were taken:

- The public comment period was extended from 30 to 90 days.
- A virtual meeting was noticed to stakeholders via email, regular mail and advertised in three local newspapers.
- Non-traditional means to submit comments were established, including:
    - Voicemail commenting through a project phone line (855-925-2801)
    - Text message commenting through a project phone line (855-925-2801)
    - An online comment portal on a third-party project website (https://www.publicinput.com/Dow-Reservoir-EIS)

Prior to the scoping meeting, attendees were prompted to register and were asked for their first name, last name, phone number, email address, if they were an elected official, and if they planned to provide a verbal comment during the commenting period. A total of 50 people attended the virtual public scoping meeting.

The public meetings began with opening remarks from Col. Timothy Vail of the Corps Galveston District. Following opening remarks, the meeting proceeded with a presentation of the proposed Project led by Mr. Greg Bong, a representative from Dow, and this presentation was followed by presentations about the EIS scoping process, the purpose and need of the proposed Project, and known environmental concerns led by Mr. Jayson Hudson, a representative of the Corps. Electronic links to view the opening remarks and presentations from Dow and the Corps are included in **Appendix D**.

Following the formal presentation portion of the virtual public scoping meeting, attendees were invited to provide verbal comments. Attendees wishing to provide comments were required to sign up either by indicating their intent to provide a verbal comment during online meeting registration or by using the virtual “Raise Hand” feature available on the Cisco WebEx Events platform during the meeting. Attendees were called to speak in the order in which they registered. Each speaker was provided with three minutes to speak and was asked to state and spell their first and last name before speaking. Verbal comments were recorded through the Cisco WebEx Events platform and provided to a court reporter for transcription following the virtual public

scoping meeting. Each meeting adjourned following the verbal commenting period. In addition to verbal comments, attendees were invited to submit comments through email, the project website, text message, or voice message.

4. Comments Received

4.1. Comment Collection Methods

All comments received during the 90-day comment period, and those received after the comment period to the extent practicable, were reviewed and considered. The comment deadline for the study was Thursday July 2, 2019. Comments were received via the following channels:

- Verbal comments were received during the formal public commenting portion of the virtual public scoping meeting.
- Comment forms were mailed to Mr. Jayson Hudson U.S. Army Corps of Engineers, Galveston District, Regulatory Branch P.O. Box 1229, Galveston, Texas 77553-1229.
- Electronic comments were received via the project email addresses at Dow-Reservoir-EIS@publicinput.com and SWG201601027@usace.army.mil.
- Text message comments were received by texting “DOW” or 369 to 855-925-2801.
- Voice message comments were received via phone at 855-925-2801 (dial 8816).

4.2. Comment Tabulation

A total of 48 comments were received from all the available channels. A database of comments submitted is available in **Appendix E**. Verbal comments were recorded in the public meeting transcript from the virtual public scoping meeting, available in **Appendix F.** Below is the breakdown of how many comments were collected through the commenting period from each of the available channels:

- Verbal comments (4)
- Comments submitted through email/website comment portal (28)
- Comments submitted through mail (11)
- Comments submitted through text (1)
- Comments submitted through voice message (4)

4.3. Comment Summary

The following list indicates the subjects identified in the 48 public comments received during the virtual scoping meeting (tally of associated comments):

- Comments addressing *public involvement* for the proposed Project (38)
    - Comments addressed the public not having access to studies, assessments, reports, and analysis available for their review.
    - Comments addressed interest in future project updates, meetings, documents, and requests to be notified when information becomes available.
- Comments addressing *environmental* concerns (mitigation, air/water quality, erosion, etc.) with the proposed Project (37)
    - Comments addressed concern for the water quality due to changes in sediment transport.
    - Comments addressed the possibility for areas to flood due to increased erosion.
    - Comments addressed the need for mitigation plans to address the impact to streams and wetland functions.

- Comments addressing *alternatives* to the proposed Project (22)
    - Comments expressed alternatives to increase drought reliability, water conservation, desalination, and enhance reclaimed water use.
    - Comments recommended to deepen and modify the current Harris and Brazoria reservoirs.
- Comments addressing *flooding* concerns with the proposed Project (16)
    - Comments addressed concern about a possible increase in flooding in areas that recently flooded due to the building of the reservoir.
    - Comments addressed concerns over removing "absorption capabilities" during heavy rainfall, storms and hurricanes.
    - Comments addressed concerns for the flooding upstream and downstream of the proposed reservoir.
- Comments addressing *property acquisition* concerns with the proposed Project (9)
    - Comment requesting if property acquisition will be required as a result of building the reservoir.
- Comments indicating *general opposition* for the proposed Project (6)
    - Comments indicated opposition to the project due to the damage the proposed Project will cause to properties surrounding the reservoir.
- Comments addressing the *purpose and need* for the proposed Project (6)
    - Comments addressed the lack of documentation
    - Comments addressed the purpose and need of the project in 2018 and 2020.
- Comments requesting for *additional studies* to be completed for the proposed Project (3)
    - Comments request the need to make studies and reports available to the public online.

5. Alternatives

The Corps evaluated information obtained from scoping and with federal and state agencies as well as the public as well as data collection and analysis of environmental, socioeconomic, and engineering factors as part of development of alternatives to the proposed Project. The Corps prioritized minimization of impacts, both individually and cumulatively, to aquatic resources during both construction and operations in its development of alternatives. Using these concepts and considering avoidance and minimization to reduce impacts, the following seven Project alternatives were identified.

1. **No Action Alternative:** Under the No Action Alternative, no additional water storage would be constructed and that the proposed activity would not take place and Dow would continue to operate their water supply system as is currently done. The No Action alternative would include Dow's current water conservation and water reclamation projects.
2. **The Harris Reservoir Expansion Project Alternative:** This alternative includes construction of an off-channel reservoir located on approximately 2,000 acres directly north of the existing Harris Reservoir to add approximately 50,000 acre-feet of additional storage capacity and estimated annual yield of approximately 80,000 acre-feet. This location is in the floodplain for the Brazos River and Oyster Creek and adjacent to Dow's existing infrastructure.
3. **The Harris Expansion Project – Alternate Embankment Configuration:** This alternative includes alternate site layout for the construction of an off-channel reservoir located on approximately 2,000 acres directly north of the existing Harris Reservoir to add approximately 50,000 acre-feet of additional storage capacity and estimated annual yield

of approximately 80,000 acre-feet. Alternative site layouts, or on-site alternatives, may reduce impacts to the Brazos River and Oyster Creek.

4. **The Off-Channel Reservoir–West Bank Brazos River Alternate Location**: This alternative will be located on the west bank of the Brazos River. This alternative would include consideration of an area outside the Oyster Creek Floodplain to construct a 50,000 AF reservoir and would allow Dow to use their existing Brazos River water rights but is not adjacent to Dow's existing infrastructure.
5. **The Allens Creek Reservoir Alternative:** This alternative is a proposed water supply storage reservoir planned for construction near the City of Wallis in Austin County. The off-channel reservoir is near the Brazos River on Allens Creek, a tributary of the Brazos, composed of diversions from the mainstem of the Brazos River which would be pumped to the impoundment formed by a dam on Allens Creek. The reservoir with have a storage capacity of up to 145,533 acre-feet and an approximate annual yield of 99,650 acre-feet. The maximum permitted diversion rate is 2,200 cubic feet per second (cfs) or approximately 1,400 MGD. The water right for Allens Creek Reservoir are owned by the Brazos River Authority and the City of Houston.
6. **The Seawater Desalination Alternative:** This alternative would include diversion of seawater using an intake facility, a reverse osmosis plant, an outfall to discharge brine concentrate, as well as water conveyance facilities.
7. **The Brackish Water Desalination Alternative:** This alternative would include diversion of brackish water from the Brazos River using an intake facility, a reverse osmosis plant, an outfall to discharge brine concentrate, as well as water conveyance facilities.

The Corps conducted a multi-step process to screen the range of alternatives to determine which alternatives are reasonable, practicable, and meet the Project purpose. The Project alternatives were analyzed using the following screening criteria to identify a range of reasonable alternatives: satisfaction of the overall Project purpose; practicable based on Clean Water Act Section 404(b)(1) Guidelines (technology, logistics, cost); and consideration of potential aquatic resources impacts. The alternatives screening analysis is summarized in **Table 1**.

Table 1. Comparison Summary of Alternatives

Alternative	**Carried Forward (Yes/No)**			
	Purpose and Need	**Practicability - Technology**	**Practicability - Logistics**	**Practicability - Cost***
No Action	No	Yes	Yes	Yes
Harris Reservoir Expansion	Yes	Yes	Yes	Yes
Harris Expansion Alternate Embankment Configuration	Yes	Yes	Yes	Yes
Harris Expansion Project –West Bank Brazos River Location Alternate	Yes	Yes	Yes	Yes
Allen's Creek Reservoir	No	Yes	No	Yes
Seawater Desalination	No	Yes	Yes	No
Brackish Water Desalination	Yes	Yes	Yes	Yes

Alternative	Carried Forward (Yes/No)			
	Purpose and Need	**Practicability - Technology**	**Practicability - Logistics**	**Practicability - Cost***
**It is not a particular applicant's financial standing that is the primary consideration for determining practicability in regards to cost, but rather characteristics of the project and what constitutes a reasonable expense for these projects that are most relevant to practicability determinations.*				

Based on this analysis, the Corps determined that the No Action Alternative and four action alternatives will be carried forward for detailed analysis in the EIS. Both the Seawater Desalination alternative and Allens Creek Reservoir alternatives were eliminated because they do not allow Dow to use their existing run-of-river water rights from the Brazos River. In addition, the Allens Creek Reservoir site is owned by the Brazos River Authority and the City of Houston and is not reasonably available to Dow.

6. Next Steps in the NEPA Process

The next step in the NEPA process for the proposed Project is consideration of scoping comments related to resource issues and identification of any additional data and analyses that may be required to conduct an analysis of environmental consequences on resources to develop the DEIS. Once the DEIS is completed, the Corps will issue a Notice of Availability (NOA) indicating that the DEIS is available for public review and comment. The DEIS will summarize the results of multiple technical reports or studies that will be relied upon to determine effects of the proposed Project (e.g. biological assessment, hydrologic and hydraulic analysis, etc.). These technical reports and studies will be appended to the DEIS for review by the public. All individuals who have already expressed interest in the proposed Project either during the Public Notice period for the DA permit application in 2018 or during the scoping, will be notified either via email, regular mail or both that the DEIS is available for public review. The DEIS and appendices will be available to the public during the comment period on the Corps project website:

https://www.swg.usace.army.mil/Business-With-Us/Regulatory/Special-Projects-Environmental-Impact-Statements/

During the public comment period for the DEIS, the Corps will hold a public meeting to provide the public with an opportunity to provide verbal comments on the DEIS. The public meeting on the DEIS will be held in-person or virtually similar to the Scoping Meeting on June 17, 2020. If COVID-19 pandemic considerations are in effect at the time of the public meeting, a virtual meeting will be conducted in compliance with Interim Army Procedures for NEPA (March 24, 2020), similar to the Project Scoping Meeting held on June 17, 2020. The NOA will include information on the public meeting and how it is to be conducted.

After the conclusion of the comment period for the DEIS, the Corps will prepare the final EIS (FEIS). Similar to the DEIS, the Corps will issue an NOA indicating that the FEIS is available for public review. It will be posted on the same Corps project website as the DEIS. Following publication of the FEIS, the Corps will decide on the DA permit for the proposed Project. The proposed timeline for these next steps is located on the Permitting Dashboard for Federal Infrastructure Projects:

https://www.permits.performance.gov/permitting-project/dow-chemical-companys-harris-reservoir-expansion-eis

Appendix A

Public Notices

Affected Party Letter

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, GALVESTON DISTRICT
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

May 27, 2020

Regulatory Division

SUBJECT: Public Scoping Workshop for Dow Chemical Company's Harris Reservoir Expansion Project, Brazoria County, Texas
(Department of the Army (DA) Permit SWG-2016-01027)

Affected Party
ADDRESS
CITY, STATE ZIP

Dear Mr. Ms. AFFECTED PARTY NAME:

This is to notify you of the upcoming Public Scoping Meeting for the proposed Harris Reservoir Expansion Project (proposed Project) on June 17, 2020. In accordance with the March 24, 2020, U.S. Army Corps of Engineers (Corps) Interim Army Procedures for National Environmental Policy Act (NEPA) which relates to COVID-19, all public meetings will be conducted virtually. For the proposed Project, the public involvement process will be conducted using PublicInput.com.

The Corps Galveston District invites all affected federal, state, and local agencies, affected Native American Tribes, other interested parties, and the general public to participate in the NEPA process during development of the environmental impact statement (EIS) for the proposed Project. The purpose of the public scoping process is to provide information to the public, narrow the scope of analysis to significant environmental issues, serve as a mechanism to solicit agency and public input on alternatives and issues of concern, and ensure full and open participation in scoping for the draft EIS.

Dow Chemical Company (Dow) requested a DA permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act for the proposed Project. The proposed Project site is located between the Brazos River and Oyster Creek approximately 8 miles northwest of the City of Angleton in Brazoria County, Texas. The proposed project evaluated in the draft EIS is for the discharge of dredged or fill material into waters of the United States, and the construction of structures and/or work that may affect navigable waters.

A virtual scoping meeting will be held online at 4:00 p.m. on June 17, 2020. The public meeting will be presented online to provide information about the proposed Project and to receive public input and comment on the draft EIS. Access information, instructions, an opportunity to subscribe to project updates, and additional information regarding this project will be made available prior to the virtual meeting at https://www.publicinput.com/Dow-Reservoir-EIS.

The Corps invites full public participation to promote open communication on the potential concerns surrounding the draft EIS. In addition, participation by Federal, State,

local agencies and other interested organizations is encouraged. Both oral and written statements will be accepted at the meeting through several channels including a virtual comment portal, telephone, and text message. Materials and visual depictions of the proposed Project and associated impacts will be available.

Each speaker will be given 3 minutes. Please keep your time to 3 minutes or less. If you do not need the full 3 minutes, help us to move the process along by only using the time you need. If you have additional comments that you would like to submit beyond what you are able to address during your time allotted, please submit them in writing. Written comments are just as valid and count the same as verbal comments presented during the Public Scoping Meeting. Questions for Dow related to the proposed Project or the Corps' regulatory and Civil Works process may be submitted to the website referenced above via email, via voice message at the toll-free number 855-925-2801 (dial 8816), or by texting "DOW" or 369 to 855-925-2801.

The public meeting will be conducted in English. Those in need of language interpreters should contact the Corps' Public Involvement consultant, Hollaway Environmental + Communications Services, Inc. (713) 868-1043, by June 10, to make arrangements. Every effort will be made to address requests.

Any comments received at the virtual public meeting will be considered by the Corps to assist in determining whether to issue, modify, condition, or deny a permit for the Project. Comments will be considered in the draft EIS analysis pursuant to NEPA and used to help determine the overall public interest of the proposed Project. All comments must be received or postmarked by Thursday, July 2, 2020, (15 calendar days following the public meeting).

Written comments regarding the proposed EIS scope should be addressed to Mr. Jayson Hudson, USACE, Galveston District, Regulatory Branch, P.O. Box 1229, Galveston, Texas 77553-1229. Individuals who would like to electronically provide comments should contact Mr. Hudson by electronic mail at: SWG201601027@usace.army.mil. Emailed comments, including attachments, should be provided in .doc, .docx, .pdf or .txt formats.

For information about this project, to be included on the mailing list for future updates and meeting announcements, or to receive a copy of the draft EIS when it is issued, contact Mr. Jayson Hudson, at the Corps at (409) 766-3108, the email address SWG201601027@usace.army.mil, or the address provided above.

Sincerely,

Jayson Hudson
Regulatory Project Manager
Policy Analysis Branch

Notice of Intent

internet. Please note that responses to this public comment request containing any routine notice about the confidentiality of the communication will be treated as public comment that may be made available to the public, notwithstanding the inclusion of the routine notice.

FOR FURTHER INFORMATION CONTACT: Arminda Pappas, 202–606–6659, or by email at *apappas@cns.gov*.

SUPPLEMENTARY INFORMATION:

Title of Collection: Application Instructions for AmeriCorps State and National Competitive New and Continuation.

OMB Control Number: 3045–0047.

Type of Review: Renewal.

Respondents/Affected Public: Organizations and State, Local or Tribal Governments.

Total Estimated Number of Annual Responses: 450.

Total Estimated Number of Annual Burden Hours: 18,000.

Abstract: The application instructions conform to the Corporation for National and Community Service's online grant application system, eGrants, which applicants must use to respond to CNCS Notices of Funding Opportunities. CNCS also seeks to continue using the currently approved information collection until the revised information collection is approved by OMB. The currently approved information collection is due to expire on June 30, 2020.

Comments submitted in response to this notice will be summarized and/or included in the request for OMB approval. Comments are invited on: (a) Whether the collection of information is necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility; (b) the accuracy of the agency's estimate of the burden of the collection of information; (c) ways to enhance the quality, utility, and clarity of the information to be collected; (d) ways to minimize the burden of the collection of information on respondents, including through the use of automated collection techniques or other forms of information technology; and (e) estimates of capital or start-up costs and costs of operation, maintenance, and purchase of services to provide information. Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; to develop, acquire, install and utilize technology and systems for the purpose of collecting, validating and verifying information, processing and maintaining information, and disclosing and providing information; to train personnel and to be able to respond to a collection of information, to search data sources, to complete and review the collection of information; and to transmit or otherwise disclose the information. All written comments will be available for public inspection on *regulations.gov*.

Dated: March 31, 2020.

Arminda Pappas,

Grant Review Manager.

[FR Doc. 2020–07217 Filed 4–6–20; 8:45 am]

BILLING CODE 6050–28–P

DEPARTMENT OF DEFENSE

Department of the Army, Corps of Engineers

Intent To Prepare an Environmental Impact Statement and Public Scoping Meeting for Dow Chemical Company's Harris Reservoir Expansion Project, Brazoria County, Texas (Department of the Army Permit SWG–2016–01027)

AGENCY: U.S. Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of intent.

SUMMARY: The U.S. Army Corps of Engineers (Corps), Galveston District, has received a permit application for a U.S. Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act from Dow Chemical Company (Dow) (SWG–2016–01027) for the Harris Reservoir Expansion Project (proposed Project). The proposed Project site is located between the Brazos River and Oyster Creek approximately 8 miles northwest of the City of Angleton in Brazoria County, Texas. The primary federal involvement associated with the proposed action (proposed Project) is the discharge of dredged or fill material into waters of the United States (U.S.), and the construction of structures and/or work that may affect navigable waters. Federal authorizations for the Project would constitute a major federal action. Based on the potential impacts, both individually and cumulatively, the Corps intends to prepare an environmental impact statement (EIS) in compliance with the National Environmental Policy Act (NEPA) to render a final decision on the permit applications. The Corps' decision will be to issue, issue with modification, or deny DA permits for the proposed action. The EIS will assess the potential social, economic, and environmental impacts of the construction and operation of the proposed project, and is intended to be sufficient in scope to address federal, state, and local requirements; environmental and socioeconomic issues concerning the proposed action; and permit reviews.

ADDRESSES: Written comments regarding the proposed EIS scope should be addressed to Mr. Jayson Hudson, USACE, Galveston District, Regulatory Branch, P.O. Box 1229, Galveston, Texas 77553–1229. Individuals who would like to electronically provide comments should contact Mr. Hudson by electronic mail at *SWG201601027@usace.army.mil.* Emailed comments, including attachments, should be provided in .doc, .docx, .pdf or .txt formats.

FOR FURTHER INFORMATION CONTACT: For information about this project, to be included on the mailing list for future updates and meeting announcements, or to receive a copy of the Draft EIS when it is issued, contact Mr. Jayson Hudson, at the Corps at (409) 766–3108, email address *SWG201601027@usace.army.mil,* or the address provided above.

SUPPLEMENTARY INFORMATION: The Corps Galveston District intends to prepare an EIS for the proposed Harris Reservoir Expansion Project located in Brazoria County, Texas. The proposed Project would include the construction of a 1,929-acre impoundment with a nominal storage capacity of 50,000 acre-feet, an intake and pump station to divert Dow's existing surface water rights from the Brazos River, an outlet to Oyster Creek, and an emergency spillway. The Project would also include floodplain enhancements on Oyster Creek, stream restoration, and temporary construction staging and laydown areas. As part of the Department of the Army permit application process, a public notice was issued on March 2, 2018. The purpose of the public notice was to initiate an early public scoping process to solicit comments and information from the public as well as state and federal agencies to better enable us to make a reasonable decision on factors affecting the public interest. All comments received to date, including those provided for review during the public notice comment period, will be considered by the Galveston District during EIS preparation.

1. *Scoping Process/Public Involvement:* The Corps invites all affected federal, state, and local agencies, affected Native American Tribes, other interested parties, and the

general public to participate in the NEPA process during development of the EIS. The purpose of the public scoping process is to provide information to the public, narrow the scope of analysis to significant environmental issues, serve as a mechanism to solicit agency and public input on alternatives and issues of concern, and ensure full and open participation in scoping for the Draft EIS. To ensure that all of the issues related to this proposed project are addressed, the Corps will conduct public scoping meeting(s) in which agencies, organizations, and members of the general public are invited to present comments or suggestions with regard to the range of actions, alternatives, and potential impacts to be considered in the EIS. The scoping meeting will begin with an informal open house including a presentation of the proposed action and a description of the NEPA process. These will be held in person, or virtually, as determined by the Agency. Comments will be accepted for 14 days following the scoping meeting. Displays and other forms of information about the proposed action will be available, and the Corps and Dow personnel will be present at the informal session to discuss the proposed project and the EIS Process. The Corps invites comments on the proposed scope and content of the EIS from all interested parties. Verbal transcribers will be available at the scoping meeting to accept verbal comments. A time limit will be imposed on verbal comments. Written comments may be submitted prior, during, or up to 14 days after the scoping meeting. The specific dates, times, and locations of the meetings will be published in press releases, special public notices and on the Corps' project website: *https://www.swg.usace.army.mil/Business-With-Us/Regulatory/Special-Projects-Environmental-Impact-Statements/.*

2. *Project Background:* The proposed Project would consist of the following:

Component 1: Construction of an approximately 50,000-acre-foot off-channel impoundment reservoir would be located directly upstream and adjacent to the existing Harris Reservoir, referred to as the Harris Reservoir Expansion. The proposed reservoir would cover approximately 2,000 acres and would include a pumped intake station on the Brazos River and gravity outfall to Oyster Creek via a new bypass channel that would be constructed. The proposed reservoir would operate with the existing Harris and Brazoria Reservoirs in a manner similar to current operations. During periods of drought, the proposed reservoir would be exhausted first, followed by the existing Harris Reservoir, and then the Brazoria Reservoir. As with current operations, emergency releases would occur because of severe weather, such as tropical storms and hurricanes with wind speeds that can overtop the embankments.

Component 2: As part of the proposed Project, Oyster Creek restoration is planned under three projects (referred to as Projects 1, 2, and 3) to enhance the flood capacity and to provide riparian restoration and enhancements. Stream restoration projects comprise bankfull benching, 100-foot buffer preservation, and buffer re-establishment out to 200 feet. Project 1 is located on a 3,600-linear-foot unnamed tributary to Oyster Creek, and Project 2 is located on a 12,860-linear-foot segment of Oyster Creek. Project 3, located on an 11,200-linear-foot segment of Oyster Creek, would serve as a receiving channel conveying overflows from Oyster Creek during high flows by providing additional hydraulic conveyance capacity in the floodplain, and would provide additional flood storage capacity by receiving backwater from Oyster Creek at the downstream end of Project 3 during flood events.

Planning: In response to public concerns on potential impacts to floodplains and hydrology raised during the 2018 Public Notice scoping period, Dow prepared the following studies:

(i) A geomorphic assessment of Oyster Creek that applied Rosgen Stream Classification Levels I, II, and III. The assessment was used to develop the proposed Oyster Creek enhancement prescriptions.

(ii) A Level I and II stream condition assessment to determine the functions and values for wetlands and waters of the U.S. that would be affected as a result of reservoir and associated facility placement.

(iii) A hydrology and hydraulic modeling report using HEC–HMS, Riverware™, and HEC–RAS models. HEC–HMS provides hydrologic modeling, Riverware™ provides reservoir operational modeling, and HEC–RAS provides hydraulic modeling. The modeling and analysis focused on drought conditions during the life of the proposed Project.

(iv) Planning-level floodplain analysis and modeling for areas downstream of the proposed Project to confirm the floodplain storage changes that would occur if the proposed Project is implemented.

(v) An updated interim hydrogeomorphic functional assessment to determine the functional capacities of wetlands and waters of the U.S. within the proposed Project site.

(vi) Other planning studies, including a Phase I Environmental Site Assessment.

Mitigation: Since the Public Notice was issued, additional wetland delineation work was conducted in September 2019 that included preparation of a functional assessment and stream assessment referred to above. The Corps verified that wetland delineation on October 10, 2019. A conceptual mitigation plan was submitted with the Section 404 Permit application in 2018 to address compensation of unavoidable impacts to waters of the U.S. The conceptual mitigation plan will be revised based on the verified wetland delineation and results of the functional assessment and stream assessments and as part of the EIS development.

3. *Location:* The project site is located between the Brazos River and Oyster Creek approximately eight miles northwest of the City of Angleton and abuts the Brazos River. The project can be located on the U.S.G.S. quadrangle map titled: OTEY, Texas.

4. *Purpose and Need:* The purpose of the proposed Project is to utilize Dow's existing run-of-river water rights from the Brazos River to improve reliability during extended drought conditions for the existing water supply system that serves Dow's Texas Operations in Freeport as well as other industrial, community and potable water users that rely on Dow's water supply. Based on modeling, Dow estimates that a total of 78,000 acre-feet of water storage capacity is necessary to provide Texas Commission on Environmental Quality's recommended 180 days of drought resilience. The current combined storage capacity in the existing Brazoria and Harris reservoirs is approximately 29,000 acre-feet. Therefore, Dow will need to develop the Harris Reservoir Expansion Reservoir to provide an additional storage capacity of at least 49,000 to provide a reliable water supply during drought.

5. *Alternatives:* An evaluation of alternatives to Dow's preferred alternative initially being considered includes a No Action alternative; alternatives that would avoid, minimize, and compensate for impacts to the environment within the proposed Project footprint; alternatives that would avoid, minimize, and compensate for impacts to the environment outside the footprint; alternatives using alternative practices; and other reasonable alternatives that will be developed through the Project scoping process, which may also meet the identified purpose and need.

6. *Public Involvement:* The purpose of the public scoping process is used to determine relevant issues that will influence the scope of the environmental analysis and EIS alternatives. General concerns in the following categories have been identified to date: Waters of the U.S. including wetlands, water quality, sedimentation and erosion, hydrology and flood hazards, water rights, wildlife and aquatic species, migratory birds, threatened and endangered species, invasive species, air quality, environmental justice, socioeconomic environment, archaeological and cultural resources, navigation and recreational resources, hazardous waste and materials, public health and safety, downstream and off-site impacts, and cumulative impacts. All parties who express interest will be given an opportunity to participate in the process.

7. *Coordination:* The proposed action is being coordinated with a number of federal, state, regional, and local agencies, including the U.S. Environmental Protection Agency (a cooperating agency under NEPA), U.S. Fish and Wildlife Service, U.S. National Marine Fisheries Service, Texas Commission on Environmental Quality, Texas General Land Office, and Texas Parks and Wildlife Department.

8. *Availability of Draft EIS and Scoping:* The draft EIS is estimated to be available for public review and comment no sooner than the spring of 2021. At that time a 45-day public review period will be provided for individuals and agencies to review and comment on the DEIS.

Pete G. Perez,

Director, Programs Directorate.

[FR Doc. 2020–07315 Filed 4–6–20; 8:45 am]

BILLING CODE 3720–58–P

DEPARTMENT OF DEFENSE

Department of the Army, Corps of Engineers

[Department of the Army Permit Number SWG–2019–00067]

[Intent To Prepare an Environmental Impact Statement and Public Scoping Meeting for the Port of Corpus Christi Channel Deepening Project, Nueces and Aransas Counties, Texas

AGENCY: U.S. Army Corps of Engineers, DoD.

ACTION: Notice of intent.

SUMMARY: The U.S. Army Corps of Engineers, Galveston District (Corps), has received a permit application for a Department of the Army (DA) Permit pursuant to Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, and Section 103 of the Marine Protection, Research and Sanctuaries Act from the Port of Corpus Christi Authority (PCCA) (SWG–2019–00067) for the deepening of the Corpus Christi Ship Channel (CCSC). The primary Federal involvement associated with the proposed action is the discharge of dredged or fill material into waters of the United States, the construction of structures and/or work that may affect navigable waters, and ocean disposal of dredged material. Federal authorizations for the proposed project would constitute a ''major federal action.'' Based on the potential impacts, both individually and cumulatively, the Corps intends to prepare an Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) to render a final decision on the permit application. The Corps' decision will be to issue, issue with modification, or deny DA permits for the proposed action. The EIS will assess the potential social, economic, and environmental impacts of the proposed project and is intended to be sufficient in scope to address Federal, State and local requirements, environmental and socioeconomic issues concerning the proposed action, and permit reviews.

ADDRESSES: Written comments regarding the proposed EIS scope should be addressed to Mr. Jayson Hudson, USACE, Galveston District, Regulatory Branch, P.O. Box 1229, Galveston, Texas 77553–1229. Individuals who would like to electronically provide comments should contact Mr. Hudson by electronic mail at: *SWG201900067@usace.army.mil.* Emailed comments, including attachments, should be provided in .doc, .docx, .pdf or .txt formats.

FOR FURTHER INFORMATION CONTACT: For information about this project, to be included on the mailing list for future updates and meeting announcements, or to receive a copy of the Draft EIS when it is issued, contact Mr. Jayson Hudson, at the Corps at (409) 766–3108, the email address *SWG201900067@usace.army.mil,* or the address provided above.

SUPPLEMENTARY INFORMATION: The Corps Galveston District intends to prepare an EIS for the proposed Port of Corpus Christi Deepening project. The proposed project is needed to accommodate transit of fully laden very large crude carriers (VLCCs) that draft approximately 70 feet. The deepening activities would be completed within the footprint of the authorized CCSC channel width. The proposed project does not include widening the channel; however, some minor incidental widening of the channel is expected to meet side slope requirements and to maintain the stability of the channel. As part of the Department of the Army permit application process, a public notice was published on August 1, 2019. The purpose of the public notice was to initiate an early public scoping process to solicit comments and information from the public as well as state and federal agencies to better enable us to make a reasonable decision on factors affecting the public interest. All comments received to date, including those provided for review during the public notice comment period, will be considered by the Galveston District during EIS preparation.

1. *Scoping Process/Public Involvement:* The Corps invites all affected federal, state, and local agencies, affected Native American Tribes, other interested parties, and the general public to participate in the NEPA process during development of the EIS. The purpose of the public scoping process is to provide information to the public, narrow the scope of analysis to significant environmental issues, serve as a mechanism to solicit agency and public input on alternatives and issues of concern, and ensure full and open participation in scoping for the Draft EIS. To ensure that all of the issues related to this proposed project are addressed, the Corps will conduct public scoping meeting(s) in which agencies, organizations, and members of the general public are invited to present comments or suggestions with regard to the range of actions, alternatives, and potential impacts to be considered in the EIS. The scoping meeting will begin with an informal open house including a presentation of the proposed action and a description of the NEPA process. These will be held in person, or virtually, as determined by the Agency. Comments will be accepted for 14 days following the scoping meeting. Displays and other forms of information about the proposed action will be available, and the Corps and PCCA personnel will be present at the informal session to discuss the proposed project and the EIS Process. The Corps invites comments on the proposed scope and content of the EIS from all interested parties. Verbal transcribers will be available at the scoping meeting to accept verbal comments. A time limit will be imposed on verbal comments. Written comments

Public Notice

English

US Army Corps
of Engineers®
Galveston District
Regulatory Division

Special Public Notice
Public Scoping Meeting for
Harris Reservoir Expansion Project
Environmental Impact Statement
5-27-2020

NOTICE OF PUBLIC SCOPING MEETING FOR DOW CHEMICAL COMPANY'S HARRIS RESERVOIR EXPANSION PROJECT, BRAZORIA COUNTY, TEXAS (DEPARTMENT OF THE ARMY PERMIT NUMBER SWG-2016-01027)

PURPOSE OF PUBLIC NOTICE: To inform you that the U.S. Army Corps of Engineers, Galveston District (Corps) has scheduled a Public Scoping Meeting on June 17, 2020 for an Environmental Impact Statement (EIS), for which you might be interested. It is also to solicit your comments and information to better enable us to make a reasonable decision on factors affecting the public interest.

BACKGROUND: The U.S. Army Corps of Engineers, Galveston District (Corps) received a permit application for a U.S. Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act from Dow Chemical Company (Dow) for the Harris Reservoir Expansion Project (proposed Project). The Corps is the lead Federal agency under National Environmental Policy Act (NEPA) and the President's Council on Environmental Quality regulations and intends to prepare an environmental impact statement (EIS) for the proposed Project. The U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service are cooperating agencies under NEPA and the Texas Commission on Environmental Quality, Texas Parks and Wildlife Department and the Texas Historical Commission are participating for the preparation of the EIS. The DA permit application was first advertised by an extended Public Notice issued March 2, 2018.

The proposed Project is located adjacent to the existing Dow Chemical Harris Reservoir in the city of Angleton, Brazoria County, Texas (Latitude 29.2709860466716 ° North, Longitude -95.543090603221 ° West). The proposed Project would include the construction of a 1,929-acre impoundment with a nominal storage capacity of 50,000 acre-feet, an intake and pump station to divert Dow's existing surface water rights from the Brazos River, an outlet to Oyster Creek, and an emergency spillway. The Project would also include floodplain enhancements on Oyster Creek, stream restoration, and temporary construction staging and laydown areas. Dow proposed the Project.

SCOPING PROCESS/PUBLIC INVOLVEMENT: A virtual scoping meeting will be held **online at 4:00 p.m. on June 17, 2020**. The public meeting will be presented online to provide information about the proposed Project and to receive public input and comment on the draft EIS. Access information, instructions, an opportunity to subscribe to project updates, and additional information regarding this project will be made available prior to the virtual meeting at **https://www.publicinput.com/Dow-Reservoir-EIS**.

The Corps invites full public participation to promote open communication on the potential concerns surrounding the draft EIS. In addition, participation by Federal, State, local agencies and other interested organizations is encouraged. Both oral and written statements will be accepted at the meeting through several channels including a virtual comment portal, telephone, and text message. Materials and visual depictions of the proposed Project and associated impacts will be available.

Each speaker will be given 3 minutes. Please keep your time to 3 minutes or less. If you do not need the full 3 minutes, help us to move the process along by only using the time you need. If you have additional comments that you'd like to submit beyond what you're able to address during your time allotted, please submit them in writing. Written comments are just as valid and count the same as verbal comments presented during the Public Scoping Meeting. Questions for Dow related to the proposed Project or the Corps' regulatory and Civil Works process may be submitted to the website referenced above or via email, text message or phone call to the toll-free number 855-925-2801. For text message comments, please text "DOW" or 369 to 855-925-2801.

The public meeting will be conducted in English. Those in need of language interpreters should contact the Corps' Public Involvement consultant, Hollaway Environmental + Communications Services, Inc. (713) 868-1043, by June 10, to make arrangements. Every effort will be made to address requests.

Any comments received at the virtual public meeting will be considered by the Corps to assist in determining whether to issue, modify, condition, or deny a permit for the Project. Comments will be considered in the draft EIS analysis pursuant to NEPA and used to help determine the overall public interest of the proposed Project. All comments must be received or postmarked by Thursday, July 2, 2020, (15 calendar days following the public meeting).

ADDRESSES: Written comments regarding the proposed EIS scope should be addressed to Mr. Jayson Hudson, USACE, Galveston District, Regulatory Branch, P.O. Box 1229, Galveston, Texas 77553-1229. Individuals who would like to electronically provide comments should contact Mr. Hudson by electronic mail at: SWG201601027@usace.army.mil. Emailed comments, including attachments, should be provided in .doc, .docx, .pdf or .txt formats.

FOR FURTHER INFORMATION CONTACT: For information about this project, to be included on the mailing list for future updates and meeting announcements, or to receive a copy of the Draft EIS when it is issued, contact Mr. Jayson Hudson, at the Corps at (409) 766-3108, the email address SWG201601027@usace.army.mil, or the address provided above.

DISTRICT ENGINEER
GALVESTON DISTRICT
CORPS OF ENGINEERS

Public Notice

Spanish

AVISO DE REUNIÓN DE ESTUDIO CONCEPTUAL PÚBLICO PARA EL PROYECTO DE EXPANSIÓN DEL EMBALSE HARRIS DE DOW CHEMICAL COMPANY, CONDADO DE BRAZORIA, TEXAS (NÚMERO DE PERMISO DEL DEPARTAMENTO DEL EJÉRCITO SWG-2016-01027)

PROPOSITO DE AVISO PÚBLICO: Para informarle que el Cuerpo de Ingenieros del Ejército de los EE. UU. del Distrito de Galveston ha programado una reunión de estudio conceptual público el 17 de junio de 2020 para una Declaración de Impacto Ambiental (EIS), por cuales podría estar interesado. También es para solicitar sus comentarios e información para permitirnos tomar una decisión razonable sobre los factores que afectan el interés público.

ANTECEDENTES: El Cuerpo de Ingenieros del Ejército de los EE. UU. (Cuerpo) del Distrito de Galveston recibió una solicitud de permiso para un permiso del Departamento del Ejército de los EE. UU. (DA) de conformidad con la Sección 10 de la Ley de Ríos y Puertos de 1899 (33 Código de Estados Unidos 403) y la Sección 404 de la Ley de Agua Limpia (33 Código de Estados Unidos 1344) de Dow Chemical Company (Dow) (SWG – 2016–01027) para el Proyecto de Expansión del Embalse Harris (proyecto propuesto). El Cuerpo de Ingenieros es la principal agencia federal para la preparación de este DEIS de conformidad con los requisitos de la Ley Nacional de Política Ambiental (NEPA) y las regulaciones del Consejo del Presidente sobre Calidad Ambiental para implementar NEPA. La Agencia de Protección Ambiental de los EE. UU. (Una agencia que coopera bajo NEPA), el Servicio de Pesca y Vida Silvestre de los EE. UU., el Servicio Nacional de Pesca Marina de EE. UU., la Comisión de Calidad Ambiental de Texas, la Oficina General de Tierras de Texas y el Departamento de Parques y Vida Silvestre de Texas están cooperando para la preparación del EIS. Esta solicitud se anunció por primera vez mediante un Aviso público emitido el 2 de marzo de 2018.

El proyecto propuesto se ubica en el Embalse Harris de Dow Chemical en Angleton, Condado de Brazoria, Texas (Latitud 29.2709860466716° Norte, Longitud -95.543090603221° Oeste). El proyecto incluiría la construcción de un embalse de 1,929 acres con una capacidad de almacenamiento nominal de 50,000 acres-pie, una estación de admisión y bombeo para desviar los derechos de agua superficial existentes de la empresa Dow desde el río Brazos, una salida a Oyster Creek y un vertedero de emergencia. El proyecto también incluiría mejoras en las llanuras aluviales en Oyster Creek, restauración de arroyos y áreas temporales de estadiaje y tendido durante la construcción.

ESTUDIO CONCEPTUAL/PARTICIPACIÓN PÚBLICA: Una reunión virtual de alcance se llevará a cabo en línea a las **4:00 p.m. el 17 de junio de 2020**. La reunión pública se presentará en línea como un evento informal de puertas abiertas para proporcionar información sobre el proyecto propuesto y recibir opiniones y comentarios del público sobre el DEIS. La información de acceso, las instrucciones, la oportunidad de suscribirse a futuras actualizaciones del proyecto y la información adicional sobre este proyecto estarán disponibles antes de la reunión virtual en **www.publicinput.com/Dow-Reservoir-EIS**.

El Cuerpo de Ingenieros invita a la participación pública plena para promover una comunicación abierta sobre las preocupaciones potenciales con respecto al EIS. Además, se alienta la participación de agencias federales, estatales, locales y otras organizaciones interesadas. En la reunión se aceptarán declaraciones verbales y escritas a través de varios canales, incluyendo un portal virtual de comentarios, teléfono y mensaje de texto. Se realizará una reunión virtual. Estarán disponibles presentaciones del proyecto propuesto y los impactos asociados. Estarán presentes representantes de la empresa Dow para responder preguntas relacionadas con el proyecto y también estarán disponibles representantes del Cuerpo de Ingenieros para responder preguntas relacionadas con los procesos de Regulación y Obras Civiles del Cuerpo de Ingenieros. Materiales y representaciones visuales del proyecto propuesto y los impactos asociados estarán disponibles.

Cada persona recibirá 3 minutos. Por favor, mantenga su tiempo a 3 minutos o menos. Si no necesita los 3 minutos completos, ayúdenos a mover el proceso utilizando sólo el tiempo que necesita. Si tiene comentarios adicionales que te gustaría enviar más allá de lo que puedes abordar durante el tiempo asignado, envíalos por escrito. Los comentarios escritos son igual de válidos y cuentan lo mismo que los comentarios verbales presentados durante la reunión pública de alcance. Las preguntas para Dow relacionadas con el proyecto propuesto o el proceso reglamentario y proceso de Obras Civiles del Cuerpo de Ingenieros pueden enviarse al sitio web al que se hace referencia anteriormente o por correo electrónico, mensaje de texto o llamada telefónica al número gratuito 855-925-2801 (dial 8816). Para comentarios de mensajes de texto, por favor envíe un mensaje de texto "DOW" o 369 a 855-925-2801.

La audiencia pública se llevará a cabo en inglés. Las personas que necesiten intérpretes de idiomas deben comunicarse con el consultor de Participación Pública del Cuerpo de Ingenieros, Hollaway Environmental + Communications (713) 868-1043, a más tardar el 10 de junio de 2020 para hacer los arreglos. Se hará todo lo posible para atender las solicitudes.

Cualquier comentario recibido en la reunión pública virtual será considerado por el Cuerpo de Ingenieros para ayudar a determinar si se debe emitir, modificar, condicionar o negar un permiso para el proyecto. De conformidad con NEPA, los comentarios se considerarán en el EIS final y se utilizarán para ayudar a determinar el interés público general del proyecto propuesto. Todos los comentarios deben ser recibidos o tener estampado el matasellos postal a más tardar el jueves 2 de julio de 2020 (15 días de

calendario después de la reunión pública).

DIRECCIONES: Las observaciones escritas sobre el alcance propuesto de la EIS deben ser enviadas a Sr. Jayson Hudson, USACE, Galveston District, Regulatory Branch, P.O. Box 1229, Galveston, Texas 77553-1229. Las personas que deseen proporcionar comentarios electrónicamente deben ponerse en contacto con el Sr. Hudson por correo electrónico a SWG201601027@usace.army.mil. Comentarios enviados por correo electrónico, deberán de estar adjuntos en formatos de .doc, .docx, .pdf or .txt.

PARA MÁS INFORMACIÓN: Para obtener información sobre este proyecto, para ser incluido en la lista de correo para futuras actualizaciones y anuncios de reuniones, o para recibir una copia del Borrador de la Declaración de Impacto Ambiental (DEIS) cuando se emita, por favor de contactar a Sr. Jayson Hudson, en el Cuerpo de Ingenieros al (409) 766-3108, o a la dirección de correo electrónico SWG201601027@usace.army.mil, o a la dirección proporcionada anteriormente.

DISTRITO DE GALVESTON
CUERPO DE INGENIEROS DEL EJÉRCITO DE LOS EE. UU.

The Weekly Bulletin of Brazoria County

Public Notice

Special Public Notice
Public Scoping Meeting for Harris Reservoir Expansion Project
Environmental Impact Statement
5-27-2020
US Army Corps of Engineers
Galveston District
Regulatory Division

NOTICE OF PUBLIC SCOPING MEETING FOR DOW CHEMICAL COMPANY'S HARRIS RESERVOIR EXPANSION PROJECT, BRAZORIA COUNTY, TEXAS (DEPARTMENT OF THE ARMY PERMIT NUMBER SWG-2016-01027)

PURPOSE OF PUBLIC NOTICE: To inform you that the U.S. Army orps o ngineers alveston District (Corps) has scheduled a u lic Scoping eeting on une or an nviron ental pact Statement (EIS), for which you might be interested. It is also to solicit your comments and information to better enable us to make a reasonable decision on actors a ecting t e public interest.

BACKGROUND: The U.S. Army orps o ngineers alveston istrict orps received a per it application for a U.S. Department of the Army (DA) permit pursuant to Section o t e ivers and ar ors ct o and Section o t e Clean Water Act from Dow Chemical Company (Dow) for the Harris Reservoir pansion roject proposed Project). The Corps is the lead ederal agenc under ational nvironmental Policy Act (NEPA) and the resident s ouncil on nviron ental Quality regulations and intends to prepare an environ ental i pact statement (EIS) for the proposed roject e S nviron ental Protection Agency and the U.S. Fish and ildli e Service are cooperating agencies under NEPA and the e as o ission on nviron ental Quality, Texas Parks and Wildlife Department and the Texas Historical Commission are participating for the preparation of the EIS. The DA permit application as rst advertised an extended Public Notice issued March

The proposed Project is located adjacent to the existing Dow Chemical arris eservoir in t e cit o Angleton, Brazoria County, Texas atitude ort ongitude est The proposed Project would include t e construction o a acre impoundment with a nominal storage capacity of 50,000 acre-feet, an intake and pu p station to divert o s existing surface water rights from t e ra os iver an outlet to ster Creek, and an emergency spillway. e roject ould also include ood-plain enhancements on Oyster Creek, stream restoration, and temporary construction staging and laydown areas. Dow proposed the Project.

SCOPING PROCESS/PUBLIC INVOLVEMENT: virtual scoping meeting will be held **online at 4:00 p.m. on June 17, 2020.** The public meeting will be presented online to provide in or ation a out t e proposed roject and to receive pu lic input and comment on the draft EIS. Access information, instructions, an opportunity to subscribe to project updates, and additional information regarding this project will be made availa le prior to t e virtual eeting at **https://www.publicinput.com/Dow-Reservoir-EIS.**

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ac spea er ill e given inutes lease eep our ti e to inutes or less ou do not need t e ull inutes elp us to ove t e process along by only using the time you need. ou ave additional co ents t at you'd like to submit beyond what you're able to address during your time allotted, please submit them in writing. Written comments are just as valid and count t e sa e as ver al comments presented during the Public Scoping Meeting. Questions for Dow related to the proposed Project or t e orps regulator and ivil Works process may be submitted to t e e site re erenced a ove or via email, text message or phone call to t e toll ree nu er For text message comments, please te t or to

The public meeting will be conducted in English. Those in need of language interpreters should contact t e orps u lic nvolve ent consultant olla a nviron ental o unications Services nc une to a e arrange ents ver e ort ill e made to address requests.

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DISTRICT ENGINEER
GALVESTON DISTRICT
CORPS OF ENGINEERS

Columbia Christian Senior Citizens Center Menu

629 E. Bernard, West Columbia, TX, (979) 345-5955

Menu subject to change. No dine-in currently. Take-out or delivery only.

Wednesday, May 27: Southern-fried chicken, creamed potatoes grav green eans carrot raisin salad, biscuits, dessert.

Thursday, May 28: Meatloaf, rice grav peas carrots peac es & cottage cheese, garlic toast, dessert.

Friday, May 29: Hamburger, corn on the cob, beans & weinies, lettuce & tomatoes, potato salad, hamburger bun, dessert.

Monday, June 1: Beef Stroganо spiced apples eets pears cottae cheese, garlic toast, dessert.

Tuesday, June 2: Baked chicken, dressing gra crea ed potatoes green eans carrot lo salt low sugar raisin salad, roll, birthday cake.

Meals on wheels available - call before 9:30 a.m.; Low salt/low sugar meals available - call before 8 a.m. Take-out meals need to be called in by 10:30 a.m. for pick-up at 11 a.m.

From the writings of the Rev. Billy Graham

God works through preachers and teachers

Q: *My youth pastor told me that preachers can help us understand the Bible. Is that true? - S.Y.*

A: When preachers present the Gospel of Jesus Christ with aut orit uoting ro t e ver Word of God, God takes that essage and drives it supernaturally into the human heart. It isn't the eloquence of the preacher, or even is a ilit to co unicate but it is by the truth of God's Word that His Holy Spirit draws people to Christ and opens their understanding to Biblical truth.

When Jesus was ready to return to eaven e said to is disciples t is to our advantage that I go away; for if I do not go away, the Helper [the Holy Spirit] will not come to you; but if I depart, I will send Him to you. And when He has come, He will convict t e orld o sin and o rig - teousness... He will guide you into all trut o n at a promise! The coming of the Holy Spirit was based upon the Word of the Lord Jesus Christ.

Jesus didn't say that He would send the Holy Spirit to some elievers and not to ot ers or did He say that we had to belong to some special organization. When Jesus makes a promise, He does not break or forget it. We may doubt the promises of friends or a il e a even dou t our own promises to others. But we ave never een given a pro ise by Jesus that has not been a certainty.

God works through preachers and teachers who faithfully proclaim the truth of His Word, but it is our responsibility to seek out those who speak from the pages of Scripture. When this happens, the door is open to the Holy Spirit to do is or in our lives od promises to bless His Word and make it abundantly clear.

Tribune Media Services

(Send your queries to "My Answer," c/o Billy Graham, Billy Graham Evangelistic Association, 1 Billy Graham Parkway, Charlotte, N.C., 28201; call 1-(877) 2-GRAHAM, or visit the Web site for the Billy Graham Evangelistic Association: www.billygraham.org.)

Stewart's FOOD STORE
102 Hwy. 332, Brazoria
(979) 798-2600
205 E. Ashley Wilson, Sweeny
(979) 548-2621

LAKE HARDWARE & LUMBER CO
Angleton: 1813 N. Velasco
(979) 849-8321
Clute: 705 Dixie Dr.
(979) 388-8800

PENNZOIL
KWIK KAR LUBE & TUNE
Family Owned & Operated
Mon-Fri 8a.m.-6pm
Sat. 8am-2pm
1104 N. Velasco, Angleton
(979) 848-9700

The Weekly Bulletin of Brazoria County

Public Notice Affidavit

STATE OF TEXAS §

COUNTY OF BRAZORIA §

AFFIDAVIT BY PUBLISHER

BEFORE ME, the undersigned authority, on this day personally appeared John Toth, who after being by me duly sworn says upon his oath the following:

1. That he is the editor/publisher of The Bulletin , a newspaper published in Brazoria County, Texas.

2. That he published a true copy of the above notice in said paper for two consecutive issues in its issues of May 26, 2020 and _____, ~~20__~~.

3. That attached hereto is a printed copy of said notice as published is in ten point black face type.

4. That said newspaper is a newspaper of general circulation published in a city or town in which the place of business of the applicant named in said notice is located.

John Toth

Signature of Editor/Publisher

SUBSCRIBED AND SWORN TO BEFORE ME, 27 day of May, 2020.

NOTARY PUBLIC STATE OF TEXAS
MELISSA MANZANO
Notary ID #129678268
My Commission Expires
January 15, 2022

Melissa Manzano

Notary Public in and for the State of Texas

Houston Chronicle

Public Notice

Legal Notices

To place legal notices email legals@chron.com or call 713.224.6868.

BIDS & PROPOSALS | BIDS & PROPOSALS | BIDS & PROPOSALS

The Houston Housing Authority ("HHA"), is soliciting sealed proposals for its Project Based Voucher Program in accordance with the requirements and the terms and conditions specified in Request for Proposal (RFP) 20-31.

Interested parties who wish to respond to this solicitation must submit the required documents in a sealed envelope by 10 A.M. Central Daylight Time (CDT) June 12, 2020 to the Houston Housing Authority Attn: Kevin M. Coleman, MS, C.P.M., Subject: RFP 20-31 Project Based Voucher DO NOT OPEN 2640 Fountain View Drive Houston, Texas 77057.

RFP 20-31 can be obtained by going to the doing business with HHA section of HHA's website at www.housingforhouston.com, or by sending an e-mail to HHA's Procurement Dept. at Purchasing@housingforhouston.com with RFP 20-31 in the subject line.

A Fair and Equal Employment Opportunity Agency. For assistance: Individuals with disabilities may contact the 504/ADA Administrator at 713-260-0528, TTY 713-260-0574 or 504ADA@housingforhouston.com

(May 18, 2020)
Houston Community College
Invitation for Bid (IFB)
System Administration Parking Garage Structural Repairs
No. 20-32
Sealed bids will be received at the Loading Dock/Mailroom (3100 Main @ Rosalie Street, Houston, Texas 77002) until 2:00PM (local time) on Thursday, June 18, 2020.
Online Pre-Bid Webinar Conference (Non-Mandatory) will be held by the Procurement Operations Department, Tuesday, June 2, 2020 at 10:00 am (local time)
HVAC Replacements for Coleman College No. 20-35
Online Pre-Bid webinar Conference (Non-Mandatory) will be held by the Procurement Operations Department, Tuesday, June 2, 2020 at 2:00 pm (local time
Documents can be obtained at: www.hccs.edu/about-hcc/procurement/

NOTICE TO BIDDERS
The Metropolitan Transit Authority of Harris County, Texas (METRO) is planning to issue the procurement documents listed in this advertisement.
IFB No. 4020000133: Purchase and Delivery of Blower Fans for METRO's Rail Vehicles. Solicitation will be available on or about 5/25/2020.
IFB No. 4020000155: Purchase and Delivery of Engine Component Machining Services. Solicitation will be available on or about 5/25/2020.
Prospective bidders/proposers can view and download these solicitations by visiting METRO's website at https://www.ridemetroapp.org/procurement/
If you are unable to download the documents or are having difficulty, please contact METRO Plan and Bid Room at (713) 739-4881.

San Leon MUD is requesting proposals for grant administration for upcoming CDBG program(s). Complete specifications for the contract may be obtained at www.slmud.org or from San Leon MUD, 443 24th Street, San Leon, Texas 77503. All bids are due by 7/1/20 at 4:30 PM. Contract will be awarded to the lowest responsible bidder. San Leon MUD reserves the right to reject any and/or all bids. Contact: Andrew Miller at (281) 339-1586

LEGAL NOTICES | LEGAL NOTICES | LEGAL NOTICES

NOTICE OF SALE

HARRIS COUNTY MUNICIPAL UTILITY DISTRICT No. 459
(A political subdivision located within Harris County, Texas and the City of Baytown, Texas)
$4,750,000
Unlimited Tax Roads Series 2020

LEGAL NOTICES | LEGAL NOTICES

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
NOTICE OF APPLICATION AND PRELIMINARY DECISION FOR AN AIR QUALITY PERMIT
PERMIT NUMBER: 87923

APPLICATION AND PRELIMINARY DECISION. Vopak Logistics Services USA Inc., 2759 Independence Pkwy S, Deer Park, TX 77536, has applied to the Texas Commission on Environmental Quality (TCEQ) for an amendment to Air Quality Permit Number 87923, which would authorize modification of a Deer Park Facility located at 2759 Independence Parkway S, Deer Park, Harris County, Texas 77536. This application was processed in an expedited manner, as allowed by the commission's rules in 30 Texas Administrative Code, Chapter 101, Subchapter J. This application was submitted to the TCEQ on September 11, 2019. The existing facility will emit the following contaminants: carbon monoxide, hazardous air pollutants, nitrogen oxides, organic compounds, inorganic compounds, particulate matter including particulate matter with diameters of 10 microns or less and 2.5 microns or less and sulfur dioxide.

The executive director has completed the technical review of the application and prepared a draft permit which, if approved, would establish the conditions under which the facility must operate. The executive director has made a preliminary decision to issue the permit because it meets all rules and regulations. The permit application, executive director's preliminary decision, and draft permit will be available for viewing and copying at the TCEQ central office, the TCEQ Houston regional office, and at the following weblink: https://www.vopak.com/terminals/vopak-terminal-deer-park-houston, beginning the first day of publication of this notice. The facility's compliance file, if any exists, is available for public review at the TCEQ Houston Regional Office, 5425 Polk St Ste H, Houston, Texas.

PUBLIC COMMENT/PUBLIC MEETING. You may submit public comments or request a public meeting about this application. The purpose of a public meeting is to provide the opportunity to submit comment or to ask questions about the application. The TCEQ will hold a public meeting if the executive director determines that there is a significant degree of public interest in the application or if requested by a local legislator. A public meeting is not a contested case hearing. **You may submit additional written public comments within 30 days of the date of newspaper publication of this notice in the manner set forth in the AGENCY CONTACTS AND INFORMATION paragraph below.**

RESPONSE TO COMMENTS AND EXECUTIVE DIRECTOR ACTION. After the deadline for public comments, the executive director will consider the comments and prepare a response to all relevant and material or significant public comments. Because no timely hearing requests have been received, after preparing the response to comments, the executive director may then issue final approval of the application. **The response to comments, along with the executive director's decision on the application will be mailed to everyone who submitted public comments or is on a mailing list for this application, and will be posted electronically to the Commissioners' Integrated Database (CID).**

LEGAL NOTICES | LEGAL NOTICES | LEGAL NOTICES | LEGAL NOTICES

NOTICE OF PUBLIC SCOPING MEETING FOR DOW CHEMICAL COMPANY'S HARRIS RESERVOIR EXPANSION PROJECT, BRAZORIA COUNTY, TEXAS (DEPARTMENT OF THE ARMY PERMIT NUMBER SWG-2016-01027)

PURPOSE OF PUBLIC NOTICE: To inform you that the U.S. Army Corps of Engineers, Galveston District (Corps) has scheduled a Public Scoping Meeting on June 17, 2020 for an Environmental Impact Statement (EIS) for which you might be interested. It is also to solicit your comments and information to better enable us to make a reasonable decision on factors affecting the public interest.

BACKGROUND: The U.S. Army Corps of Engineers, Galveston District (Corps) received a permit application for a U.S. Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act from Dow Chemical Company (Dow) for the Harris Reservoir Expansion Project (proposed Project). The Corps is the lead Federal agency under National Environmental Policy Act (NEPA) and the President's Council on Environmental Quality regulations and intends to prepare an environmental impact statement (EIS) for the proposed Project. The U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service are cooperating agencies under NEPA and the Texas Commission on Environmental Quality, Texas Parks and Wildlife Department and the Texas Historical Commission are participating for the preparation of the EIS. The DA permit application was first advertised by an extended Public Notice issued March 2, 2018.

The proposed Project is located adjacent to the existing Dow Chemical Harris Reservoir in the city of Angleton, Brazoria County, Texas (Latitude 29.27098604667167° North, Longitude -95.54309060322 1° West). The proposed Project would include the construction of a 1,929-acre impoundment with a nominal storage capacity of 50,000 acre-feet, an intake and pump station to divert Dow's existing surface water rights from the Brazos River, an outlet to Oyster Creek, and an emergency spillway. The Project would also include floodplain enhancements on Oyster Creek, stream restoration, and temporary construction staging and laydown areas. Dow proposed the Project.

SCOPING PROCESS/PUBLIC INVOLVEMENT: A virtual scoping meeting will be held **online at 4:00 p.m. on June 17, 2020**. The public meeting will be presented online to provide information about the proposed Project and to receive public input and comment on the draft EIS. Access information, instructions, an opportunity to subscribe to project updates, and additional information regarding this project will be made available prior to the virtual meeting at **https://www.publicinput.com/Dow-Reservoir-EIS.**

The Corps invites full public participation to promote open communication on the potential concerns surrounding the draft EIS. In addition, participation by Federal, State, local agencies and other interested organizations is encouraged. Both oral and written statements will be accepted at the meeting through several channels including a virtual comment portal, telephone, and text message. Materials and visual depictions of the proposed Project and associated impacts will be available.

Each speaker will be given 3 minutes. Please keep your time to 3 minutes or less. If you do not need the full 3 minutes, help us to move the process along by only using the time you need. If you have additional comments that you'd like to submit beyond what you're able to address during your time allotted, please submit them in writing. Written comments are just as valid and count the same as verbal comments presented during the Public Scoping Meeting. Questions for Dow related to the proposed Project or the Corps' regulatory and Civil Works process may be submitted to the website referenced above or via email, text message or phone call to the toll-free number 855-925-2801 (dial 8816). For text message comments, please text "DOW" or 369 to 855-925-2801.

The public meeting will be conducted in English. Those in need of language interpreters should contact the Corps' Public Involvement consultant, Hollaway Environmental + Communications Services, Inc. (713) 868-1043, by June 10, to make arrangements. Every effort will be made to address requests.

Any comments received at the virtual public meeting will be considered by the Corps to assist in determining whether to issue, modify, condition, or deny a permit for the Project. Comments will be considered in the draft EIS analysis pursuant to NEPA and used to help determine the overall public interest of the proposed Project. All comments must be received or postmarked by Thursday, July 2, 2020, (15 calendar days following the public meeting).

ADDRESSES: Written comments regarding the proposed EIS scope should be addressed to Mr. Jayson Hudson, USACE, Galveston District, Regulatory Branch, P.O. Box 1229, Galveston, Texas 77553-1229. Individuals who would like to electronically provide comments should contact Mr. Hudson by electronic mail at: SWG201601027@usace.army.mil. Emailed comments, including attachments, should be provided in .doc, .docx, .pdf or .txt formats.

FOR FURTHER INFORMATION CONTACT: For information about this project, to be included on the mailing list for future updates and meeting announcements, or to receive a copy of the Draft EIS when it is issued, contact Mr. Jayson Hudson, at the Corps at (409) 766-3108, the email address SWG201601027@usace.army.mil, or the address provided above.

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Houston Chronicle

Public Notice Affidavit

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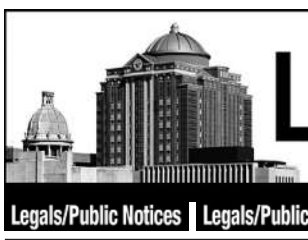

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AVISO DE UN PERMISO FEDERAL PARA OPERACION PRELIMINAR

Permiso Preliminar Numero: 45072

SOLICITUD Y PERMISO PRELIMINAR Texas Cement Products, Inc. (Texrite) 4000 Pinemont Drive, Houston, Texas 77018 ha presentado una solicitud ante la Comision de Calidad Ambiental de Texas (TCEQ, por sus siglas en ingles) para la renovacion del Permiso Federal de Operacion (en adelante denominado el Permiso) numero 45072, Solicitud numero 45072, para autorizar la continuacion de la operacion de fabricacion de lechada y mortero de capa delgada para losetas en la planta de Texrite. El area a la cual se refiere la solicitud esta ubicada en 4000 Pinemont Drive, en la ciudad de Houston, Condado de Harris, Texas 77018. Este enlace a un mapa electronico de la ubicacion general del sitio o de la instalacion es proporcionado como una cortesia y no es parte de la solicitud o del aviso. Para la ubicacion exacta, consulte la solicitud. http://www.tceq.texas.gov/assets/public/hb610/index.html?lat=29.841111&lng=-95.443888&zoom=13&type=r. El sitio esta autorizado para emitir los contaminantes de aire seguidos: materia particular, incluso materia particular con diametros de 10 micras o menos, y de 2.5 micras o menos.

Esta solicitud fue recibida por la TCEQ el 14 de Febrero, del 2020. El permiso preliminar, si es aprobado, codificara las condiciones bajo las cuales el area debe operar. El director ejecutivo ha concluido la revision tecnica de la solicitud y ha hecho una decision preliminar para preparar el permiso preliminar para la revision y comentario publico. El director ejecutivo de la TCEQ recomienda la expedicion de este permiso preliminar. La solicitud de permiso, la declaracion de base y el permiso preliminar estaran disponibles para ser revisados y copiados en la Oficina Central de la TCEQ, 12100 Park 35 Circle, Building (Edificio) E, First Floor (primer Piso), Austin, Texas 78753, y en la oficina de la region de Houston ubicada en 5425 Polk ave, Houston, Texas 77023, y en el sitio web de Texrite: www.texrite.com, empezando el primer dia de la publicacion de este aviso.

El director ejecutivo ha determinado que la solicitud esta administrativamente completa y realizara una revision tecnica de la solicitud. La informacion en la solicitud indica que la renovacion de este permiso no daria lugar a un aumento de las emisiones permitidas y no daria lugar a la emision de un contaminante del aire que no se haya emitido previamente. **La TCEQ puede actuar en esta solicitud sin buscar mas comentarios publicos o brindar una oportunidad para una audiencia de caso impugnado si se cumplen ciertos criterios.**

COMENTARIO PUBLICO Puede enviar comentarios publicos o una solicitud para una audiencia de caso impugnado a la Oficina del Secretario Principal a la direccion que figura a continuacion. La TCEQ considerara todos los comentarios publicos al desarrollar una decision final sobre la solicitud. **La fecha limite para enviar comentarios publicos es 15 dias despues de la publicacion del aviso en el periodico**. Despues de la fecha limite para comentarios publicos, el director ejecutivo preparara una respuesta a todos los comentarios publicos relevantes y materiales, o significativos. Cuestiones como el valor de las propiedades, el ruido, la seguridad del trafico y la zonificacion estan fuera de la jurisdiccion de TCEQ para abordar en el proceso de permisos.

Despues de que se complete la revision tecnica, el director ejecutivo considerara los comentarios y preparara una respuesta a todos los comentarios publicos relevantes y materiales o significativos. Si solo se reciben comentarios, la respuesta a los comentarios, junto con la decision del director ejecutivo sobre la solicitud, se enviara por correo a todas las personas que presentaron comentarios publicos o que estan en la lista de correo de esta solicitud, a menos que la solicitud se remita directamente a una audiencia de caso impugnado.

OPORTUNIDAD PARA UNA AUDIENCIA DE CASO CONTESTADO Puede solicitar una audiencia de caso impugnado. El solicitante o el director ejecutivo tambien pueden solicitar que la solicitud se remita directamente a una audiencia de caso impugnada despues de una revision tecnica de la solicitud. Una audiencia de caso impugnado es un procedimiento legal similar a un juicio civil en un tribunal de distrito estatal. A menos que se presente una solicitud por escrito para una audiencia de caso impugnada dentro de los 15 dias a partir de este aviso, el director ejecutivo puede actuar sobre la solicitud. **Si no se recibe una solicitud de audiencia dentro de este periodo de 15 dias, no se brindara mas oportunidad de audiencia.** De acuerdo con la Ley de Aire Limpio de Texas § 382.056 (o), una audiencia de caso impugnada solo se puede otorgar si el historial de cumplimiento del solicitante se encuentra en la clasificacion mas baja segun los requisitos de historial de cumplimiento aplicables y si la solicitud de audiencia se basa en cuestiones de hecho disputadas que son relevantes y material para la decision de la Comision sobre la solicitud. Ademas, la Comision solo puede otorgar una audiencia sobre los asuntos presentados durante el periodo de comentarios publicos y no retirados.

Una persona que pueda verse afectada por las emisiones de contaminantes del aire de la instalacion tiene derecho a solicitar una audiencia. Si solicita una audiencia de caso impugnada, debe presentar lo siguiente: (1) su nombre (o para un grupo o asociacion, un representante oficial), direccion postal, numero de telefono durante el dia; (2) nombre del solicitante y numero de permiso; (3) la declaracion "[yo / nosotros] solicito una audiencia de caso impugnado"; (4) una descripcion especifica de como se veria afectado negativamente por la aplicacion y las emisiones al aire de la instalacion de una manera no comun para el publico en general; (5) la ubicacion y la distancia de su propiedad en relacion con la instalacion; (6) una descripcion de como usa la propiedad que puede verse afectada por la instalacion; y (7) una lista de todas las cuestiones de hecho en disputa que envie durante el periodo de comentarios. Si la solicitud la realiza un grupo o asociacion, uno o mas miembros que tienen derecho a solicitar una audiencia deben ser identificados por su nombre y direccion fisica. Tambien deben identificarse los intereses que el grupo o asociacion busca proteger. Tambien puede enviar los ajustes propuestos a la solicitud / permiso que satisfarian sus inquietudes. Las solicitudes para una audiencia de caso impugnada deben presentarse por escrito dentro de los 15 dias posteriores a este aviso a la Oficina del Secretario Principal a la direccion que figura a continuacion.

Si alguna solicitud para una audiencia de caso impugnada se presenta a tiempo, el Director Ejecutivo remitira la solicitud y cualquier solicitud de audiencia de caso impugnado a los Comisionados para su consideracion en una reunion programada de la Comision. A menos que la solicitud se remita directamente a una audiencia de caso impugnada, el director ejecutivo enviara por correo la respuesta a los comentarios junto con la notificacion de la reunion de la Comision a todos los que presentaron comentarios o estan en la lista de correo de esta solicitud. La Comision solo puede conceder una solicitud para una audiencia de caso impugnada sobre asuntos que el solicitante presento en sus comentarios oportunos que no fueron retirados posteriormente. **Si se concede una audiencia, el tema de la audiencia estara limitado a cuestiones de hecho en disputa o preguntas mixtas de hecho y de ley relacionadas con inquietudes relevantes y materiales sobre la calidad del aire presentadas durante el periodo de comentarios.** Cuestiones como el valor de las propiedades, el ruido, la seguridad del trafico y la zonificacion estan fuera de la jurisdiccion de la Comision para abordar en este procedimiento.

LISTA PARA ENVIO DE CORREO. Aparte de entregar comentarios publicos, usted puede solicitar ser incluido en una lista para envio de correo con respecto a esta solicitud al enviar su peticion a la Oficina del Secretario Oficial (Office of Chief Clerk) a la direccion mencionada. Los que se encuentran en la lista para envio de correo recibiran copias de avisos publicos futuros (si hay) para esta solicitud enviados por correo por el Secretario Oficial.

CONTACTOS E INFORMACION DE LA AGENCIA Los comentarios publicos y las solicitudes deben presentarse electronicamente en www14.tceq.texas.gov/epic/eComment/, o por escrito a la Comision de Calidad Ambiental de Texas (TCEQ), Oficina del Secretario Principal, MC-105, P.O. Box 13087, Austin, Texas 78711-3087. Tenga en cuenta que cualquier informacion de contacto que proporcione, incluido su nombre, numero de telefono, direccion de correo electronico y direccion fisica, formara parte del registro publico de la agencia. Para obtener mas informacion sobre esta solicitud de permiso o el proceso de autorizacion, llame al numero gratuito del Programa de Educacion Publica al 1-800-687-4040. Si desea informacion en espanol, puede llamar al 1-800-687-4040.

Puede obtener mas informacion sobre Texas Cement Products, Inc., 4000 Pinemont Drive, Houston, Texas 77018-1104 llamando al Senor George Manrique al telefono 713.682.8411.

Fecha de Expedicion: Mayo 20, 2020

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Comision de Calidad Ambiental de Texas
AVISO DE UN PERMISO FEDERAL PARA OPERACION PRELIMINAR

Permiso Preliminar Numero: O1293

SOLICITUD Y PERMISO PRELIMINAR Total Petrochemicals & Refining USA, Inc., P.O. Box 888, Deer Park, TX 77536-0888, ha presentado una solicitud ante la Comision de Calidad Ambiental de Texas (TCEQ, por sus siglas en ingles) para la renovacion y examen del Permiso Federal de Operacion (en adelante denominado el Permiso) numero O1293, Solicitud num. 29760, para autorizar la operacion de la Planta de Polipropileno de La Porte, una planta de Fabricacion de Materiales de Plastico y Resinas. El area a la cual se refiere la solicitud esta ubicada en 1818 Independence Parkway South en La Porte, Condado de Harris, Texas 77571-9803. Este enlace a un mapa electronico de la ubicacion general del sitio o de la instalacion es proporcionado como una cortesia y no es parte de la solicitud o del aviso. Para la ubicacion exacta, consulte la solicitud. http://www.tceq.texas.gov/assets/public/hb610/index.html?lat=29.726111&lng=-95.089444&zoom=13&type=r Esta solicitud fue recibida por la TCEQ el 20 de noviembre de 2020.

El proposito de un Permiso Federal de Operacion es mejorar el acatamiento general con las normas que gobiernan el control de la contaminacion atmosferica, claramente definiendo todos los requisitos aplicables como estan definidos en el Titulo 30 del Codigo Administrativo de Texas § 122.10 (30 TAC § 122.10, por sus siglas en ingles). El permiso preliminar, si es aprobado, codificara las condiciones bajo las cuales el area debe operar. El permiso no autorizara construccion nueva. El director ejecutivo ha concluido la revision tecnica de la solicitud y ha hecho una decision preliminar para preparar el permiso preliminar para la revision y comentario publico. El director ejecutivo de la TCEQ recomienda la expedicion de este permiso preliminar. La solicitud de permiso, la declaracion de base y el permiso preliminar estaran disponibles para ser revisados y copiados en la Oficina Central de la TCEQ, 12100 Park 35 Circle, Edificio E, Primer Piso, Austin, Texas 78753, y en la Oficina Regional de Houston, 5425 Polk St Ste H, Houston, Texas 77023-1452, y en el City of La Porte City Hall, 604 W Fairmont Parkway, La Porte, Texas 77571, empezando el primer dia de la publicacion de este aviso. El permiso preliminar y la declaracion de base estan disponibles en el sitio de la TCEQ:

www.tceq.texas.gov/goto/tvnotice

En la oficina central y la oficina regional tambien puede revisar y copiar documentos pertinentes para el permiso preliminar, asi como los permisos para la Evaluacion de Nuevas Fuentes que han sido incorporados por referencia. Cualquier persona que tengan dificultades obteniendo estos materiales debido a restricciones para viajar pueden comunicarse con la sala de archivos de la Oficina Central al telefono (512) 239-2900.

COMENTARIOS/NOTIFICACION PUBLICA Y AUDIENCIA. Cualquier persona puede entregar comentarios publicos sobre el permiso preliminar. Comentarios relacionados a la exactitud, lo completo, y lo apropiado de las condiciones del permiso pueden resultar en cambios al permiso preliminar.

Una persona que podria ser afectada por la emision de contaminantes atmosfericos del area del sitio del permiso puede solicitar una audiencia de aviso y comentarios. El proposito de la audiencia de notificacion y comentarios es para proporcionar la oportunidad para entregar comentarios sobre el permiso preliminar. El permiso puede ser cambiado en base a si los comentarios relacionados con el permiso permiten el cumplimiento con el Titulo 30 del Codigo Administrativo de Texas, Capitulo 122 (ejemplos pueden incluir que el permiso no tiene todos los requisitos aplicables que correspondan o que no se cumplieron los procedimientos de aviso publico). La TCEQ puede otorgar una audiencia de aviso y comentarios con respecto a esta solicitud si una peticion por escrito es presentada dentro de los treinta dias despues de la publicacion del anuncio en el diario. La solicitud de audiencia debe incluir la base de la solicitud, incluyendo una descripcion de como la persona puede ser afectada por la emision de contaminantes atmosfericos del area de la solicitud. La solicitud tambien deberia especificar las condiciones del permiso borrador que son inapropiados o especificar como la decision preliminar para expedir o denegar el permiso es inapropiado. Todos los asuntos razonablemente verificables deben ser planteados y todos los argumentos razonablemente disponibles deben ser entregados a no mas tardar al final del periodo de comentarios publicos. Si se concede una audiencia de aviso y comentario, todos los individuos que presentaron comentarios por escrito o una solicitud de audiencia recibiran confirmacion por escrito de la audiencia. Esta confirmacion indicara la fecha, hora y lugar de la audiencia.

Comentarios publicos por escrito y/o peticiones para una audiencia de aviso y comentarios deberian ser presentados a la Comision de Calidad Ambiental (TCEQ), Oficina del Secretario Oficial (Office of Chief Clerk), MC-105, P.O. Box 13087, Austin, Texas 78711-3087, o por internet al www14.tceq.texas.gov/epic/eComment/, dentro de treinta dias despues de la fecha de publicacion en el periodico de este aviso. Si se comunica electronicamente con la TCEQ, favor de notar que su correo electronico, tal como su direccion de correo domestico, formaran parte del archivo publico de la agencia.

Un aviso de la accion final propuesta que incluye una respuesta a los comentarios y denotando cualquier cambio al permiso preliminar, sera enviado a todas las personas que hayan presentado comentarios publicos, una solicitud de audiencia o que hayan solicitado ser incluidos en la lista de correo. Este envio de correo tambien proveera instrucciones para hacer peticiones publicas a la Agencia de Proteccion Ambiental (EPA, por sus siglas en ingles), para solicitar que la EPA se oponga a la expedicion del permiso preliminar. Despues de recibir una solicitud, la EPA solamente podra objetar a la expedicion de un permiso que no cumple con los requisitos aplicables o los requisitos del 30 TAC Capitulo 122.

LISTA PARA ENVIO DE CORREO. Aparte de entregar comentarios publicos, usted puede solicitar ser incluido en una lista para envio de correo con respecto a esta solicitud al enviar su peticion a la Oficina del Secretario Oficial (Office of Chief Clerk) a la direccion antes mencionada. Los que se encuentran en la lista para envio de correo recibiran copias de avisos publicos futuros (si hay) para esta solicitud enviados por correo por el Secretario Oficial.

INFORMACION. Para mas informacion con respecto a esta solicitud de permiso o el proceso de permisos, favor de contactar a la Texas Commission on Environmental Quality (Comision de Calidad Ambiental de Texas), Programa de Educacion del Publico (Public Education Program), MC-108, P.O. Box 13087, Austin, Texas 78711-3087 o llamar sin cargo al 1-800-687-4040.

Puede obtener mas informacion sobre Total Petrochemicals & Refining USA, Inc., llamando a Mr. Ben Dickson, P.E. al (281) 476-3874.

Fecha de Expedicion: 26 de mayo de 2020

Comisión de Calidad Ambiental del Estado de Texas
AVISO DE RECIBO DE LA SOLICITUD Y EL INTENTO DE OBTENER PERMISO PARA LA CALIDAD DEL AGUA MODIFICACION
PERMISO NO. WQ0014897001

SOLICITUD. Holy Trinity Episcopal School of Greater Houston, Inc., 11810 Lockwood Road, Houston, Texas 77044, ha solicitado a la Comisión de Calidad Ambiental del Estado de Texas (TCEQ) para modificar el Permiso No. WQ0014897001 (EPA I.D. No. TX 0125326) del Sistema de Eliminación de Descargas de Contaminantes de Texas (TPDES) para autorizar la descarga de aguas residuales tratadas en un volumen que no sobrepasa un flujo promedio diario de 50,000 galones por día. La planta está ubicada 11810 Lockwood Road, Houston en el Condado de Harris, Texas. La ruta de descarga es del sitio de la planta a zanja de drenaje privado; de allí a una serie de zanjas del Distrito de Control de Inundaciones del Condado de Harris; desde allí a los pantanos verdes sobre la marea. La TCEQ recibió esta solicitud el March 6, 2020. La solicitud para el permiso está disponible para ver en línea en https://bleylengineering.com/tceq-major-amendment-permit-application/. Este enlace a un mapa electrónico de la ubicación general del sitio o de la instalación es proporcionado como una cortesía y no es parte de la solicitud o del aviso. Para la ubicación exacta, consulte la solicitud. https://tceq.maps.arcgis.com/apps/webappviewer/index.html?id=db5bac44afbc468bbddd360f8168250f&marker=-95.206944%2C29.891666&level=12

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

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

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

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

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

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

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

También se puede obtener información adicional del Holy Trinity Episcopal School of Greater Houston, Inc. a la dirección indicada arriba o llamando a Mr. Travis T.K. Walker, P.E., Bleyl Engineering al 936-441-7833.

Fecha de emisión April 29, 2020

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AVISO DE REUNIÓN DE ESTUDIO CONCEPTUAL PÚBLICO PARA EL PROYECTO DE EXPANSIÓN DEL EMBALSE HARRIS DE DOW CHEMICAL COMPANY, CONDADO DE BRAZORIA, TEXAS
(NÚMERO DE PERMISO DEL DEPARTAMENTO DEL EJÉRCITO SWG-2016-01027)

PROPOSITO DE AVISO PÚBLICO: Para informarle que el Cuerpo de Ingenieros del Ejército de los EE. UU. del Distrito de Galveston ha programado una reunión de estudio conceptual público el 17 de junio de 2020 para una Declaración de Impacto Ambiental (EIS), por cuales podría estar interesado. También es para solicitar sus comentarios e información para permitirnos tomar una decisión razonable sobre los factores que afectan el interés público.

ANTECEDENTES: El Cuerpo de Ingenieros del Ejército de los EE. UU. (Cuerpo) del Distrito de Galveston recibió una solicitud de permiso para un permiso del Departamento del Ejército de los EE. UU. (DA) de conformidad con la Sección 10 de la Ley de Ríos y Puertos de 1899 (33 Código de Estados Unidos 403) y la Sección 404 de la Ley de Agua Limpia (33 Código de Estados Unidos 1344) de Dow Chemical Company (Dow) (SWG – 2016–01027) para el Proyecto de Expansión del Embalse Harris (proyecto propuesto). El Cuerpo de Ingenieros es la principal agencia federal para la preparación de este DEIS de conformidad con los requisitos de la Ley Nacional de Política Ambiental (NEPA) y las regulaciones del Consejo del Presidente sobre Calidad Ambiental para implementar NEPA. La Agencia de Protección Ambiental de los EE. UU. (Una agencia que coopera bajo NEPA), el Servicio de Pesca y Vida Silvestre de los EE. UU., el Servicio Nacional de Pesca Marina de EE. UU., la Comisión de Calidad Ambiental de Texas, la Oficina General de Tierras de Texas y el Departamento de Parques y Vida Silvestre de Texas están cooperando para la preparación del EIS. Esta solicitud se anunció por primera vez mediante un Aviso público emitido el 2 de Marzo de 2018.

El proyecto propuesto se ubica en el Embalse Harris de Dow Chemical en Angleton, Condado de Brazoria, Texas (Latitud 29.2709860466716° Norte, Longitud -95.543090603221° Oeste). El proyecto incluiría la construcción de un embalse de 1,929 acres con una capacidad de almacenamiento nominal de 50,000 acres-pie, una estación de admisión y bombeo para desviar los derechos de agua superficial existentes de la empresa Dow desde el río Brazos, una salida a Oyster Creek y un vertedero de emergencia. El proyecto también incluiría mejoras en las llanuras aluviales en Oyster Creek, restauración de arroyos y áreas temporales de estadiaje y tendido durante la construcción.

ESTUDIO CONCEPTUAL/PARTICIPACIÓN PÚBLICA: Una reunión virtual de alcance se llevará a cabo en línea a las 4:00 p.m. el 17 de junio de 2020. La reunión pública se presentará en línea como un evento informal de puertas abiertas para proporcionar información sobre el proyecto propuesto y recibir opiniones y comentarios del público sobre el DEIS. La información de acceso, las instrucciones, la oportunidad de suscribirse a futuras actualizaciones del proyecto y la información adicional sobre este proyecto estarán disponibles antes de la reunión virtual en www.publicinput.com/Dow-Reservoir-EIS.

El Cuerpo de Ingenieros invita a la participación pública plena para promover una comunicación abierta sobre las preocupaciones potenciales con respecto al EIS. Además, se alienta la participación de agencias federales, estatales, locales y otras organizaciones interesadas. En la reunión se aceptarán declaraciones verbales y escritas a través de varios canales, incluyendo un portal virtual de comentarios, teléfono y mensaje de texto. Se realizará una reunión virtual. Estarán disponibles presentaciones del proyecto propuesto y los impactos asociados. Estarán presentes representantes de la empresa Dow para responder preguntas relacionadas con el proyecto y también estarán disponibles representantes del Cuerpo de Ingenieros para responder preguntas relacionadas con los procesos de Regulación y Obras Civiles del Cuerpo de Ingenieros. Materiales y representaciones visuales del proyecto propuesto y los impactos asociados estarán disponibles.

Cada persona recibirá 3 minutos. Por favor, mantenga su tiempo a 3 minutos o menos. Si no necesita los 3 minutos completos, ayúdenos a mover el proceso utilizando sólo el tiempo que necesita. Si tiene comentarios adicionales que te gustaría enviar más allá de lo que puedes abordar durante el tiempo asignado, envíalos por escrito. Los comentarios escritos son igual de válidos y cuentan lo mismo que los comentarios verbales presentados durante la reunión pública de alcance. Las preguntas para Dow relacionadas con el proyecto propuesto o el proceso reglamentario y proceso de Obras Civiles del Cuerpo de Ingenieros pueden enviarse al sitio web al que se hace referencia anteriormente o por correo electrónico, mensaje de texto o llamada telefónica al número gratuito 855-925-2801 (dial 8816). Para comentarios de mensajes de texto, por favor envíe un mensaje de texto "DOW" o 369 a 855-925-2801.

La audiencia pública se llevará a cabo en inglés. Las personas que necesiten intérpretes de idiomas deben comunicarse con el consultor de Participación Pública del Cuerpo de Ingenieros, Hollaway Environmental Communications (713) 868-1043, a más tardar el 10 de junio de 2020 para hacer los arreglos. Se hará todo lo posible para atender las solicitudes.

Cualquier comentario recibido en la reunión pública virtual será considerado por el Cuerpo de Ingenieros para ayudar a determinar si se debe emitir, modificar, condicionar o negar un permiso para el proyecto. De conformidad con NEPA, los comentarios se considerarán en el EIS final y se utilizarán para ayudar a determinar el interés público general del proyecto propuesto. Todos los comentarios deben ser recibidos o tener estampado el matasellos postal a más tardar el jueves 2 de julio de 2020 (15 días de calendario después de la reunión pública).

DIRECCIONES: Las observaciones escritas sobre el alcance propuesto de la EIS deben ser enviadas a Sr. Jayson Hudson, USACE, Galveston District, Regulatory Branch, P.O. Box 1229, Galveston, Texas 77553-1229. Las personas que deseen proporcionar comentarios electrónicamente deben ponerse en contacto con el Sr. Hudson por correo electrónico a SWG201601027@usace.army.mil. Comentarios enviados por correo electrónico, deberán de estar adjuntos en formatos de .doc, .docx, .pdf or .txt.

PARA MÁS INFORMACIÓN: Para obtener información sobre este proyecto, para ser incluido en la lista de correo para futuras actualizaciones y anuncios de reuniones, o para recibir una copia del Borrador de la Declaración de Impacto Ambiental (DEIS) cuando se emita, por favor de contactar a Sr. Jayson Hudson, en el Cuerpo de Ingenieros al (409) 766-3108, o a la dirección de correo electrónico SWG201601027@usace.army.mil, o a la dirección proporcionada anteriormente.

DISTRITO DE GALVESTON
CUERPO DE INGENIEROS DEL EJÉRCITO DE LOS EE. UU.

COMISIÓN DE CALIDAD AMBIENTAL DE TEXAS
Aviso Revisado de un Permiso Federal para Preliminar

Permiso Preliminar Núm. : O2234

Solicitud y Permiso Preliminar. Rohm and Haas Texas Incorporated, PO Box 1000, Deer Park, TX 77536-1000, ha presentado una solicitud ante la Comisión de Calidad Ambiental de Texas (TCEQ, por sus siglas en inglés) para la renovación del Permiso Federal de Operación (en adelante denominado el Permiso) Núm. O2234, Solicitud Núm. 29745 para autorizar la operación de P-North, una Instalación de Fabricación de Productos Químicos Orgánicos Básicos. El área a la cual se refiere la solicitud está ubicada en 1900 Tidal Rd in Deer Park, Harris County, Texas 77536-2416. Este enlace a un mapa electrónico de la ubicación general del sitio o de la instalación es proporcionado como una cortesía y no es parte de la solicitud o del aviso. Para la ubicación exacta, consulte la solicitud. http://www.tceq.texas.gov/assets/public/hb610/index.html?lat=29.726388&lng=-95.102777&zoom=13&type=r. Esta solicitud fue recibida por la TCEQ el 13 de noviembre, 2019.

El propósito de un Permiso Federal de Operación es mejorar el acatamiento general con las normas que gobiernan el control de la contaminación atmosférica, claramente definiendo todos los requisitos aplicables como están definidos en el Título 30 del Código Administrativo de Texas § 122. 10 (30 TAC § 122. 10, por sus siglas en inglés). El permiso preliminar, si es aprobado, codificará las condiciones bajo las cuales el área debe operar. El permiso no autorizará construcción nueva. El director ejecutivo ha concluido la revisión técnica de la solicitud y ha hecho una decisión preliminar para preparar el permiso preliminar para la revisión y comentario público. El director ejecutivo de la TCEQ recomienda la expedición de este permiso preliminar. La solicitud de permiso, la declaración de base y el permiso preliminar estarán disponibles para ser revisados y copiados en la Oficina Central de la TCEQ, 12100 Park 35 Circle, Building E, First Floor, Austin, Texas 78753, la Oficina Regional de la TCEQ en Houston, 5425 Polk St. , Ste. H, Houston, Texas 77023-1452, y la Biblioteca Pública de Deer Park , 3009 Center St, Deer Park, Texas 77536-5063, empezando el primer día de la publicación de este aviso. El permiso preliminar y la declaración de base están disponibles en el sitio de la TCEQ:

www. tceq. texas. gov/goto/tvnotice

En la oficina central y la oficina regional también puede revisar y copiar documentos pertinentes para el permiso preliminar, así como los permisos para la Evaluación de Nuevas Fuentes que han sido incorporados por referencia. Cualquier persona que tengan dificultades obteniendo estos materiales debido a restricciones para viajar pueden comunicarse con la sala de archivos de la Oficina Central al teléfono (512) 239-2900.

Comentarios/Notificación Pública y Audiencia. Cualquier persona puede entregar comentarios públicos sobre el permiso preliminar. Comentarios relacionados a la exactitud, lo completo, y lo apropiado de las condiciones del permiso pueden resultar en cambios al permiso preliminar.

Una persona que podría ser afectada por la emisión de contaminantes atmosféricos del área del sitio del permiso puede solicitar una audiencia de aviso y comentarios. El propósito de la audiencia de notificación y comentarios es para proporcionar la oportunidad para entregar comentarios sobre el permiso preliminar. El permiso puede ser cambiado en base a si los comentarios relacionados con el permiso permiten el cumplimiento con el Título 30 del Código Administrativo de Texas, Capítulo 122 (ejemplos pueden incluir que el permiso no tiene todos los requisitos aplicables que correspondan o que no se cumplieron los procedimientos de aviso público). La TCEQ puede otorgar una audiencia de aviso y comentarios con respecto a esta solicitud si una petición por escrito es presentada dentro de los treinta días después de la publicación del anuncio en el diario. La solicitud de audiencia debe incluir la base de la solicitud, incluyendo una descripción de como la persona puede ser afectada por la emisión de contaminantes atmosféricos del área de la solicitud. La solicitud también debería especificar las condiciones del permiso borrador que son inapropiados o especificar como la decisión preliminar para expedir o denegar el permiso es inapropiado. Todos los asuntos razonablemente verificables deben ser planteados y todos los argumentos razonablemente disponibles deben ser entregados a no más tardar al final del período de comentarios públicos. Si se concede una audiencia de aviso y comentario, todos los individuos que presentaron comentarios por escrito o una solicitud de audiencia recibirán confirmación por escrito de la audiencia. Esta confirmación indicará la fecha, hora y lugar de la audiencia.

Comentarios públicos por escrito y/o peticiones para una audiencia de aviso y comentarios deberían ser presentados a la Comisión de Calidad Ambiental (TCEQ), Oficina del Secretario Oficial (Office of Chief Clerk), MC-105, P. O. Box 13087, Austin, Texas 78711-3087, o por internet al www14. tceq. texas. gov/epic/eComment/, dentro de treinta días después de la fecha de publicación en el periódico de este aviso. Si se comunica electrónicamente con la TCEQ, favor de notar que su correo electrónico, tal como su dirección de correo doméstico, formarán parte del archivo público de la agencia.

Un aviso de la acción final propuesta que incluye una respuesta a los comentarios y denotando cualquier cambio al permiso preliminar, será enviado a todas las personas que hayan presentado comentarios públicos, una solicitud de audiencia o que hayan solicitado ser incluidos en la lista de correo. Este envío de correo también proveerá instrucciones para hacer peticiones públicas a la Agencia de Protección Ambiental (EPA, por sus siglas en inglés), para solicitar que la EPA se oponga a la expedición del permiso preliminar. Después de recibir una solicitud, la EPA solamente podrá objetar a la expedición de un permiso que no cumple con los requisitos aplicables o los requisitos del 30 TAC Capítulo 122.

Lista Para Envío de Correo. Aparte de entregar comentarios públicos, usted puede solicitar ser incluido en una lista para envío de correo con respecto a esta solicitud al enviar su petición a la Oficina del Secretario Oficial (Office of Chief Clerk) a la dirección antes mencionada. Los que se encuentran en la lista para envío de correo recibirán copias de avisos públicos futuros (si hay) para esta solicitud enviados por correo por el Secretario Oficial.

Información. Para más información con respecto a esta solicitud de permiso o el proceso de permisos, favor de contactar a la Texas Commission on Environmental Quality (Comisión de Calidad Ambiental de Texas), Programa de Educación del Público (Public Education Program, por sus siglas en inglés) MC-108, P. O. Box 13087, Austin, Texas 78711-3087 o llamar sin cargo al 1-800-687-4040.

Puede obtener más información sobre Rohm and Haas Texas Incorporated llamando a Sr. Rafael Mendez al teléfono (281) 228-2872.

Fecha de Expedición: el 1 de mayo, 2020

View legal notices at chron.com/legals

AVISO *ENMENDADO* DE SOLICITUD Y DECISIÓN PRELIMINAR PARA UN PERMISO DE CALIDAD DE AIRE
PERMISO NÚMERO: 9423

SOLICITUD Y DECISIÓN PRELIMINAR. Equistar Chemicals, LP, 10801 Choate Road, Pasadena, TX 77507-1503, ha solicitado a la Comisión de Calidad de Aire Ambiental de Texas (TCEQ por sus siglas) para la enmienda de Permiso de Calidad de Aire Número 9423, la cual autorizaría la modificación de la Planta de polipropileno de Bayport ubicada en 12001 Bay Area Boulevard, Pasadena, Condado de Harris, Texas 77507. Esta solicitud se presentó a la TCEQ el 29 de marzo, 2019. La *instalación existente em

Appendix B

Meeting Materials

Fact Sheet

DOW CHEMICAL HARRIS RESERVOIR EXPANSION PROJECT

US Army Corps of Engineers®
Galveston District

June 2020



Existing Harris Reservoir

Thank you for your interest in the Dow Chemical Harris Reservoir Expansion EIS Project. This newsletter is intended to give you information about the U.S. Army Corps of Engineers' (Corps) Environmental Impact Statement (EIS) that is being prepared to support the proposed Project. We look forward to receiving your feedback.

Purpose And Need

The Corps has determined that the proposed Project is needed to utilize Dow's existing run-of-river water rights from the Brazos River to improve reliability for the existing Brazoria and Harris reservoir system during extended drought conditions. This system serves Dow's Texas Operations in Freeport as well as other industrial, community and potable water users that rely on Dow's water supply. An estimated 78,000 acre-feet of water storage capacity is necessary to provide the Texas Commission on Environmental Quality's recommended 180 days of drought resilience.

The current combined storage capacity of the existing Brazoria and Harris reservoirs is approximately 29,000 acre-feet. Therefore, the Harris Reservoir Expansion is needed to provide additional storage capacity of at least 49,000 acre-feet to provide a reliable water supply during a drought.

Join Us for the Virtual Public Scoping Meeting for the Project on June 17, 2020 at 4 p.m. CST

The Corps has scheduled a Public Scoping Meeting for the Dow Chemical Harris Reservoir Expansion Project EIS. **This virtual scoping meeting will be held online at 4 p.m. CST on June 17, 2020.**

More information about accessing the Scoping meeting is available at **www.publicinput.com/Dow-Reservoir-EIS**

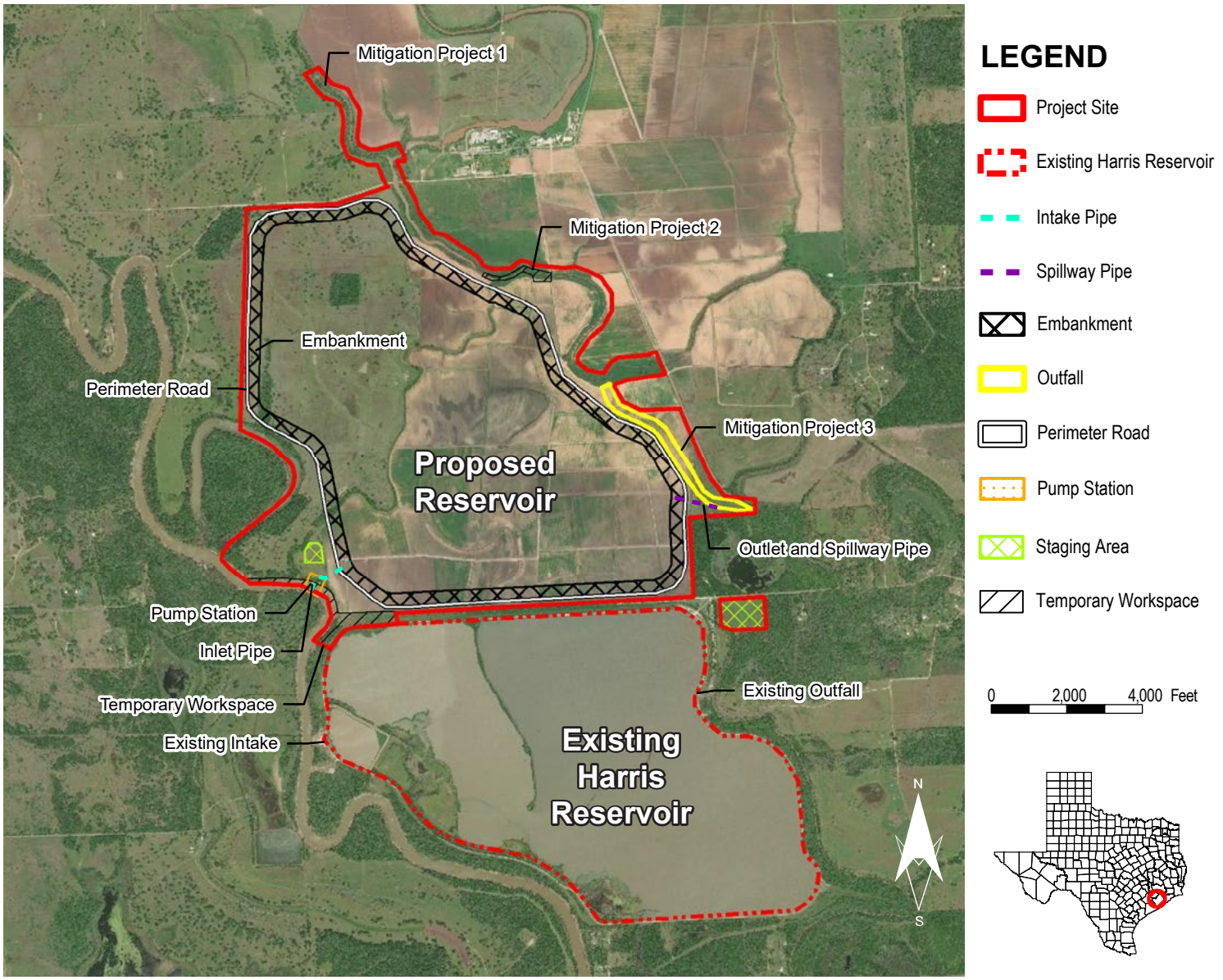
The public meeting will be presented online on this project website to provide information about the proposed Project and to receive public input and comment on the draft EIS. Access information, instructions, an opportunity to subscribe to project updates, and additional information regarding this project is available on this project website.

How to Provide Comments

There are multiple ways to provide comments:

1. Submit written comments online at **www.publicinput.com/Dow-Reservoir-EIS**
2. Email **Dow-Reservoir-EIS@publicinput.com**
3. Text "**DOW**" or **369** to **855-925-2801** to submit a text message
4. Call **855-925-2801** (dial **8816**) to leave a voice message

All comments will be considered equally.



Project Location and Description

The proposed Project is located between the Brazos River and Oyster Creek approximately eight miles northwest of the City of Angleton. The proposed Project includes the construction of an o c annel i pound ent reservoir it a no inal storage capacity of 50,000 acre-feet that would be located directly upstream and adjacent to the existing Harris Reservoir. The proposed reservoir would cover approximately 2,000 acres and would include a pumped intake station on the Brazos River and a gravity outfall to Oyster Creek through the construction of a new bypass channel. The proposed reservoir would operate with the existing Harris and Brazoria reservoirs in a manner similar to current operations. During periods of drought, the proposed reservoir ould e e austed rst ollo ed t e existing Harris Reservoir, and then the Brazoria Reservoir. As with current operations, emergency releases would occur due to severe weather, such as tropical storms and hurricanes exhibiting wind speeds that could potentially overtop the embankments.

The proposed Project includes plans for Oyster Creek The proposed Project includes plans for Oyster Creek restoration under three projects (referred to as Restoration Projects 1, 2, and to en ance t e ood capacit and to provide restoration and enhancements of the plant habitats and communities along the river bank (riparian area). The proposed stream restoration includes creating flat or shallowly sloped areas above the an ull eig t to slo ig velocit o s during stor events an ull enc ing oot u er preservation and u er re establishment up to 200 feet.

- Project 1 is located on a 3,600-linear-foot unnamed tributary to Oyster Creek.
- Project 2 is located on a 12,860-linear-foot segment of Oyster Creek.
- Project 3, located on an 11,200-linear-foot segment of Oyster Creek, would serve as a receiving channel conveying over o s ro ster ree during ig o s providing additional draulic conve ance capacit in t e oodplain and would provide additional flood storage capacity by receiving backwater from Oyster Creek at the downstream end o roject during ood events



Existing Harris Reservoir Outfall

What is an Environmental Impact Statement?

An Environmental Impact Statement, or an EIS, is an analysis prepared under the National Environmental Policy Act (NEPA) and includes a public participation component. A federal agency must prepare an EIS if it is proposing a major federal action t at a signi cantl a ect t e ualit o t e natural and human environment in order to comply with NEPA. NEPA established our country's national environmental policy in 1969 so that the environmental review process seeks to facilitate better informed decisions and involve citizens. The Corps will seek to involve the many stakeholders throughout the EIS process for Dow's proposed Harris Reservoir Expansion project.

The EIS will assess the affected environment (existing conditions) and analyze the potential environmental impacts to resources. Resources for this EIS include soils, water quality, wetlands, wildlife, threatened and endangered species, and cultural resources. The Project area is mostly agricultural land and pasture with smaller areas of forested habitat and etlands e orps as veri ed t at t ere are acres of palustrine wetlands and 74.1 acres of waterbodies within the Project area. Potential habitat for the threatened whooping crane, Texas fawn foot, and other sensitive bird, reptile, and mussel species may be present.

Who is Involved in the EIS Process?

The Corps is lead agency under NEPA in the preparation of the EIS and the U.S. Environmental Protection Agency, or EPA, and the U.S. Fish and Wildlife Service are cooperating agencies under NEPA for this EIS. The Corps has engaged a third-party contractor to assist in the preparation of the EIS that includes subject matter experts ranging from hydrologists and biologists to social scientists. In addition, the Texas Commission on Environmental Quality, Texas Parks and Wildlife Department and the Texas Historical Commission are participating agencies.

Corps Permitting

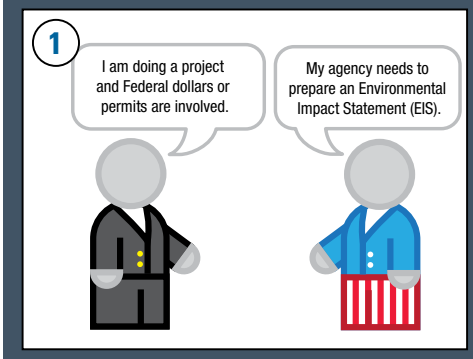
The Corps received a U.S. Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act from Dow Chemical Company for the proposed Project (SWG–2016–01027) and issued a public notice on March 2, 2018. The purpose of the public notice was to initiate an early public scoping process to solicit comments and information from the public as well as state and federal agencies to better enable us to make a reasona le decision on actors a ecting t e pu lic interest All comments received in response to the public notice will be included in the scope of the EIS.

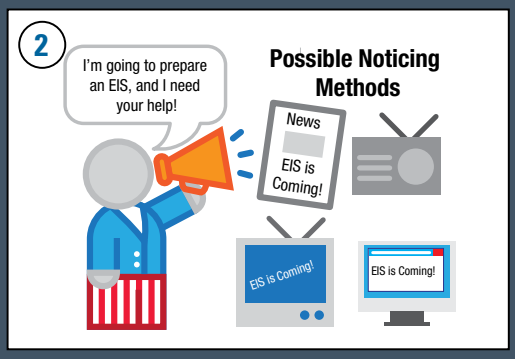
The EIS Process

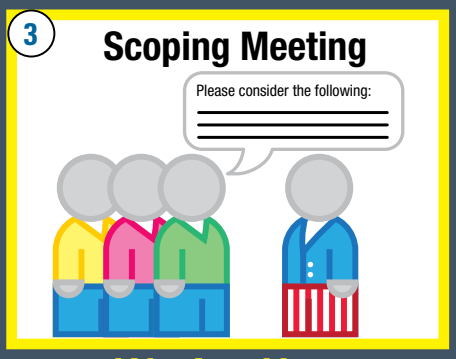
U.S. Army Corps of Engineers (the Lead Agency)

Dow Chemical (The Applicant)

You The Public and Local Stakeholders



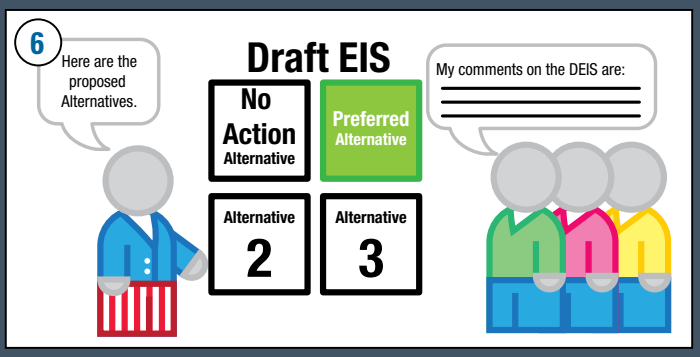




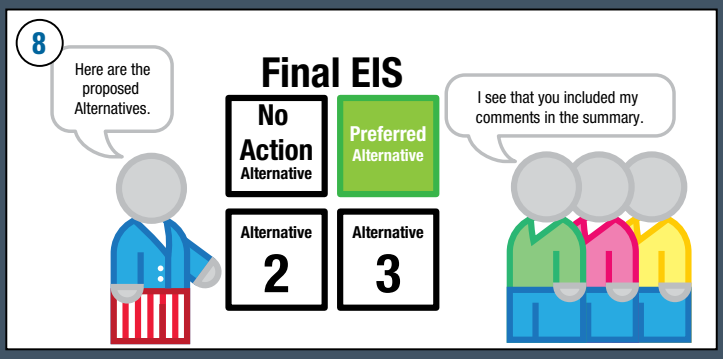
We Are Here

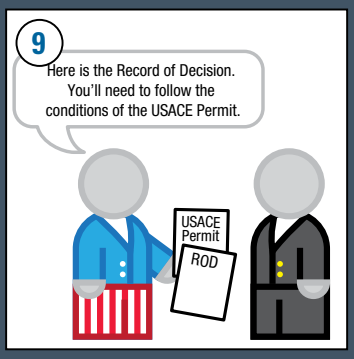












Get Involved

You may participate in this process by providing comments for the Project team's consideration. Public involvement is essential in assessing the environmental consequences of the proposed Project and improving the quality of environmental decision making. The Corps is using this meeting to receive citizens' ideas on the potential issues and impacts of the Project on the natural and human environment. These ideas will be addressed in t e environ ental i pacts anal sis to elp de ne t e scope o t e S n addition to t ese ideas t e orps speci call see s the public's input on the problems, opportunities, and potential alternatives that the reservoir expansion improvements may address. All comments received in response to the public notice will be included in the scope of the EIS.

The Corps encourages full public participation to promote open communication on the issues surrounding the EIS for the proposed Project. In addition, participation by federal, state, regional, and local agencies and other interested organizations is encouraged.

How Do I Submit Comments for the Proposed Project?

There are multiple ways to provide comments:

1. Submit written comments online at **www.publicinput.com/Dow-Reservoir-EIS**
2. Email **Dow-Reservoir-EIS@publicinput.com**
3. Text "**DOW**" or **369** to **855-925-2801** to submit a text message
4. Call **855-925-2801** (dial **8816**) to leave a voice message

All comments will be considered equally.

All comments must be received or postmarked by **Thursday, July 2, 2020**.

Register at **www.publicinput.com/Dow-Reservoir-EIS** to be added to the project mailing list.

Floodplain Discussion Fact Sheet

DOW CHEMICAL HARRIS RESERVOIR PROJECT SITE FLOODPLAIN DISCUSSION

US Army Corps of Engineers®
Galveston District

June 2020

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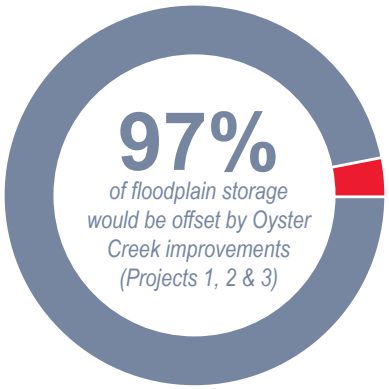
Floodplain Storage Loss Effects



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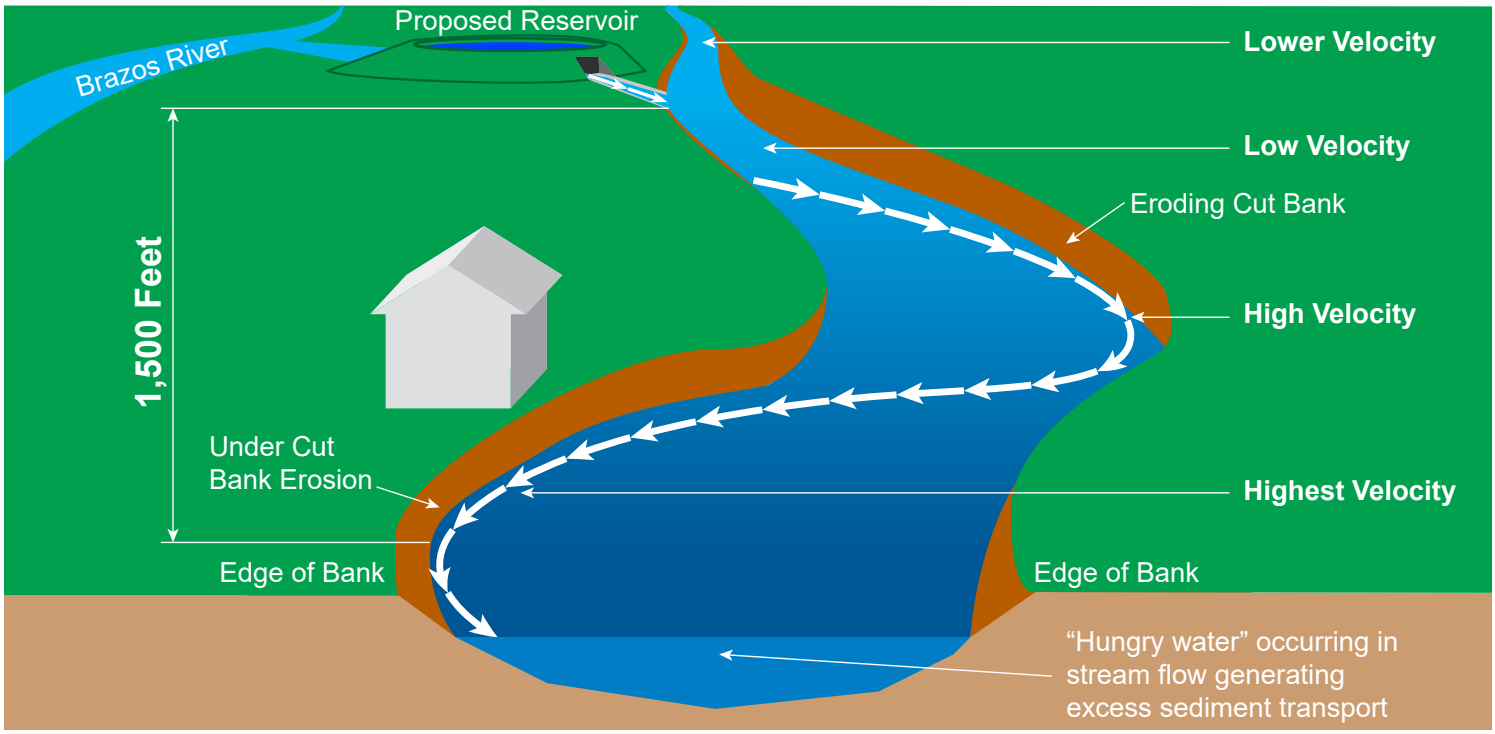
www.publicinput.com/ Dow-Reservoir-EIS

Oyster Creek Hydromodification



Introduction Video

Dow Harris Reservoir Expansion Project EIS Introduction Video



Frequently Asked Questions Handout

FAQS: DOW CHEMICAL HARRIS RESERVOIR EXPANSION PROJECT ENVIRONMENTAL IMPACT STATEMENT

What is being studied in the environmental impact statement (EIS)?

The Dow Chemical Company (Dow or the Applicant) is proposing to provide additional water storage capacity by constructing an off-channel (upland) reservoir and associated infrastructure located immediately north of the existing Harris Reservoir site. The off-channel reservoir would include a 1,929-acre impoundment with a nominal storage capacity of 50,000 acre-feet, an intake and pump station to divert Dow's existing surface water rights from the Brazos River, an outlet to Oyster Creek, and an emergency spillway. The Project also includes floodplain enhancements in Oyster Creek, stream restoration, and temporary construction staging and laydown areas. The proposed off-channel reservoir would be operated in conjunction with the existing Brazoria and Harris Reservoirs to supplement the total available storage capacity and to provide additional operational flexibility.

Why is the Proposed Action needed?

The Project facilities are intended to provide a reliable water supply from the Brazos River for Dow's Texas Operations in Freeport, Texas, and other users of Dow's water supply system, including the Brazosport Water Authority during extended periods of low stream flows and/or drought.

What is the U.S. Army Corps of Engineers' (Corps) relationship with the applicant?

The Corps has no relationship with the Applicant in regard to this Project and is neither for nor against the Project. The Corps has a responsibility to review the Applicant's proposed Project with the same objectivity as it would any permit application and make a permit decision under the Corps' statutory authorities.

Is the Project already approved and going to be built?

No.

What is the Corps' role in reviewing this project?

The Applicant has applied for authorization under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. It is the Corps' responsibility to evaluate their application and ultimately make permit decisions (approval or denial) under the Corps' authorities.

Are any other agency reviews required based on the Applicant's submittal of the permit application?

The permit application is subject to reviews under the Endangered Species Act, National Historic Preservation Act, Coastal Zone Management Act, and Section 401 of the Clean Water Act (Water Quality Certification). The Corps has invited the U.S. Fish and Wildlife Service, Texas Historical Commission, and the Texas Commission on Environmental Quality, respectively, to coordinate these reviews.

What is the National Environmental Policy Act (NEPA)?

NEPA requires federal agencies to engage in a review process to evaluate the potential environmental and public health effects of a proposed action and to involve the public before a decision is made or construction begins.

A NEPA-mandated review must be completed before an agency makes a final decision on a proposed action. NEPA does not require the decision-maker to select the most environmentally preferable alternative, but NEPA does require that decision-makers be informed of the environmental consequences of their decisions. Analysis under NEPA should be informed by NEPA's policy goals, which include assuring a safe and healthful environment for future generations.

Is the Corps studying alternatives to the Proposed Action?

The Corps compiles a range of alternatives to be considered that meet the overall project purpose with consideration of the Applicant's objectives. The alternatives compilation will include the No Action alternative, any alternatives considered by the Applicant, and alternatives suggested during the scoping process.

Has the Corps determined the overall project purpose?

Yes, the Corps has concluded that the overall project purpose is: "To utilize Dow's existing run-of-river water rights from the Brazos River to improve reliability during extended drought conditions for the existing water supply system that serves Dow's Texas Operations in Freeport. Based on modeling, Dow estimates that 78,000 acre-feet of water storage capacity is necessary to provide Texas Commission on Environmental Quality's recommended 180 days of drought resilience."

Will the Corps seriously consider the No Action alternative? What factors might lead to its selection?

The Corps cannot be pre-decisional; therefore, the process will be required to analyze and consider the No Action alternative. In the context of Corps' evaluation, the No Action alternative constitutes an action that would not include the discharge of fill material into waters of the U.S.

What is scoping?

Scoping is the process of identifying the elements of the environment to be evaluated in an EIS. Scoping is intended to help identify and narrow the issues to those that are significant. Scoping includes a public comment period so that the public and other agencies can comment on key issues and concerns. Following the comment period, the Corps considers all comments received and determines the scope of review for the NEPA environmental analysis.

Is the scoping meeting a public hearing?

No. A scoping meeting is not a public hearing. Public hearings have formal procedural and legal steps that differ from scoping meetings. NEPA is intended to identify and evaluate potentially significant environmental impacts and mitigation measures that could avoid, reduce, or minimize adverse environmental impacts. The EIS is an objective, comprehensive document used by agency decision-makers to inform their permitting and other decisions. Although scoping meetings are not required by NEPA, the Corps decided to offer both agency and public meetings where people could learn more about the proposal and provide written and/or verbal comments to help inform the draft EISs. People do not have to attend scoping meetings to submit comments—there are a variety of ways to do this and all comments are treated equally.

What should scoping comments address?

Public comments on the scope of the EIS help the agencies determine what should be addressed in each document. Comments may address any or all of the following:

- A reasonable range of alternatives (identification of an alternative site for a terminal, or identification of an alternative approach to bulk material handling that achieves the proposal's objective).
- Potentially affected resources and extent of analyses (identification of natural, cultural, or community resources that will be potentially affected and the extent of study and analyses that is needed to understand the potential impacts).
- Significant unavoidable adverse impacts.
- Measures to avoid, minimize, and mitigate (offset) effects of the proposal.

Does it matter what method people use to comment during scoping?

No. All comments are valued equally no matter what method is used. It doesn't matter if a comment is submitted online, via U.S. mail, by electronic mail, or recorded verbally. All comments are considered equal by the Corps. But remember that only those comments submitted within the scoping period dates are considered for each draft EIS.

What is an EIS?

Federal agencies prepare an EIS if a proposed major federal action is determined to significantly affect the quality of the human environment. An EIS is a detailed written statement that defines the purpose and need for a project; considers a range of reasonable alternatives (including a No Action alternative); analyzes and evaluates the potential direct, indirect, and cumulative environmental impacts that may result from a proposed action and reasonable alternatives that meet the purpose and need; and identifies measures that may mitigate the effects of a proposed action.

An EIS includes the following:

- Executive summary. A summary of the EIS, including the major conclusions, areas of controversy, and the issues to be resolved.
- Table of contents. Assists the reader in navigating through the EIS.
- Purpose and need statement. Explains the reason the agency is proposing the action and what the agency expects to achieve.
- Alternatives. The EIS must consider all reasonable project alternatives that can accomplish the purpose of and need for the proposed action. For all project alternatives that were eliminated, the EIS must briefly discuss the reasons why the alternative was eliminated from consideration.
- Affected environment. Describes the environment of the area to be affected by the alternatives under consideration.
- Environmental consequences. A discussion of the direct and indirect environmental effects and their significance.
- Mitigation. Describes measures to be taken to minimize harm from the proposed action and reasonable alternatives.
- List of preparers. A list of the names and qualifications of the persons who were primarily responsible for preparing the EIS.
- List of agencies, organizations, and persons to whom the EIS was sent.
- Index. The index focuses on areas of reasonable interest to the reader.
- Appendices (if required). Appendices provide background materials prepared in connection with the EIS.

What is the difference between a draft EIS and a final EIS?

A draft EIS provides the public and agency decision-makers with information on likely significant adverse environmental impacts of a proposal and alternatives and on mitigation measures to reduce impacts. Following publication of the draft EIS, a comment period of no less than 30 days begins.

A final EIS includes all comments received on the draft EIS and responses from the Corps and may include revisions to the draft EIS based on comments received and new information learned. Publication of the final EIS begins the minimum 30-day "wait period," in which agencies are generally required to wait 30 days before making a final decision on a proposed action.

How will I know when the draft EIS is issued and where will it be available?

The draft EIS is tentatively scheduled to be released in March 2021. Should the schedule change, updated information will be posted on the Corps' project web site. A notice of availability and a copy of the draft EIS will be posted on the Corps' project web site at https://www.swg.usace.army.mil/Business-With-Us/Regulatory/Special-Projects-Environmental-Impact-Statements/.

What is a record of decision (ROD)?

The ROD is a concise public document that records a Federal agency's decision(s) concerning a proposed action for which the agency has prepared an EIS. The ROD includes: 1) an explanation of the agency's decision; 2) describes the alternatives the agency considered; and 3) discusses the agency's plans for mitigation and monitoring, if necessary. The ROD will be provided on the Corps' project website at https://www.swg.usace.army.mil/Business-With-Us/Regulatory/Special-Projects-Environmental-Impact-Statements/.

What is Executive Order 13807 – Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure?

This Executive Order requires Federal agencies to process environmental reviews and authorization decisions for "major infrastructure projects" as One Federal Decision. That means that all Federal agencies with environmental review, authorization, or consultation responsibilities for major infrastructure projects will develop a single EIS for such projects, sign a single ROD and issue all necessary permits, if authorized, within 90 days after the ROD.

What is the anticipated schedule for the EIS?

The schedule for the EIS and ROD is located on the Permitting Dashboard for Infrastructure Projects where One Federal Decision projects are tracked: https://www.permits.performance.gov/permitting-project/dow-chemical-companys-harris-reservoir-expansion-eis.

What are the opportunities for providing input?

Public participation is an important part of developing an EIS under NEPA. Submitting substantive and concise comments during the scoping period is an important role the public plays in the NEPA process and can influence the scope of analysis for the EIS. The public is also provided with an opportunity to review the draft EIS and submit comments on the analyses contained within. These comments are considered and addressed during preparation of the final EIS.

When and how will my comments be considered in preparing the EIS?

Formal requests for comment occur during two important phases of an EIS:

- During the scoping period, the public is asked to comment on the issues and potential impacts that should be addressed in the EIS. The public is also asked to suggest alternatives to the proposed action that should be considered for evaluation in the EIS.
- Once the draft EIS is released for public review and comment, the public is given the opportunity to submit comments in written form via the project website and orally at public meetings on the draft EIS. All comments submitted will be put into the record, analyzed, and considered in relation to the scope and potential impacts identified within the draft EIS and in making changes to the draft EIS during the preparation of the final EIS. The Corps is required to prepare responses to comments submitted on the draft EIS; comments submitted and responses will be included in the final EIS.

How can I make my comments the most effective?

- Be clear, concise, and organized. Decide what you need to say before you begin. Developing an outline, if you have a number of points, is a good idea to help you group your comments in a logical order. Jumping back and forth between several topics reduces the impact of your argument.
- Be specific. Saying that you are against a project will not have as much effect as saying why. It is always a good idea to give as much support as possible to your comments. Include as much factual information as possible. For instance, you can compare how things were to how they are and to how you believe they will be in the future—and why. Support your statements with explanations, facts, and references, as appropriate.
- Identify possible solutions. Suggestions on reasonable mitigation (conditions to avoid, minimize, or reduce adverse impacts) may help shape a questionable project into a welcome addition to a community. After identifying your concern, whenever possible, suggest possible solutions.

Who makes the final decision whether the proposal is approved or not?

No single agency makes a final approval or disapproval for the entire proposal. The proposal will need multiple permit decisions from a variety of federal, state, and local agencies. Permit decisions by federal, state, and local agencies cannot be made until after the EIS process is complete. Each permit has its own regulatory process, timeline, and requirements.

Where do I vote on the proposal?

The EIS process is not a vote. NEPA is intended to identify and evaluate probable environmental impacts and for the development of mitigation measures that would reduce adverse environmental impacts. An EIS is an impartial, comprehensive document that is used by agency decision-makers for their permitting processes.

Where can more information be found regarding the EIS process?

For more detailed information, please see "A Citizen's Guide to NEPA" (https://ceq.doe.gov/docs/get-involved/Citizens_Guide_Dec07.pdf) published by the White House Council on Environmental Quality.

Appendix C

Project Website



US Army Corps of Engineers
Galveston District

DOW Harris Reservoir Expansion Environmental Impact Statement

Welcome to the DOW Harris Reservoir Third-Party EIS Project

Thank you for your interest in the Dow Chemical Harris Reservoir Expansion EIS Project. This project website is intended to give you information about the U.S. Army Corps of Engineers' Environmental Impact Statement (EIS) that is being prepared to support the proposed Project. We look forward to receiving your feedback.

Thank you for joining us for the June 17, 2020 Virtual Scoping Meeting

You may still provide your comments through July 2, 2020.

*Get involved by **submitting written comments** online, **calling 855-925-2801** (enter 8816) to leave us a voice message, or **text DOW to 855-925-2801**.*

Welcome! | About the Proposed Project | About the EIS Process | Get Involved

Special Public Notice
Public Scoping Meeting for
The Harris Reservoir Expansion Project

NOTICE OF PUBLIC SCOPING MEETING FOR DOW CHEMICAL COMPANY'S HARRIS RESERVOIR EXPANSION PROJECT, BRAZORIA COUNTY, TEXAS (DEPARTMENT OF THE ARMY PERMIT NUMBER SWG-2016-01027)

PURPOSE OF PUBLIC NOTICE: To inform you that the U.S. Army Corps of Engineers, Galveston District (Corps) has scheduled a Public Scoping Meeting on June 17, 2020 for an Environmental Impact Statement (EIS), for which you might be interested. It is also to solicit your comments and information to better enable us to make a reasonable decision on factors affecting the public interest.

BACKGROUND: The U.S. Army Corps of Engineers, Galveston District (Corps) received a permit application for a U.S. Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act from Dow Chemical Company (Dow) for the Harris Reservoir Expansion Project (proposed Project). The Corps is the lead Federal agency under National Environmental Policy Act (NEPA) and the President's Council on Environmental Quality regulations and intends to prepare an environmental impact statement (EIS) for the proposed Project. The U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service are cooperating agencies under NEPA and the Texas Commission on Environmental Quality, Texas Parks and Wildlife Department and the Texas Historical Commission are participating for the preparation of the EIS. The DA permit application was first advertised by an extended Public Notice issued March 2, 2018.

The proposed Project is located adjacent to the existing Dow Chemical Harris Reservoir in the city of Angleton, Brazoria County, Texas (Latitude 29.2709860466716 ° North, Longitude -95.543090603221 ° West). The proposed Project would include the construction of a 1,929-acre impoundment with a nominal storage capacity of 50,000 acre-feet, an intake and pump station to divert Dow's existing surface water rights from the Brazos River, an outlet to Oyster Creek, and an emergency spillway. The Project would also include floodplain enhancements on Oyster Creek, stream restoration, and temporary construction staging and laydown areas. Dow proposed the Project.

SCOPING PROCESS/PUBLIC INVOLVEMENT: A virtual scoping meeting will be held online at 6:00 p.m. on June 17, 2020. The public meeting will be presented online to provide information about the proposed Project and to receive public input and comment on the draft EIS. Access information, instructions, an opportunity to subscribe to project updates, and additional information regarding this project will be made available prior to the virtual meeting at https://www.publicinput.com/Dow-Reservoir-EIS.

The Corps invites full public participation to promote open communication on the potential concerns surrounding the draft EIS. In addition, participation by Federal, State, local agencies and other interested organizations is encouraged. Both oral and written statements will be accepted at the meeting through several channels including a virtual comment portal, telephone, and text message. Materials and visual depictions of the proposed Project and associated impacts will be available.

Each speaker will be given 3 minutes. Please keep your time to 3 minutes or less. If you do not need the full 3 minutes, help us to move the process along by only using the time you need. If you have additional comments that you'd like to submit beyond what you're able to address during your time allotted, please submit them in writing. Written comments are just as valid and count the same as verbal comments presented during the Public Scoping Meeting. Questions for Dow related to the proposed Project or the Corps' regulatory and Civil Works process may be submitted to the website referenced above or via email, text message or phone call to the toll-free number 855-925-2801. For text message comments, please text "DOW" or 369 to 855-925-2801.

The public meeting will be conducted in English. Those in need of language interpreters should contact the Corps' Public Involvement consultant, Hollaway Environmental Communications Services, Inc. (713) 868-1043, by June 10, to make arrangements. Every effort will be made to address requests.

Any comments received at the virtual public meeting will be considered by the Corps to assist in determining whether to issue, modify, condition, or deny a permit for the Project. Comments will be considered in the draft EIS analysis pursuant to NEPA and used to help determine the overall public interest of the proposed Project. All comments must be received or postmarked by Thursday, July 2, 2020. (15 calendar days following the public meeting).

ADDRESSES: Written comments regarding the proposed EIS scope should be addressed to Mr. Jayson Hudson, USACE, Galveston District, Regulatory Branch, P.O. Box 1229, Galveston, Texas 77553-1229. Individuals who would like to electronically provide comments should contact Mr. Hudson by electronic mail at: SWG201601027@usace.army.mil. Emailed comments, including attachments, should be provided in .doc, .docx, .pdf or .txt formats.

FOR FURTHER INFORMATION CONTACT: For information about this project, to be included on the mailing list for future updates and meeting announcements, or to receive a copy of the Draft EIS when it is issued, contact Mr. Jayson Hudson, at the Corps at (409) 766-3108, the email address SWG201601027@usace.army.mil, or the address provided above.

Corps Public Scoping Meeting on June 17, 2020 at 4 p.m. CST

The U.S. Army Corps of Engineers, Galveston District (Corps) has scheduled a Public Scoping Meeting for the Dow Chemical Harris Reservoir Expansion Project Environmental Impact Statement (EIS). **This virtual scoping meeting will be held online at 4 p.m. CST on June 17, 2020.**

The public meeting will be presented online on this project website to provide information about the proposed Project and to receive public input and comment on the draft EIS. Access information, instructions, an opportunity to subscribe to project updates, and additional information regarding this project is available on this project website.

How to Provide Comments

There are multiple ways to provide comments:

1. Visit the "Get Involved and Provide Comments" Page to submit comments online
2. Email Dow-Reservoir-EIS@publicinput.com
3. Text **"DOW" or 369 to 855-925-2801** to submit a text message
4. Call **855-925-2801 (dial 8816)** to submit a voice message

This website page will be updated with additional information closer to our meeting date on June 17, 2020.

Continue

USACE Scoping Meeting Presentation



Harris Reservoir Expansion Video

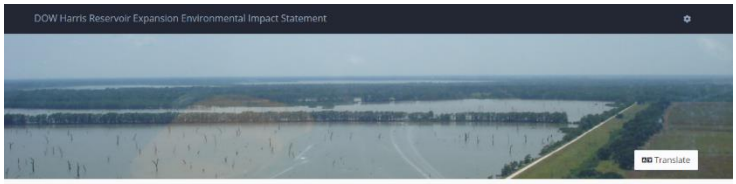


Dow Harris Reservoir Expansion Project EIS Introduction Video



Documents

- DOW Harris Reservoir Expansion Project - NEPA FAQ - May 27, 2020.pdf
- ENGLISH - FINAL DRAFT_DOW EIS Public Notice 5-21-2020.pdf
- Dow EIS Factsheet June 2020.pdf
- Dow EIS Floodplain Discussion June 2020.pdf



US Army Corps of Engineers
Galveston District

DOW Harris Reservoir Expansion Environmental Impact Statement

Welcome to the DOW Harris Reservoir Third-Party EIS Project

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Thank you for joining us for the June 17, 2020 Virtual Scoping Meeting

You may still provide your comments through July 2, 2020.

*Get involved by **submitting written comments** online, **calling 855-925-2801** (enter 8816) to leave us a voice message, or **text DOW to 855-925-2801**.*

Welcome! | About the Proposed Project | About the EIS Process | Get Involved

Purpose and Need

The Corps has determined that the proposed Project is needed to utilize Dow's existing run-of-river water rights from the Brazos River to improve reliability for the existing Brazoria and Harris reservoir system during extended drought conditions. This system serves Dow's Texas Operations in Freeport as well as other industrial, community and potable water users that rely on Dow's water supply. An estimated 78,000 acre-feet of water storage capacity is necessary to provide the Texas Commission on Environmental Quality's recommended 180 days of drought resilience.

The current combined storage capacity of the existing Brazoria and Harris reservoirs is approximately 29,000 acre-feet. Therefore, the Harris Reservoir Expansion is needed to provide additional storage capacity of at least 49,000 acre-feet to provide a reliable water supply during a drought.

Project Location and Description

The proposed Project is located between the Brazos River and Oyster Creek approximately eight miles northwest of the City of Angleton. The proposed Project includes the construction of an off-channel impoundment reservoir with a nominal storage capacity of 50,000 acre feet that would be located directly upstream and adjacent to the existing Harris Reservoir. The proposed reservoir would cover approximately 2,000 acres and would include a pumped intake station on the Brazos River and a gravity outfall to Oyster Creek through the construction of a new bypass channel.

The proposed reservoir would operate with the existing Harris and Brazoria reservoirs in a manner similar to current operations. During periods of drought, the proposed reservoir would be exhausted first, followed by the existing Harris Reservoir, and then the Brazoria Reservoir. As with current operations, emergency releases would occur due to severe weather, such as tropical storms and hurricanes exhibiting wind speeds that could potentially overtop the embankments.

The proposed Project includes plans for Oyster Creek restoration under three projects (referred to as Restoration Projects 1, 2, and 3) to enhance the flood capacity and to provide restoration and enhancements of the plant habitats and communities along the river bank (riparian area). The proposed stream restoration includes creating flat or shallowly sloped areas above the bankfull height to slow high velocity flows during storm events (bankfull benching), 100-foot buffer preservation, and buffer re-establishment up to 200 feet

- Project 1 is located on a 3,600-linear-foot unnamed tributary to Oyster Creek.
- Project 2 is located on a 12,860-linear-foot segment of Oyster Creek.
- Project 3, located on an 11,200-linear-foot segment of Oyster Creek, would serve as a receiving channel conveying overflows from Oyster Creek during high flows by providing additional hydraulic conveyance capacity in the floodplain, and would provide additional flood storage capacity by receiving backwater from Oyster Creek at the downstream end of Project 3 during flood events.

The Harris Reservoir Expansion Project is currently a proposed project, which is why the scope of analysis has been conducted to:

- determine any significant environmental issues;
- serve as mechanism to solicit agency and public input on alternatives and issues of concern; and
- ensure full and open participation in scoping for the Draft EIS.

Proposed Project Area

Zoom in to view the proposed project area.



Corps Ongoing Environmental Clearance and Permitting

The Corps received a U.S. Department of the Army (DA) permit pursuant to Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act from Dow Chemical Company for the proposed Project (SWG-2016-01027) and issued a public notice on March 2, 2018. The purpose of the public notice was to initiate an early public scoping process to solicit comments and information from the public as well as state and federal agencies to better enable us to make a reasonable decision on factors affecting the public interest.

Documents

- DOW Harris Reservoir Expansion Project - NEPA FAQ - May 27, 2020.pdf
- ENGLISH - FINAL DRAFT_DOW EIS Public Notice 5-21-2020.pdf
- Dow EIS Factsheet June 2020.pdf
- Dow EIS Floodplain Discussion June 2020.pdf

Continue

USACE Scoping Meeting Presentation



Harris Reservoir Expansion Video



Dow Harris Reservoir Expansion Project EIS Introduction Video



Documents

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US Army Corps of Engineers
Galveston District

DOW Harris Reservoir Expansion Environmental Impact Statement

Welcome to the DOW Harris Reservoir Third-Party EIS Project

Thank you for your interest in the Dow Chemical Harris Reservoir Expansion EIS Project. This project website is intended to give you information about the U.S. Army Corps of Engineers' Environmental Impact Statement (EIS) that is being prepared to support the proposed Project. We look forward to receiving your feedback.

Thank you for joining us for the June 17, 2020 Virtual Scoping Meeting

You may still provide your comments through July 2, 2020.

*Get involved by **submitting written comments** online, **calling 855-925-2801** (enter 8816) to leave us a voice message, or **text DOW to 855-925-2801**.*

Welcome! | About the Proposed Project | About the EIS Process | Get Involved

Where are we in the EIS process?

An EIS, or Environmental Impact Statement, is prepared in a series of steps. The first step, referred to as "Scoping", involves an open process where government and public comments are gathered to define issues that will be analyzed in the EIS. After the Scoping stage, the draft EIS is prepared and is then made available for public and agency review; the project team will then receive and respond to public comments on the draft EIS and prepare the final EIS in consideration of all feedback received during the EIS process. Decisions are not made in an EIS; rather, the EIS analysis serves as one of several factors decisionmakers consider. The decision is announced in the Record of Decision after the final EIS has been published.

We are currently in the Scoping stage of the EIS process. After reviewing comments and constraints identified by the public and coordinating with the appropriate federal, state, regional, and local agencies, our team will then proceed with developing alternatives for future public review in the Draft EIS.

What is an Environmental Impact Statement (EIS)?

An EIS is an analysis prepared under the National Environmental Policy Act (NEPA) and incudes a public participation component. A federal agency must prepare an EIS if it is proposing a *major federal action* that may significantly affect the quality of the natural and human environment to comply with NEPA. NEPA established our country's national environmental policy in 1969 so that the environmental review process seeks to facilitate better informed decisions and involve citizens. The Corps will seek to involve the many stakeholders throughout the EIS process for Dow's proposed Harris Reservoir Expansion project.

Who is involved in the EIS process?

The Corps is lead agency under NEPA in the preparation of the EIS and the U.S. Environmental Protection Agency, or EPA, and the U.S. Fish and Wildlife Service are cooperating agencies under NEPA for this EIS. The Corps has engaged a third-party contractor to assist in the preparation of the EIS that includes subject matter experts ranging from hydrologists and biologists to social scientists. In addition, the Texas Commission on Environmental Quality, Texas Parks and Wildlife Department and the Texas Historical Commission are participating agencies.

How do I participate in the EIS process?

You may participate in this process by providing comments for the Project team's consideration. Public involvement is essential in assessing the environmental consequences of the proposed Project and improving the quality of environmental decision making. The Corps is using this meeting to receive citizens' ideas on the potential issues and impacts of the Project on the natural and human environment. These ideas will be addressed in the environmental impacts analysis to help define the scope of the EIS. In addition to these ideas, the Corps specifically seeks the public's input on the problems, opportunities, and potential alternatives that the reservoir expansion improvements may address. All comments received in response to the public notice will be included in the scope of the EIS.

The Corps encourages full public participation to promote open communication on the issues surrounding the EIS for the proposed Project. In addition, participation by federal, state, regional, and local agencies and other interested organizations is encouraged.

Please visit the Get Involved and Provide Comments Page to submit comments today. Note that all comments must be received or postmarked by Thursday, July 2, 2020.

Continue

USACE Scoping Meeting Presentation



Harris Reservoir Expansion Video



Dow Harris Reservoir Expansion Project EIS Introduction Video



Documents

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- ENGLISH - FINAL DRAFT_DOW EIS Public Notice 5-21-2020.pdf
- Dow EIS Factsheet June 2020.pdf
- Dow EIS Floodplain Discussion June 2020.pdf



US Army Corps of Engineers
Galveston District

DOW Harris Reservoir Expansion Environmental Impact Statement

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*Get involved by **submitting written comments** online, **calling 855-925-2801** (enter 8816) to leave us a voice message, or **text DOW to 855-925-2801**.*

Welcome! | About the Proposed Project | About the EIS Process | Get Involved

How do I submit comments for the proposed Project?

There are multiple ways to provide comments:

1. Visit the "Get Involved and Provide Comments" Page to submit comments online <link to page>
2. Email Dow-Reservoir-EIS@publicinput.com
3. Text "DOW" or 369 to 855-925-2801 to submit a text message
4. Call 855-925-2801 (dial 8816) to submit a voice message

All comments must be received or postmarked by Thursday, July 2, 2020.

* * Please provide any feedback you have regarding the DOW Harris Reservoir Expansion EIS Project along with your first name, last name, and email address.

You've successfully responded to this form.
View form again

Share your thoughts and ideas...

Sign in with

Your name

Gregory Sevcik

Post Publicly

Register **here** to be added to the project mailing list.

How do I get more information?

For more information about the Corps, visit https://www.swg.Corps.army.mil/Media/Public-Notices/Year/2020/.

USACE Scoping Meeting Presentation



Harris Reservoir Expansion Video



Dow Harris Reservoir Expansion Project EIS Introduction Video



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Appendix D

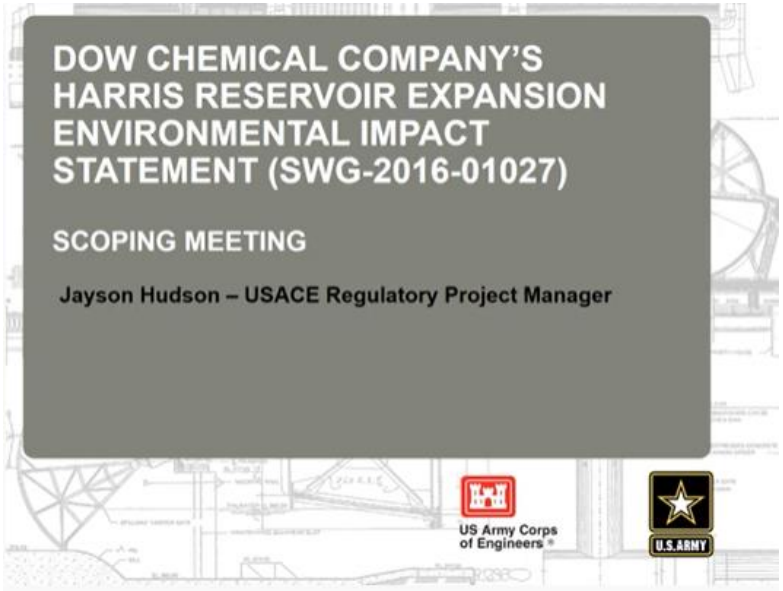
Meeting Presentations

Video Links

Dow Virtual Public Scoping Meeting Opening Remarks June 2020



Dow's Proposed Project Video



Dow Harris Reservoir Expansion Project Presentation

Harris Reservoir Expansion Project



Date: 30-Apr-20
Greg Bond

Appendix E

Comment Database

Dow Chemical Company Harris Reservoir Expansion Project
Public Scoping Meeting Comment Database

Comment #	Topic #	Commenter (Last Name/First Name)	Commenter Contact Information	Date Received	Category	Comment	Response	Type
1	1	[redacted]		6/17/2020	Flood Concerns	My name is - and during the last couple of big water events we have had a lot of water in our house the first time since we've lived here in 25 years and I don't know what's all of a sudden the cause of that but I'm just concerned that taking away all that area that could soak up water and turning it into a reservoir is going to just let our neighborhood flood more.So I would I would oppose that unless they have some kind of remediation effort in mind. Thank you.		Voice Message Comment
2	1			6/17/2020	Flood Concerns	Lives a mile south of the floodplain and home flooded in 2017. The Brazos River and Creek can't handle the amount of water coming down from up north in the event of a flood. Does not support building a 2000 acre reservoir as it may cause a lot of problems if adding the reservoir raises the flood 3 or 4 inches. It would flood hundreds of houses. The Harris reservoir could possibly erode the bottom of the earthen dam given the 335 million dollars spent. In a drought, saltwater backs up to Brazos River if another drought happens, the new reservoir will be dry in four years.		Voice Message Comment (Paraphrased due to poor recording quality)
2	2			6/17/2020	Alternatives	Oceans can give a never-ending supply of water and this should be considered as you can't predict rainfalls and flooding. Is not convinced by the issue because several buildings in the north are sending water their way because elevations of homes, apartments, businesses, parking lots and streets being built over land can no longer absorb rainwater.		Voice Message Comment (Paraphrased due to poor recording quality)
3	1			7/1/2020	Opposed to the project	Yes, I just found out about the proposed reservoir. I am an adjacent landowner directly southwest of the reservoir. I am adamantly opposed to it. I have drafted a letter, which will be postmarked certified mail by the deadline tomorrow. It will better explain everything, but I'm adamantly opposed. I'm sorry, I just found out about it. Obviously didn't want adjacent landowners to know about it. Thank you very much. My name is -. My phone number is -. You can look me up on the Brazos County Appraisal District records. Thank you.		Voice Message Comment
4	1			7/2/2020	Flood Concerns	Hello, my name is -, and I'm calling about the reservoir expansion. We are pleading pleading pleading to deny this permit as that will directly affect the flood area of our ranch and our cattle operation. We are really really concerned about this for our family, so we are seeing that this be denied. My number is -. Thanks so much.		Voice Message Comment
5	1			7/2/2020	No Comment	No comment recorded.		Text Message Comment
6	1			6/8/2020	Property Buyouts	To your knowledge will there be any buyouts concerning the Chenago Residents around the Cr 34 CR 717 and CR 444 areas?		Email Comment
7	1			7/1/2020	Opposed to the project	As an adjacent large landowner, commenter is adamantly opposed to this project as an adjacent large landowner. Has enclosed a letter (Find attached)		Email Comment
7	2			7/1/2020	Opposed to the project	Believes the project will adversely affect the 467 acre property across the river from Dow's Current Harris Reservoir. Will personally hold Dow Chemical Co. and the Corp of Engineers responsible for any flooding in the future on property. Did not receive enough notification on the project especially neighboring landowners.		Email Comment
7	3			7/1/2020	Opposed to the project	Was under Contract for 240 acres directly on the Brazos River JUST north east of downtown Rosenberg in June and desires the construction of a 10 to 17 acre lake within the flood zone and worked with an engineer with JLA Engineering; Fort Bend County Drainage District; Fort Bend Subsidence District; Charles Kalkomey- the certified flood plain manager and City engineer.		Email Comment
8	1			7/2/2020		These comments are in addition to those submitted on behalf of the Board of the Brazos River Club. Hunting & Fishing Club - Established 1956 (Enclosed in pdf document)		Email Comment
8	2			7/2/2020	Land and Erosion Concerns	Believed the proposed plan's focus is strictly on the operational aspects of the reservoir without consideration given to the significant impact of diverting additional river water down stream during weather events. The plan refers to stream restoration and improvements to Oyster Creek but does not include any language or plan regarding channel improvement or restoration to the Brazos River. The soil conditions down stream of the project are subject to significant erosion and will be dramatically impacted by the taking of approximately 2,000 acres of floodplain.		Email Comment
8	3			7/2/2020	Flood Concerns	Construction of levees to impound water in the reservoir project will divert tens of thousands of acre-feet of water downstream. Without the buffer of the 2,000-acre floodplain the project will be a detriment of the Brazos River channel, adjoining properties and sensitive environmental habitats. Additional floods and highwater events would add to bank erosion and cause unrepairable damage to properties and habitats.		Email Comment

Dow Chemical Company Harris Reservoir Expansion Project
Public Scoping Meeting Comment Database

Comment #	Topic #	Commenter (Last Name/First Name)	Commenter Contact Information	Date Received	Category	Comment	Response	Type
8	4	[redacted]	[redacted]	7/2/2020	Alternatives	Other methods of achieving the civil goals should be considered when addressing the TCEQ's recommendations. If approved, this one-off solution ignores potential defects in providing a single solution to water sourcing in drought conditions. Civic goals would be better served with a combination of sources or an alternate site. Alternatives including site selection, alternative water sources including desalination should be considered as a safeguard insuring a continuous supply of water. Alternatives can achieve the civic goals without negatively impacting properties and the environment. The "all eggs in one basket" approach to providing water for the community and industrial users should be denied in favor of an integrated approach to provide water for the communities and industry.		Email Comment
9	1			7/2/2020	Property and Ecological Concerns	Concerened about the effect of the project on Black Ranch and neighboring properties. Hasn't been given proper notice of what's happening or presented appropriate research into what exactly this measure will do to us, the land, and the ecosystems involved. Black Ranch is a family ranch going back generations and is threatened with elevated risk of flooding due to the proposed levying of the DOW reservoir. There exists a large amount of flooding in the northern end of the property. Levying the reservoir will cause more flooding, which then causes further damage to the land, livestock, people, and any otherwildlife that may be there. Request proper notice and research is done to ensure that landowners and wildlife system are not poorly affected by any proposed solutions.		Email Comment
10	1			7/2/2020		Scoping comments on behalf of the Brazos River Club addressing Dow Chemical's Proposed Harris Reservoir Expansion project in addition to comments submitted by Michael Thomas, the club's treasurer.		Email Comment
10	2			7/2/2020	Property and Flood Concerns	Expect this project will significantly impact the floodwater flows downstream on the Brazos River. Impacts on our property, our organization, and our members will increase if Dow Chemical Company's proposal to construct and operate a reservoir in 2000 acres of the combined floodplain and floodways of the Brazos River and Oyster Creek proceeds as proposed. During flood events, the Brazos River and Oyster Creek merge, with many acres covered in feet of water, including the project property, joining these watersheds. Dow's proposal reservoir would remove tens of thousands of acre-feet of flood storage capacity, as well as alter waterways and flow patterns.		Email Comment
10	3			7/2/2020	Public Involvement	The notices for the scoping process and meeting without any reference to recognition inthese notices of the very real and major impacts that are almost certain to occur in the BrazosRiver floodplain if this project is constructed as proposed by Dow.		Email Comment
10	4			7/2/2020	Public Involvement	This analysis does not seem to be available for public review. We have no way of confirming whether impacts in the Brazos River floodway and floodplain have been evaluated in any real, substantive way in response to the 2018 comments, or whether this report just looks at "areas downstream" within Oyster Creek. Lacking this and other reports, it becomes difficult to make informed comments about specific areas where additional information needs to be developed.		Email Comment
10	5			7/2/2020	Erosion Concerns	As a result of the combined recent flood events, our property abutting the Brazos River also hasexperienced erosion. Visual observations of the river and the riverbed from our property confirm the erosion that has occurred. Observations at the Highway 35 bridge and other locations downstream from the proposed reservoir also confirm the erosion impacts along the river from recent floods. The greater the volume of water during a flood event, the greater its erosive power.		Email Comment
10	6			7/2/2020	Erosion Concerns	The proposed reservoir effectively creates additional levees removing floodplain areas for the Brazos River. It also alters the flow between the Brazos River and Oyster Creek during flood events. We expect that significant additional volumes of flood water could be directed downstream along the Brazos River during a variety of rain and flood profiles. Some areas that 3 previously did not flood could flood, and the height, impacts, and erosive power of the flood waters post-project likely will result in future additional impacts and damages downstream that would not occur but-for this project. It does not appear that these impacts have been evaluated.		Email Comment
10	7			7/2/2020	Erosion Concerns	The scope of the Environmental Impact Statement should substantively and thoroughly evaluate potential flood and erosions impacts, including impacts downstream in the Brazos River, for a broad range of flood profiles. These should include using Harvey in 2017 and some of the other actual flood events, including floods where the greatest rainfall and volume contributions come from upstream of the proposed reservoir.		Email Comment
10	8			7/2/2020	Flood and Erosion Concerns	The increased flood and erosion impacts from this proposal will impact people, property both upstream and downstream of our property and wildlife habitat. The full scope of all of these impacts should be evaluated. Other potential impacts, such as impacts on wetland (which can absorb floodwater) and much more should be evaluated thoroughly.		Email Comment

Dow Chemical Company Harris Reservoir Expansion Project
Public Scoping Meeting Comment Database

Comment #	Topic #	Commenter (Last Name/First Name)	Commenter Contact Information	Date Received	Category	Comment	Response	Type
10	9	[redacted]	[redacted]	7/2/2020	Purpose and Need	An important part of any NEPA process is the project purpose and need. In the 2018 documentation, "the project's overall purpose" was stated as "providing reliable water supply during drought" by "using existing Dow-owned surface water rights." The April 9, 2020 Corps notice contains the following: Purpose and Need: The purpose of the proposed Project is to utilize Dow's existing runof-river water rights from the Brazos River to improve reliability during extended drought conditions for the existing water supply system that serves Dow's Texas Operations in Freeport as well as other industrial, community and potable water users that rely on Dow's water supply. Based on modeling, Dow estimates that a total of 78,000 acre-foot of water storage capacity is necessary to provide Texas Commission on Environmental Quality's recommended 180 days of drought resilience. The current combined storage capacity in the existing Brazoria and Harris reservoirs is approximately 29,000 acre-foot. Therefore, Dow will need to develop the Harris Reservoir Expansion to provide an additional storage capacity of at least 49,000 acre-foot to provide a reliable water supply during drought. This feels like an after-the-fact attempt to redefine and narrow the purpose and need to favor the specific project sought by the applicant. It appears that the newer conclusions with respect 4 to storage as part of the need, and the exact amount of storage, are based primarily or exclusively on information provided by the applicant.		Email Comment
10	10			7/2/2020	Purpose and Need	The BRC requests that the scope and need be considered broadly, as initially defined in early 2018 for the project. The scope and need for the project should not be narrowed before the EIS to exclude a broad range of alternatives to storage at this location. There are many alternatives that could meet the broader objectives of providing a reliable water supply during drought using existing water rights. Some of these, addressed below, might provide similar drought relief or use of water rights while not involving a specific volume of storage at the proposed location.		Email Comment
10	11			7/2/2020	Alternatives	Another key part of any scoping and NEPA process is identifying possible alternatives to be evaluated. As noted above, BRC requests consideration of a broad range of alternatives to meet the objectives of reliability during a drought and use of existing water rights. Alternatives to be analyzed should include, but not be limited to those listed below: Evaluation of an upland alternative location – or multiple locations or combination of locations – for Dow's off-channel reservoir capacity that would be outside the Brazos River and Oyster Creek 100 year floodplains. Deepening or modifying the current Harris and Brazoria reservoirs. Conservation practices, including both continuing practices and other conservation practices that could be implemented during times of drought. Desalination alternatives – for both Brazos River water and bay or gulf waters. Operational changes at the Harris and Brazoria reservoirs, within Dow's facilities, or elsewhere. A salt-water barrier downstream on the Brazos River to minimize a salt water wedge during times of drought an allow the use of water not currently available. Barriers are used on other major rivers in Texas. Minimizing evaporative losses from the current Harris and Brazoria reservoirs, and elsewhere in the Brazos River and Oyster Creek watersheds. Enhanced reclaimed water use. Also, combinations of multiple alternatives that could in the aggregate meet the objectives should be evaluated. These could include combining conservation with enhanced reclaimed water use along with modifications to existing reservoirs.		Email Comment
10	12			7/2/2020	Public Involvement	Lack of information and extension of the comment period. The development and availability of information is a key part of both permitting processes and the EIS process. As noted, the April 2020 Corps notices reference many studies or assessments that were prepared in response to our comments and other comments submitted as part of the 2018 permitting process. These have not been available for review by the public during the scoping comment period. Also, documentation related to this project references comments prepared by other agencies such as the Environmental Protection Agency, the U.S. Fish and Wildlife Service, and others. These also have not been available to the public for review and consideration as part of this scoping process. It is difficult to provide substantive comments about scoping when key information is not available for review. Also, the notices for and information for this scoping period have been difficult to find. From the Corps website, someone would need to go into the May 2020 notice to know the that a website was being created for this scoping process. The public input website is extremely minimal, and did not include or link to key existing documentation relating to the project. Efforts to try to find the site through basic search engines, knowing that the site existed, did not find the scoping website. While we expect the argument that the scoping period has been open for some time, key information has not been available. One of our members requested this information some time ago, and had the expectation that additional substantive information would be posted. We request that the reports and assessments referenced in the April 7 and 9, 2020 Corps of Engineers scoping notices, as well as the permit application and supporting documentation and comments by other agencies, be placed online for review as part of this scoping process. Once this has been done, we request an additional 30 days be provided for informed scoping comments on Dow's proposed project.		Email Comment

Dow Chemical Company Harris Reservoir Expansion Project
Public Scoping Meeting Comment Database

Comment #	Topic #	Commenter (Last Name/First Name)	Commenter Contact Information	Date Received	Category	Comment	Response	Type
11	1	[redacted]	[redacted]	7/2/2020	Public Involvement and Flooding Concerns	Asking that the DOW Harris Reservoir Expansion is denied the permit as it will directly affect family land and all improvements recently made for the wildlife and cattle operation by creating new flood areas. Black Ranch, is a 4th generation family ranch with historic, economic, and environmental value. Leveeing of DOW reservoir expansion will put large areas of privately held land at high risk of flooding. Agrees with previous suggestions for Dow improve their existing Harris Reservoir and do not take any more of the connected Brazos River system. Due to the lack of outreach, the current comment period fails to thoroughly represent those who will be affected most adversely.		Email Comment
12	1			0702/2020	Public Involvement/ Flooding Concerns	Owners and users of Black Ranch along with neighboring properties making up over 2000 acres of privately owned cow/calf operations located across the river from current DOW reservoir have not been made aware of this project in a manner which allows for proper research or representation as to the welfare of these respective properties. Overall awareness of this project by those that may be adversely affected by it have been proven insufficient. Due to the lack of outreach, the current comment period fails to represent those who will be affected most adversely. Leveeing of DOW reservoir expansion will put large areas of privately held land at elevated risk of flooding. Black Ranch is a 4th generation family ranch with historic, economic, and environmental value; currently threatened by the increased risk of flooding by the expansion of DOW reservoir.		Email Comment
13	1			0702/2020	Public Involvement	Owns 600 acres on the west side of the Brazos directly across from Harris Reservoir property registered under MDK Ranch, LLC since February 2015. Did not receive notification from Dow concerning this project in the 5 years I have owned it. Wants to be added to the notification list.		Email Comment
13	2			0702/2020	Flood Concerns	Has concerns about the impact that the 40 foot berm bordering the Brazos river will have on the future flooding of property. It appears the flood waters will be deflected directly into my neighboring Black Ranch and then into my ranch. Concerned that the water deflection caused by the Dow Reservoir would force water into the natural slough that runs behind newly-constructed house causing potential flooding. The Brazos River flooding bordering the east side of our ranch would also be higher than previous floods, both of which have the potential of flooding my new home and imperiling our 150 head of cattle.		Email Comment
14	1			7/3/2020		Homeowners near the Brazos River, a few miles sout of the proposed Dow Reservoir and interested in the Brazor River Club as members. Appreciates that the Corps of Engineers responded to the concerns regarding initiating this EIS process.		Email Comment
14	2			7/3/2020	Public Involvement	Requests that there be a 30-day extension of the scoping comment period to review and incorporate additional applicable information related to this projec.		Email Comment
14	3			7/3/2020	Public Involvement	Requests that documents related to project be made available for review as part of the scoping process.		Email Comment
14	4			7/3/2020	Public Involvement	Concerned that referenced assessments, reports, or studies stated to be included in the April 2020 notices have been made available to the public as part of this scoping process. The Corps od Engineers also doesn't have a direct link to the page. Suggests that the project documents be posted on an easily accessible public website and opportunity for the interested public to review and comment on the information as it is critical to the NEPA process.		Email Comment
14	5			7/3/2020	Alternatives	Suggests that ther costs of the project, and the costs of minimizing shifting the impacts and harms from a project on others and the environment (externalities), should be borne by those benefiting from the		Email Comment
14	6			7/3/2020	Purpose and Need	This includes a very specific amount of storage capacity, and based primarily on the Dow's information, appearing to narrow the purpose and need significantly. It not only narrows the approach to drought contingency to storage, but storage of a specific quantity and was done without public involvement or input. Documentarion and information supporting this is lacking.		Email Comment
14	7			7/3/2020	Alternatives	Should include relocating the project outside of the floodplain, deepening or modifying the existing Harris and Brazoria reservoirs using their existing foot print, desalinization, a salt water barrier (as is used in other major Texas rivers), conservation, water reuse, operational changes and approaches to minimize evaporative losses.		Email Comment
14	8			7/3/2020	Flooding Impacts/ Alternatives	Believes this conveyance will negatively affect stakeholders downstream if the proposed Reservoir significantly alters the flooding on the Brazos River or Oyster Creek. Where are these mitigation projects conveyed? Property in undeveloped areas owned by the applicant that have been dry during recent flood events can be a good alternative location for this project. This long-term project includes several large detention basins have been built to partially mitigate these impacts. The project also includes stream improvements to increase conveyance downstream and then move upstream.		Email Comment

Dow Chemical Company Harris Reservoir Expansion Project
Public Scoping Meeting Comment Database

Comment #	Topic #	Commenter (Last Name/First Name)	Commenter Contact Information	Date Received	Category	Comment	Response	Type
14	9	[redacted]		7/3/2020	Flood Concerns	Limited information and documentation is provided making it difficult to evaluate the proposed mitigation projects.These projects address flood issues in a very localized area that only impact Oyster Creek. Yet these projects could create greater impacts on downstream properties such as ours. In evaluating flood impacts, the focus needs to be on the overall impact of the project on removing 2000 acres from the flood plain and significantly changing flow patterns during flood events. The ability of mitigation projects to convey rainwater during localized nonflood events does not address this issue.		Email Comment
14	10			7/3/2020	Cultural Resources/ Threatened and Endangered Public Involvement	Impacts on historical and cultural resources. Loss of valued Columbia Bottomland habitat. Climate change and its role in increasing future impacts from the proposed project. Destruction of or impacts on wetlands, stream habitats, and other key habitats Impacts on fish and wildlife from changes to instream flow patterns due to operations of the proposed reservoir and transmission through Oyster Creek. Requests the public availability of additional existing information and studies related to this project, and, once it is posted, a 30 day extension of the scoping comment period to review and incorporate that additional information. I also request that a second scoping meeting held, and that information about this meeting and scoping process be made more accessible to the public.		Email Comment
15	1			7/3/2020	Property Concerns	Owns Black Ranch across the river from Harris reservoir since the early 50s. Would like to go on the record against the current plan/design of the proposed DOW reservoir along the east bank of the Brazos river just north of the ranch. By the building up of the river bank just north and east of us, when in flood stage, the Brazos river will re-direct it's flood waters, (that would have been disbursed to the east side of the river), to the west side of the river and our ranch.		Email Comment
15	2			7/3/2020	Public Involvement	Requests a public hearing to present and explain data and concerns. We have presented your filings to our attorney for review and would like more time to formally present our position.		Email Comment
16	1			4/7/2020	Additional Studies	I am interested in the additional studies completed by Dow since the 2018 public notice that are referenced in today's Federal Register notice (i.e. the stream assessments, h&h studies, etc.). Are they available electronically?		Email Comment
17	1			4/7/2020	No Comment	The U.S. Geological Survey has no comment to offer on this until the ER is ready for review.		Email Comment
18	1			5/6/2020	Public Involvement	Can you please add me to the SWG-2016-01027 EIS mailing list for the upcoming announcements, etc.?		Email Comment
19	1			5/16/2020	Environmental Impacts	Dow Chemical's production of petrochemical and plastic materials will ensure that additional climate change air pollutants (primarily carbon dioxide (CO2) and methane (CH4) are discharged into the air and alter our local and global climates. The Corps should require that an accurate climate change analysis and ensure applicant prepare a Climate Change Ecological Resilient Plan. (CCERP).		Mail Comment (Paraphrased due to length)
19	2			5/16/2020	Alternatives	Supports water conservation alternatives that reduce volume of water used as per unit of productionto stretch water supplies long-term and reduce environmental impacts on ecosystems. Potential instream flow impacts and estuary impacts.		Mail Comment (Paraphrased due to length)
19	3			5/16/2020	Water and Sediment Quality	The Corps should require the applicant prepare an emissions inventory (EI) for volatile organic compounds (VOC) and other air pollutants generated by supplying water to DC, other industries, and municipal and other water users. A LDAR program is needed to reduce VOCs and toxic air pollutants generated by supplying all water needs for DC now and in the future.		Mail Comment (Paraphrased due to length)
19	4			5/16/2020	Flooding Concerns	The Corps should require an analysis, using Ike, Harvey, Imelda, and other data, about the flood potential and safety of construction in floodplains/floodways and possible storm surge zones.		Mail Comment (Paraphrased due to length)
19	5			5/16/2020	Alternatives	The construction of an impoundment and dam and the use of 50,000 acre-feet of water for DC, Brazosport Water Authority will cause property damage, injuries, and death. Water conservation programs by those users in exchange for agreements to allow DC to permanently or for limited periods use the volume of water made available through water savings achieved through those programs.		Mail Comment (Paraphrased due to length)

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19	6	[redacted]		5/16/2020	Alternatives	Alternatives Analysis must have an unbiased Evaluation Criteria that can keep reasonable alternatives from being analyzed. Explnations to be given on how alternatives are scored during any screening process for various alternatives.		Mail Comment (Paraphrased due to length)
19	7			5/16/2020	Alternatives	Requests transparent upland off-channel reservoir is a reasonable alternative. The Corps must ensure that DC does not call a floodplain off-channel reservoir an upland reservoir.		Mail Comment (Paraphrased due to length)
19	8			5/16/2020	Public Involvement	Supports the Corps decision to require a study of the environmental impacts of proposed impoundment/dam has and prepare an EIS requiring a 90-day public review/comment period including scoping, public hearings, public meetings, and draft and final EISs.		Mail Comment (Paraphrased due to length)
19	9			5/16/2020	Wetlands	Wetlands onsite will be lost and their Clean Water Act benefits will no longer be available.		Mail Comment (Paraphrased due to length)
19	10			5/16/2020	Alternatives	Suggests the creation of list of trees to be planted. Recommends the use of herbicides requires individuals are state licensed herbicide applicator and must be onsite at all times when they are used with no diesel fuel as a carrier for herbicides since diesel fuel contaminates water.		Mail Comment (Paraphrased due to length)
19	11			5/16/2020	Threatened and Endangered Species	CMP should include NNIPS and feral hog control.		Mail Comment (Paraphrased due to length)
19	12			5/16/2020	Alternatives	The Corps must give a thorough discussion of the use of this evaluation method in place of using quantitative data for the impact issue that is being discussed.		Mail Comment (Paraphrased due to length)
19	13			5/16/2020	Alternatives	Modify SWG-1999-02549 (formerly 18848), to extend the timeframe for five years.		Mail Comment (Paraphrased due to length)
19	14			5/16/2020	Threatened and Endangered Species/ Water and Sediment Quality	Mussels, clams, other aquatic invertebrates, fish, turtles, and other aquatic organisms will potentially have resting, feeding, breeding, and reproduction areas smothered. No sediment and water testing are required to ensure that pollutants other than sediments are not discharged to the Brazos River.		Mail Comment (Paraphrased due to length)
19	15			5/16/2020	Public Involvement	Requests that project information is verified. Concerned about the release of public notices with unverified information furnished by the applicant. Believes the public must have this information to review, comment and understand potential environmental impacts of the proposal.		Mail Comment (Paraphrased due to length)
19	16			5/16/2020	Public Involvement	The Corps must verify the wetlands delineation in the EIS and discuss the wetland delineation, the verification process, and the results of that process and provide it to the public.		Mail Comment (Paraphrased due to length)
19	17			5/16/2020	Public Involvement	The Corps should prepare its Public Interest Review Factors analysis of public interest factors carefully when reviewing this proposal and then provide it for public review and comment.		Mail Comment (Paraphrased due to length)
19	18			5/16/2020	Public Involvement	Requests a public hearing and meetings under the NEPA to fully inform the public about this proposal and to solicit additional information before an EIS is prepared and sent out for public review and comment. This must be done after the coronavirus pandemic is over and with widespread and adequate public notice.		Mail Comment (Paraphrased due to length)
20	1			5/29/2020	Public Involvement	Please include me on the mailing list for future updates and meeting announcements.		Email Comment

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21	1	[redacted]	[redacted]	5/29/2020	Environmental Impacts	The NMFS - HCD's status on the Dow Chemical Company - Brazos River and Oyster Creek Harris Reservoir Expansion Project, permit application SWG-2016-01027 remains the same as our last response on April 10, 2020. We will not be providing comments on the aforementioned permit application, since we do not have any trust resources in this area. While the footprint of the reservoir is expanding, Dow will not be acquiring additional water rights to fill the proposed expansion. In addition, this proposed expansion occurs wholey in a freshwater riverine system. Therefore, not tidally influenced areas will be impacted by the proposed expansion of the Harris Reservoir.		Email Comment
21	2			4/10/2020	Environmental Impacts	The NMFS - HCD will not be commenting on the permit application, SWG-2016-01027, for the Harris Reservoir Expansion Project, since we do not have trust resources in this area. The project takes place in freshwater riverine systems and will not be acquiring any additional water rights. Therefore, no tidally influenced areas will be impacted by the proposed expansion of the Harris Reservoir.		Email Comment
22	1			6/1/2020	Public Involvement	I submitted comments in 2018 on the proposed Dow reservoir project in Brazoria County, Texas. I recently received the notice of the scoping meeting scheduled online for June 17. The Corps' April 9, 2020 notice indicating that scoping was upcoming identified multiple studies that had been done in response to concerns raised in the 2018 comments submitted related to this project. These studies include a Phase 1 Environmental Site Assessment and much more. I have not been able to find these studies online -- either when I searched shortly after the April notice, or on the recently-created website for the June 17 scoping meeting. It is difficult to effectively comment in the scoping process when this important information is missing. Am I missing something? I argue that the scoping meeting is premature -- or that there should be an additional later meeting held well after these documents become available. I also think that a significantly extended time to submit scoping comments is appropriate.		Email Comment
23	1			6/6/2020	Public Involvement	Would like to be informed of the next public meetings concerning the issue to ask questions and get answers.		Email Comment
24	1			4/9/2020	Public Involvement	We have received and reviewed the PN and NOI. Is there an anticipated schedule for the scoping meetings?		Email Comment
24	2			5/6/2020	Public Involvement	The SPN makes references to quite a number of documents/studies that were prepared in response to the comments on the original PN. Are those available, or will they be made available soon?		Email Comment
24	3			5/6/2020	Public Involvement	Thanks Jayson. I presume this will also to apply to supplemental documentation prepared by the applicant.		Email Comment
25	1			5/31/2020	Public Involvement	Thanks for sending me the public notice for the June 17, 2020 virtual scoping meeting for the DOW Off-Channel Reservoir. I will attempt to be there but that same day similar meetings are being held for the Flower Garden Banks National Marine Sanctuary expansion and a GLO Technical Advisory Committee meeting for its Texas Coastal Resiliency Master Plan. Seems everyone thought about using the same day. I assume that the comments I sent you on May 16, 2020 fall within the scoping public comment period. If I need to resubmit them again for this current time period please let me know and I will do so. Hope you and your family are fine and safe.		Email Comment
26	1			6/6/2020	Public Involvement	Schedule meeting concerning this Expansion		Email Comment
26	2			6/8/2020	Property Concerns	To your knowledge will there be any buyouts concerning the Chenago Residents around the Cr 34 CR 717 and CR 444 areas?		Email Comment
27	1			6/10/2020	Public Involvement	I attempted to view the project webpage to sign up to participate in the online public scoping meeting on June 17, but the link does not work. Please sign me up and let me know how to participate.		Email Comment
28	1			6/15/2020	Clean Water Act/Wetlands	The EPA recommends the EIS include an evaluation of a full range of alternatives for avoiding and minimizing the impacts to the waters of the U.S. As well as summarizing the criteria used to screen for reasonable alternatives, including the Clean Water Act. The EPA also recommends the Draft EIS identifies aquatic impacts and include a draft migation plan to address the need for compensatory mitigation for unavoidable impacts to aquatic resources. Differentiation between permanent vs. temporary impacts, and address potential temporal losses. Clearly define the project components along Oyster Creek as project infrastructure or activities intended as compensatory mitigation.		Mail Comment (Paraphrased due to length)
28	2			6/15/2020	Air Quality	Recommends the adoption of a Construction Emissions Mitigation Plan in the Record of Division to reduce potential short-term air quality impacts. EPA recommends the follwoing to be considered for inclusion in the plan to reduce pollutants from construction-related activities: fugitive dust source controls, mobile/stationary source controls, and administrative controls		Mail Comment (Paraphrased due to length)

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28	3	[redacted]		6/15/2020	Socioeconomics/Land Use/Recreation/E	Recommends identifying and consulting with tribal governments affected by proposed action and address issues/concerns raised. Allow enough time for tribal governments to participate in consultation and coordination due to COVID-19 impacts.		Mail Comment (Paraphrased due to length)
28	4			6/15/2020	Tribal Consultation	An evaluation of environmental justice populations near the geographic scope of the project should be conducted. If EJ populations exists ceate a comprehensive communication strategy to inform the communities and encourage their participation. Reconmmends utilizing the Promising Pratice Report for considering and analyzing EJ populations.		Mail Comment (Paraphrased due to length)
29	1			6/15/2020	Flood Concerns/ Property Concerns	I live South - East of Harris Reservoir, I have been in this Area all my life (and I am 68 years old). Records show in May 2 - 1957 the crest on the Brazos river was 53.40, I was 5 years old but I remember it well. Since that time flooding has gotten much worse. The floods are covering land that was not covered in 1957, I think this is due to levees built to protect the subdivisions. If we cover approximately 2000 acres of land that already floods 4 feet to 5 feet deep, with 50,000 acre feet of water in my opinion, what will happen if the level washes out due to rushing water against it? If or when that happen what happens to the People and their properties, how do you protect the people and their properties'?		Email Comment
30	1			6/16/2020	Public Involvement	Is there at least a list of the studies and reports already submitted to the Corp by the applicant. Would those studies and reports and files be public information? Or are they perhaps available through FEMA or other agencies if I knew their titles.		Email Comment
30	2			6/16/2020	Alternatives	However I would submit that it seems that the only viable alternative and an alternative that must be included in an analysis of the project is to move the reservoir out of the floodplain altogether. This would require a system to move water up slope out of the floodplain to the east. This would not take that much lift in such a flat landscape. This should definitely be one of the alternatives studied in the draft EIS.		Email Comment
30	3			6/16/2020	Flooding Concerns/Property Concerns	The effect of continuing to remove floodplain from the river is a huge cumulative impact. In Fort Bend County I estimate that over 30,000 acres has been removed from the floodplain by levee improvement districts. This may be a factor in the devastation we saw from the river during Harvey in Brazoria County. There are at least 15 LIDs in Fort Bend County. Each during permitting claimed minimal impact. But if they had been permitted together a 30,000 acre decrease in the floodplain would have put up a red flag. Each removal as in this case (2000 acres) adds to a decrease in the floodplain and at some point the impact is very significant. It causes the river to flood other portions of the floodplain more deeply or more widely or at greater velocity. Each project claims a minimum of impact but the cumulative impact must eventually be considered! The floodplain must be protected so that it can function during a flooding event. Otherwise West Columbia, Lake Jackson and other communities could be drastically impacted.		Email Comment
31	1			6/16/2020	Public Involvement	THC acknowledges receipt of notification of public scoping meeting regarding the Harris Reservoir Expansion Project.		Email Comment

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32	1	[redacted]	[redacted]	6/17/2020	Flooding /Property Concerns	My name is -. My home is approximately 1½ miles south of the existing Harris Reservoir. We built our home here in 1992 and have enjoyed living among the great oak trees. Suddenly, in 2016, we were engulfed in water; this water did not get in our home, but filled our barns and covered our pasture. This "flood" was the result of intense rains in the Waco area that eventually worked their way south and spilled over the banks of the Brazos River neat Otey, TX. Those waters spilled into Oyster Creek which then pushed them up a small slough and flooded our neighborhood. In 2017, Hurricane Harvey cause even worse flooding, this time the water was kept out of our home by the use of sandbags, but we still had to replace all the sheetrock and insulation in the bottom 16" of our walls. I am curious as to what happened to bring these flooding events into our property. I suppose that much development up-river has limited the expansion area of the Brazos River and forced the water downstream where it quickly floods many areas that are not even close to the flood zone. Our home has ground-level of 41' plus we built up 3' when we built. So our home sits at approximately 44' – and we still got flooded. We have a beautiful home and property that we will never be able to sell to for what it is worth because it flooded in 2017. Now, Dow Chemical has decided to take 2,000 acres of property and turn it into a new reservoir. This will certainly make things worse by removing the absorption capabilities of that much acreage from our area. I question the need for such a reservoir, especially when Dow could re-activate or rebuild the de-salinization plant in Freeport to provide its' water supply, without putting homeowners in our area in further jeopardy. Furthermore, failure of earthen dams containing Dow's reservoirs in Michigan have failed, bringing flooding to neighborhoods and threatening Dow's Superfund Site. I am pretty sure that nobody thought those dams would fail either. Dow Chemical has the resources to solve its' water needs without threatening the homes of people like me.		Email Comment
33	1			6/17/2020	Alternatives	The permit application SWG-2016-01027 on page four states the reservoir will be in the Oyster Creek floodplain. I have watched the river flow across that land for years and relieve the downstream flooding on the lower brazos river. Is the river still going to be allowed to flow into oyster creek when the river is on the rise?		Mail Comment
34	1			6/18/2020	Public Involvement	The Sierra Club requests an extension of the scoping comment period. This request is predicated on the Corps failing to put on the website for this proposal the information and studies that it has or is verifying for this proposal. The Sierra Club was told by a Corps official in May that this information and studies would be put on the proposal's website before the scoping public hearing. This was not done. The Sierra Club requests that the scoping comment period be revised to be 30 days after the information that the Corps is verifying for this proposal is put on the proposal's website so the public can review and comment on this information.		Mail Comment (Paraphrased due to length)
34	2			6/18/2020	Alternatives	In the presentation on June 17, 2020 by the Corps of the National Environmental Policy Act (NEPA) and Council on Environmental Quality's (CEQ) environmental impact statement (EIS) process, several alternatives were introduced which were stated as being alternatives determined early in this proposal's process, which dates back for the public to the 2018 public notice. However, the alternative that the Sierra Club defines as a true "upland and off-channel reservoir" was not listed as one of these alternatives even though the Sierra Club in its' comments on permit application SWG-2016-01027, April 23, 2018, mentioned such an alternative on Page 5 of those comments when it was critiquing the DOW alternatives analysis for this proposal and said, "This off-channel alternative which is really in the uplands was not considered in the alternatives analysis (Pages 1 through 39, Attachment D, Alternatives Analysis) and thus that document is deficient since such an alternative is feasible, prudent, sensible, economic, social beneficial, and environmentally preferable since it reduces wetlands and waters of the United States impacts to a minimum. Dow Chemical should have avoided and minimized impacts by use of such an alternative. A brackish groundwater use alternative is also not studied in the alternatives analysis."		Mail Comment (Paraphrased due to length)
34	3			6/18/2020	Alternatives	The Sierra Club mentioned this upland and off-channel reservoir alternative again on May 16, 2020, Page 7, when it submitted scoping comments before the June 17, 2020 scoping public hearing. The Sierra Club again requests that a true upland and off-channel reservoir alternative, that is not in the Brazos River and Oyster Creek 100-year floodplains, be included as a "reasonable alternative" under the NEPA/CEQ regulations for the draft EIS for this proposal.		Mail Comment (Paraphrased due to length)
34	4			6/18/2020	Flood Concerns/ Property Concerns/Ecological Concers	The Sierra Club requests that the draft EIS discuss and analyze the ":economic and legal liability" that the applicant has if this proposal is constructed and floodwaters are directed or in some way are worsened downstream on property-owners and affects their property, lives, and important ecological features like Christmas Bay.		Mail Comment (Paraphrased due to length)

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34	5	[redacted]		6/18/2020	Public Involvement	The Sierra Club informs the Corps that it was not able to hear the comments of Michael Thomas when he spoke at the June 17, 2020 virtual public hearing because the reception was so bad that almost all of his remarks were unintelligible. This negatively detracted from the information that the Sierra Club was able to hear and glean from the scoping public hearing.		Mail Comment (Paraphrased due to length)
34	6			6/18/2020	Public Involvement	The Sierra Club requests that the Corps place the DOW and EIS slides that were presented at the June 17, 2020 scoping public hearing on the proposal's website for public review and comment and notify the public of the availability of this information.		Mail Comment (Paraphrased due to length)
35	1			6/22/2020	Public Involvement	Per the Special Public Notice issued May 27, 2020, I would like to be included on the mailing list for future updates and meeting announcements, or to receive a copy of the Draft EIS when it is issued. I also experienced technical difficulties in trying to view the virtual public scoping meeting June 17th. Is it possible to view a recorded version of this meeting, presentation, and/or public comments?		Email Comment
36	1			7/1/2020	Public Involvement	Good Afternoon, Mr. Hudson, Attached is a letter about the environmental concerns I have about the Dow Chemical Harris Reservoir Expansion Project. Please note the mailing address on file for me is incorrect. I am interested in receiving future updates, meeting announcements, and a copy of the draft EIS.		Email Comment
36	2			7/1/2020	Environmental Impacts	I own 50 acres off of county road 36 and edged by Oyster Creek and a drainage ditch next to the adjacent prison farm. The legal designation is -. I have been unable to ascertain where my property lies in regard to the expansion project based on the maps I can easily find online, but wish to express my concerns particularly with regards to future flooding, possible sinkholes, and potential wildlife impact.		Email Comment
36	3			7/1/2020	Flood Concerns	My property had never flooded significantly until Hurricane Harvey. At that time, the entire 50 acres went under water for 2 weeks. The force from the water coming downstream on Oyster Creek was strong enough to lift my neighbors' in-ground concrete swimming pool out of the ground and break in in half. I am concerned that when the reservoir is put in that in, there will be less arable land to absorb flood waters and that flooding will be worse. Are there plans for flood abatement along our stretch of Oyster Creek? If so, what are those plans? I would like to see a wetlands area put in to improve wildlife habitat.		Email Comment
36	4			7/1/2020	Environmental Impacts	I am also unclear on the source of water for the reservoir expansion project. My understanding is that in the past, brackish water from downstream has been processed to fill the Harris Reservoir. Is this correct, and will this be the source for the expansion project? If not, will water be pumped from underground, and should I be concerned about the formation of a sinkhole, like the one that formed on highway 521 several years ago? Or, will water be pumped from the Brazos River or Oyster Creek, and should I be concerned about a loss of wildlife habitat?		Email Comment
36	5			7/1/2020	Socioeconomics/Land Use/Recreation/EJ	Finally, are there any potential benefits of this project for me as a landowner? Will the expanded reservoir area be available to the public for recreation such as fishing and boating? While I realize you may not be able to address my concerns about the Dow Chemical Harris Reservoir Expansion Project individually, I hope to see them addressed in the final Environmental Impact Statement. I also hope to receive communications about the project at my correct mailing address which I have affixed below.		Email Comment
37	1			7/2/2020	Wetlands/SAV	The EIS should include appropriate functional assessments performed on streams and wetlands to be impacted by the construction and operation of the reservoir. This should include areas affected by inundation as well as areas downstream of the proposed dam affected by changes in flow regime including Oyster Creek.		Mail Comment
37	2			7/2/2020	Mitigation	The EIS should clearly account for losses of stream and wetland function due to direct fill impacts, as well as secondary impacts. Stream impacts should be provided in linear feet and distinguished by stream type. Impacts to aquatic resources should be mitigated in-kind.		Mail Comment
37	3			7/2/2020	Mitigation	The EIS should include the name of the mitigation bank(s) that will be used, the number and resource type of credits to be secured, the availability of credits, and how the number and resource type of credits were determined.		Mail Comment
37	4			7/2/2020	Mitigation	The EIS should explain the need for cutting a 4:1 slope on Oyster Creek and how this mitigates for impacts to streams impacted by the project. Widening or channelization of Oyster Creek can negatively affect stream function. This may be considered a stream impact rather than mitigation and may require mitigation to replace the lost functions in the channelized areas.		Mail Comment

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37	5	[redacted]	[redacted]	7/2/2020	Mitigation	The proposed mitigation may be insufficient to compensate for impacts to streams and wetlands. Based on the Galveston Stream Tool guidance, the impact factor for the impacted streams due to the reservoir should be higher than the proposed score of 1. Most or all the stream functions will be lost due to the reservoir. Based on the Reach Condition Index (RCI) score, it is likely that the impact factor score should be a 4 or 5. The EIS should revise the impact factor scores and required mitigation credits or explain in detail how the mitigation is sufficient.		Mail Comment
37	6			7/2/2020	Water Quality	The EIS should address all measures that will be taken to maintain water quality during and after reservoir construction.		Mail Comment
37	7			7/2/2020	Water and Sediment Quality	The EIS should address potential water quality impacts such as impacts due to changes in sediment transport downstream of the reservoir.		Mail Comment
38	1			6/17/2020	Air Quality	I volunteer for the Houston Sierra Club. Some of our concerns deal with climate change. On this particular project, Dow Chemicals operations releases a lot of C02 into the atmosphere. We would like an accurate climate change analysis for this particular proposal. Also, carbon dioxide pollutants.		Public Scoping Meeting Comment
38	2			6/17/2020	Alternatives	We also support alternatives with water conservation. We're very concerned that the alternatives that were shown do not show identified floodplain, which to us supports an off channel reservoir alternative. So we would very much like to see that as an alternative.		Public Scoping Meeting Comment
38	3			6/17/2020	Alternatives	It's also of great concern about this particular project is it has the potential for rerouting the Brazos River during a flood event and capturing (indiscernible). (Indiscernible) Brazos River channel. So it's very important that (indiscernible) as well as what the flood effects might (indiscernible). Those are all the comments I wish to make.		Public Scoping Meeting Comment
39	1			6/17/2020	Additional Studies	Okay. I've been researching all the information that you provided online, and I have great concern on the floodplain that's going to be affected by the placement of this reservoir. I've not been able to find the three studies that were mentioned in the presentation anywhere, the details. I would like to see those.		Public Scoping Meeting Comment
39	2			6/17/2020	Flood Concerns	And furthermore, I have seen no study or no comments through the entire process on how this project is going to affect the west side of the Brazos River flood basin. And I'm afraid when you take 10,000 acre-feet out of the storage unit, your -- it's got to go somewhere. And it looks to me like it's going to west side, and none of this has ever been addressed. So I would like to see some studies or some comments along those lines. They might be out there. I've yet to see them though, and that is my primary comment of what I'm concerned with.		Public Scoping Meeting Comment
40	1			6/17/2020	Flood Concerns	Okay. My name is -. My family owns a home off the Brazos River downstream of the proposed project. This home has been flooded by the river five times between June 2015 and June 2019. Prior to that, the property did not have a river flood in over 20 years.		Public Scoping Meeting Comment
40	2			6/17/2020	Public Involvement	The Corps is requiring an EIS for this project, and I thank you for that. Citizen involvement and the development, availability, and review of information about the proposed project are key parts of this EIS process.		Public Scoping Meeting Comment
40	3			6/17/2020	Additional Studies	As part of the federal register notice published on April 7, 2020, for this scoping period, this notice identified three studies and assessments that were prepared in response to issues raised by myself and others in 2018. Also referenced is a wetlands delineation that was verified by the Corps in October of 2019. Weeks ago I asked if these might be available and understood that additional information will be posted on the scoping website. There's very little information there. None of these assessments reports on the wetland delineation seem to be available online for review by the public. When critical information is not available for review, genuine public feedback cannot occur. I requested these reports and studies be made available to the public online and that the scoping period be extended to allow a response related to the issues that are raised.		Public Scoping Meeting Comment
40	4			6/17/2020	Alternatives	Another key part of the EIS process is the identification, analysis, and review of alternatives to the proposed project. I urge consideration of a broad range of alternatives to increase drought reliability, not just focusing on this specific project alone, looking at the broader purpose. These can include storage at this location, storage at other locations, but I don't know that it needs to be focused on a specific volume without looking more broadly. Alternatives could include conservation, operational changes, a salt wedge barrier, storage at other locations outside the floodplain, redesigning or reducing the footprint and flood impacts, and a range of other options.		Public Scoping Meeting Comment
40	5			6/17/2020	Flood Concerns	Impacts of concern, again, include the flooding downstream of the proposed reservoir, particularly in the Brazos River. The one-page summary that was posted raised more questions than it answers. It seems to focus on Oyster Creek while not addressing the known interconnection and impacts on the Brazos River that occur during flooding events.		Public Scoping Meeting Comment

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41	1	[redacted]	[redacted]	6/17/2020	Environmental Impacts	(Audio cutting out - indiscernible) And again, I see focus on Oyster Creek (indiscernible) for the reservoir expansion, but I don't see any benefit (indiscernible). I also am very concerned about the of the (indiscernible) with the Brazos River and (indiscernible) version of the (indiscernible) and how that may impact the river all with irrigation and all the impact to -- wildlife (indiscernible). So that pretty much wraps up my -- my comment.		Public Scoping Meeting Comment
42	1	[redacted]	[redacted]	7/2/2020	Public Involvement	Expressed concern that information, studies and other document related to the project were difficult to find without directly contacting the Corps of Engineers for website. Expressed further concerned as still unable to find relevant studies stated in comment on the website the day before the close of scoping comments.		Mail Comment (Paraphrased due to length)
42	2	[redacted]	[redacted]	7/2/2020	Purpose and Need	Concerned that the purpose and need have been significantly narrowed from the 2018 version of the document. Believes the purpose statement should be more broad to account for possible alternatives or documention supporting the shift in purpose should be made available.		Mail Comment (Paraphrased due to length)
42	3	[redacted]	[redacted]	7/2/2020	Alternatives	Suggested that the EIS should evaluate a broad range of alternatives for accessing water rights and addressing drought situations. Believed the alternatives stated to be insufficient.		Mail Comment (Paraphrased due to length)
42	4	[redacted]	[redacted]	7/2/2020	Flood Concerns	Concerned that the project could lead to worse flood events by interfering with the flow between Brazos River and Oyster Creek and flood capacity of the area. Believe that proposed mitigation project to address flood concerns don't address the downstream area and could lead to issues for property owners.		Mail Comment (Paraphrased due to length)
42	5	[redacted]	[redacted]	7/2/2020	Environmental Impacts	Suggested that the project consider impact on: - Impacts on historical and cultural resources - Loss of valued Columbia Bottomland habitat - Climate change and its role in increasing future impacts from the proposed project - Destruction of or impacts on wetlands, stream habitats, and other key habitats - Impacts on fish and wildlife from changes to instream flow patterns due to operations of the proposed reservoir and transmission through Oyster Creek. - Impacts on endangered, threatened, and proposed listed species - Human environment - flood elevation		Mail Comment (Paraphrased due to length)
43	1	[redacted]	[redacted]	5/29/2018	Public Involvement	Stated that the application appears to be based on incomplete information that has no been fully developed, carried out or analyzed. Requested the Corps require preparation of an EIS and a public meeting for the proposed permit.		Mail Comment (Paraphrased due to length)
43	2	[redacted]	[redacted]	5/29/2018	Flood and Erosion Concerns	Concerned that the project could lead to worse flood events by interfering with the flow between Brazos River and Oyster Creek, which will have negative consequences for landowners. Additionally, concerned that the floodwater will erode the riverbanks downstream which will affect landowners downstream. Concerned that there is no public available documents that show the hydrological impacts of the project have been analyzed.		Mail Comment (Paraphrased due to length)
43	3	[redacted]	[redacted]	5/29/2018	Alternatives	Suggested that the purpose in the Alternatives Analysis is not clearly defined and lacks critical information needed to conduct an alternative analysis. Additionally, suggested conducting analysis of the loss of stored water due to evaporation. Lastly, requested that a combination of alternatives be evaluated.		Mail Comment (Paraphrased due to length)
43	4	[redacted]	[redacted]	5/29/2018	Opposed to the project	Requested the Dow Chemical Company's currently-pending permit application for a 2000 acre be denied, and that an EIS be conducted for this proposed project.		Mail Comment (Paraphrased due to length)
44	1	[redacted]	[redacted]	7/2/2020	Public Involvement	Requested all the updated reports concerning potential impacts to floodplains and hydrology In response to concerns regarding potential impacts to floodplains and hydrology, the Corps conducted several studies including a geomorphic assessment of Oyster Creek; a Level I and II stream assessment; a hydrology and hydraulic modeling report; modeling of areas downstream to confirm the floodplain storage; an updated interim hydrogeomorphic functional assessment to determine capacities of the waters of the U.S.; and, a Phase I Environmental Site Assessment1. As a cooperating agency, we request all updated reports be provided to our office for a thorough project review and comment. Concerns related to these potential impacts may include, but are not limited to: increase in flooding within the floodplain of the Brazos River and Oyster Creek; mitigation needs to offset impacts to the floodplain, loss or conversion of riparian habitat, and bottomland forested areas; and, impacts to water quality and quantity as it relates to our federally-listed and candidate species and migratory birds.		Mail Comment (Paraphrased due to length)

Dow Chemical Company Harris Reservoir Expansion Project
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Comment #	Topic #	Commenter (Last Name/First Name)	Commenter Contact Information	Date Received	Category	Comment	Response	Type
44	2	[redacted]		7/2/2020	Erosion Concerns	The Service is concerned with the clearing of the riparian zone where the pump/in-take station is proposed to be constructed on the Brazos River bank. The removal of the riparian zone along the banks of streams and rivers increases the risk and rate of erosion significantly causing water quality issues and habitat degradation. Impacts to this riparian zone can also alter flooding regimes and alter sensitive bottomland forested areas of habitat. The applicant should avoid and/or minimize impacts to riparian habitats to the maximum extent practical in the design of this Project, including any laydown and staging areas. We recommend implementing best management practices (attached) to minimize potential effects to the Brazos River, Oyster Creek, and their associated riparian zones and its delicate ecosystems.		Mail Comment (Paraphrased due to length)
44	3			7/2/2020	Mitigation	The proposed Project proposes to impact 12.19 acres of emergent wetlands, 4.15 acres of forested wetlands, and 20,486.3 linear feet (5.73 acres) of streams. Since the issuance of the public notice in 2018, both a functional and stream assessments were conducted in September 2019. The Corps verified the wetland delineation in October 2019 and plans to revise the conceptual mitigation plan based on these assessments. The applicant should develop a detailed stream mitigation plan pursuant to the requirements of 33 CFR 332.4 (c). We request that the Corps provide this plan to the Service and other resource agencies for review and comment prior to the issuance of this permit.		Mail Comment (Paraphrased due to length)
44	4			7/2/2020	Wetlands/SAV	We are concerned with temporal loss of forested wetland functions and values posed by the Project. Stream restoration and enhancement will likely require years to stabilize, become functional, and grow mature riparian zones. Loss of habitat for multiple generations could destabilize local populations of species with short life cycles (e.g. amphibians, birds, etc.). The applicant should conduct long-term monitoring of mitigation sites in order to capture the streams' timeframe of recovery, and as such, these details should be detailed in the mitigation planning documents.		Mail Comment (Paraphrased due to length)
44	5			7/2/2020	Environmental Impacts	A plan that includes post-construction site restoration and management activities should be developed and provided to the Service for review and comment. Such a plan should address potential management strategies (i.e. mowing, herbicide use, plantings); ways to avoid/minimize the introduction of nonnative aquatic and plant species into the ecosystem; and, address measures to avoid and/or minimize impacts of such activities to our trust resources (e.g. federally-listed and candidate species, migratory birds, aquatic resources).		Mail Comment (Paraphrased due to length)
44	6			7/2/2020	Threatened and Endangered Species	The applicant should conduct baseline and post-restoration assessments of macroinvertebrate (e.g. mussels), fish, and riparian zones within areas of the Project and the proposed in-stream mitigation sites. The Texas fawnsfoot (Truncilla macrodon) can potentially occur within the Colorado and Brazos River drainages. The species is currently a candidate and is under review by the Service to determine if protection under the Act is warranted.		Mail Comment (Paraphrased due to length)
44	7			7/2/2020	Environmental Impacts	Per prior guidance, post-construction bank restoration strategies should strive to obtain a minimum surviving density of 400 stems/acre of trees and shrubs planted by year 3. Of those, 250 stems/acre should be six feet tall by year 7. As the stand matures and the canopy closes, light will be limited and competition will increase. This will lead to a decrease in population densities to between 100 and 250 stems/acre and producing, in concert with forest management strategies, a sustainable and productive community of native tree species.		Mail Comment (Paraphrased due to length)
44	8			7/2/2020	Wetlands/SAV	Recommended several best management practices to implement as the project has the potential to effect river, stream or tributary aquatic habits. In addition to these recommendations, the commenter suggested the project considers SMZ widths (chart provided) and additional permit requirements for fill materials and additional individual projects.		Mail Comment (Paraphrased due to length)
45	1			7/2/2020	Environmental Impacts	Texas Parks and Wildlife Department is concerned with potential impacts to environmentally critical habitats including wetlands, streams, coastal prairie, neotropical songbird nesting and foraging areas, and federal/state threatened and endangered species habitat. TPWD recommends the EIS include detailed descriptions and evaluations for all associated phases of the project relative to the items discussed in Attachment A and Attachment B.		Mail Comment (Paraphrased due to length)
46	1			7/2/2020	Public Involvement	Requested the scoping period be extended 30 days after the last of studies and documents are made available for public review.		Mail Comment (Paraphrased due to length)

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Comment #	Topic #	Commenter (Last Name/First Name)	Commenter Contact Information	Date Received	Category	Comment	Response	Type
46	2	[redacted]		7/2/2020	Purpose and Need	LBRW believes that the modified purpose and need statement for this project, as provided in the June 2020 information/scoping meeting announcement, reframes the purpose in terms of increasing water supply by a specific amount (49,000 acre feet) and thus results in a de facto exclusion of any alternatives that might address reducing demand. This is inconsistent with NEPA's intent that a broad range of feasible alternatives be considered, to accomplish the project's ultimate goal. Increasing standing supply is not the only way to accomplish providing Dow Chemical with an adequate, reliable water supply		Mail Comment (Paraphrased due to length)
46	3			7/2/2020	Public Involvement	LBRW is concerned with the manner in which the public notice and the scoping meeting announcement were made. Even for those of us with some familiarity with the USACE process and communication it was very difficult to locate. We are also concerned that during the virtual scoping meeting we were unable to see the participants list. It appeared that a meeting on a project that has had wide interest was minimally attended. This should be rectified by holding a second scoping meeting after all of the above mentioned documents are made available for public review.		Mail Comment (Paraphrased due to length)
46	4			7/2/2020	Alternatives	Suggested review of floodplain impact for alternatives identified. Considered alternatives for water conservation that may eliminate or reduce the scope of the project.		Mail Comment (Paraphrased due to length)
46	5			7/2/2020	Environmental Impacts	Concerned with the impacts of construction activities and post-construction alterations on habitats, river, riverbanks, etc.		Mail Comment (Paraphrased due to length)
46	6			7/2/2020	Flood Concerns	As we have noted in several places throughout our comments, the original permit application completely omits consideration of project impacts to floodplains and potential impacts to downstream property as a result of its construction. Lower Brazos Riverwatch and others have made efforts to track down information relating to any Conditional Letter of Map Revision (CLOMR) or Letter of Map Revision (LOMR) for this project and have been unsuccessful in obtaining any documentation, though we have been told that this process may actually be going on with no public notice or involvement. The absence of information on this critical topic reduces us to making a general scoping recommendation that this be fully considered in the EIS. We believe that the issuance by FEMA of any such CLOMR/LOMR should be considered an integral part of this EIS process and done with full public involvement, since the project could not be constructed but for the issuance of such approvals. There is also considerable anecdotal information and observations that indicate that at water levels greater than 100 year flood elevation, similar to our last three 500 year plus events, the flood waters from the Brazos River flows through the project area and joins Oyster Creek. Documents obtained from Brazoria County Engineering indicate that there are and have been studies of how to manage this cross channel flood flow between the Brazos and Oyster Creek and between Oyster Creek and Bastrop Bayou. Where this water goes in a post-project condition needs to be evaluated as part of the EIS process, as does the loss of up to 50,000 acres feet of valley storage by the construction of the reservoir itself. Lower Brazos Riverwatch believes that the USACE needs to obtain this information from the applicant, as part of the EIS preparation, and deal fully with this issue in the DEIS.		Mail Comment (Paraphrased due to length)
46	7			7/2/2020	Mitigation	Requested the EIS specify which mitigation bank will be utilized for credits and which organization will hold the conservation easements. A more thorough mitigation plan for on-site mitigation that describe how they will address the specific impacts being lost. Need to address the loss of valley storage.		Mail Comment (Paraphrased due to length)
46	8			7/2/2020	Threatened and Endangered Species	Requested the EIS re-analysis the impact on wildlife species in the area of the project. Additionally, request a re-evaluation of the threatened & endangered species and general species list to confirm species on the list and consider other species (refer to comment for specific species).		Mail Comment (Paraphrased due to length)
46	9			7/2/2020	Socioeconomics/Land Use/Recreation/EJ	The USACE needs to consider the impacts of the project, both during construction and operation on recreational use of the Brazos and Oyster Creek. The EIS needs to consider how safe use of the river will continue uninterrupted during construction and operation. Possibly investigate acquisition of a portage easement, either temporarily during construction, or permanently, if the project would create an unsafe situation for recreational users. Also suggested considering impacts to launch and landing sites from excess sediment should also be considered.		Mail Comment (Paraphrased due to length)
46	10			7/2/2020	Cumulative Impacts	Suggested a thorough evaluation of the cumulative impacts of the project on the environment.		Mail Comment (Paraphrased due to length)

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Comment #	Topic #	Commenter (Last Name/First Name)	Commenter Contact Information	Date Received	Category	Comment	Response	Type
47	1	[redacted]		6/17/2020	Flood and Property Concerns	I am a Brazoria County Land Owner along County Road 25 directly downstream and on the west side of the Brazos River. I have land the lies both North and South of the Mann Lake Complex including Brazos River Bank property. I also own land just west of Oyster Creek in the Planter's Point Subdivision near Holiday Lakes. The red water of a Brazos River Flood from the recent 2015-2019 floods, it inundates the Oyster Creek system. Oyster Creek doesn't flood red-silted water when it has a rain event in the Fort Bend and Harris County drainage. This demonstrates that the Brazos River is the driving factor in the flooding of the Brazos River/Oyster Creek floodplain, not Oyster Creek. This project's environmental, economic and life adjustment for affected individuals is incomplete without a very comprehensive study of the effects of the flood waters in the Brazos River channel and west bank floodplains.		Mail Comment (Paraphrased due to length)
47	2			6/17/2020	Mitigation	In the 870 acres west of the new approximately 11,000 foot westernmost levee of the new reservoir, there are 3867.67 acre feet of flood waters that aren't being accounted for in all of the mitigation discussions.		Mail Comment (Paraphrased due to length)
47	3			6/17/2020	Flood and Property Concerns	A study needs to be done to demonstrate that the proposed new reservoir will not impact the west side of the Brazos River and impact the communities and lands that have never seen a Brazos River flood before. If the Brazos River breaches the abandoned diversion channel, the channel will not be able to contain the flow and it will overflow and breach to the north and west of the channel. The floodwater will directly enter into the Lake systems. This will directly impact the communities along Brazoria County Road 255, 24, 26, 27, 23, 13 and Mallard Lake Club, Brazos River Club and Columbia Lakes along Brazoria County Road 25. It will further impact the City of West Columbia in a much greater manner than it has been impacted in prior floods.		Mail Comment (Paraphrased due to length)
47	4			6/17/2020	Environmental Impacts	Bell Lake, Manor Lake and Eagle Nest Lake are a unique and special ecosystem in the Columbia Bottoms wetlands and the current ecosystem, as it exists, will be destroyed by a massive influx of sediment loaded, possibly polluted Brazos River water. The United States Fish & Wildlife Service has a long term conservation easement for Eagle Nest Lake. I assume since they are listed as one of the cooperating Agencies of this project, that they have done a study of the impact on Eagle Nest Lake should the Brazos River waters influx into its basin. If such a study exists, please provide the same for examination.		Mail Comment (Paraphrased due to length)
47	5			6/17/2020	Alternatives	Because of that potential impact, maybe the DOW Harris Expansion Project should be abandoned or vastly altered. DOW should look into dredging the 2 existing reservoirs and possibly adding more storage capacity. DOW should be looking into a location that doesn't so greatly impact the floodplains of the Brazos River, which by their own admission will be greatly impacted by further development upstream		Mail Comment (Paraphrased due to length)
48	1			6/2/2018	Opposed to the project	I request that the permit application, as currently proposed, be denied by the USACE		Mail Comment (Paraphrased due to length)
48	2			6/2/2018	Flood and Erosion Concerns	We are members of the Brazos River Club (BRC). BRC's property has experienced erosion because of recent floods. I am concerned about flooding and erosion. Have hydrological analysis been done to address flooding in the Brazos River and Oyster Creek watersheds? Building levees and removing larges areas from the floodplain will increase the flow and erosive impacts downstream of the project.		Mail Comment (Paraphrased due to length)
48	3			6/2/2018	Purpose and Need Alternatives	The limitations on these water rights, the evaporation that will occur, the timing of rainfall and drought, and more factors come into consideration. Options to manage the saltwater wedge that occurs in the Brazos River during low flow conditions could be included in the alternatives considered in future analysis.		Mail Comment (Paraphrased due to length)

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Comment #	Topic #	Commenter (Last Name/First Name)	Commenter Contact Information	Date Received	Category	Comment	Response	Type
48	4	[redacted]		6/2/2018	Environmental Impacts	Much of the area to be inundated is classified as Columbia Bottomlands. These are important ecological resources, and these impacts should be given additional analysis and consideration. Request a full Environmental Impact Statement be completed before further consideration is given to approving the proposed project.		Mail Comment (Paraphrased due to length)

Appendix F

Public Scoping Meeting Transcript

TRANSCRIPT OF VIDEO FILE

DOW EIS

JUNE 17, 2020

MR. HUDSON: Good afternoon. On behalf of the project team, we thank you for your time and interest in the Dow Chemical Harris Reservoir Environmental Impact Statement or EIS.

My name is Jayson Hudson, and I am the U.S. Army Corps of Engineers Regulatory Project Manager for the Department of the Army permit application.

The overall goal of public scoping is to define the issues to be addressed in depth in the analysis that will be included in the EIS. That's why we're here today. We want to hear from you about the issues you would like for us to address in the EIS, and we appreciate everyone taking the time to join us today.

Before I proceed with our agenda, I would like to acknowledge the project team members in attendance today. From the U.S. Army Corps of Engineers, we are joined by Joe McMahan, Chief of Regulatory, and Bob Hindley, Deputy Chief of Regulatory.

From the Dow Chemical Company, we are joined by Yvonne Sampson (phonetic), Senior EH&S Leverage Delivery Leader, EHS focal point for the project, and Greg Bond, Dow Project Manager with

the Environmental Technology Center.

From the Corps EIS contractor team, we are joined by Whitney Fior (phonetic), Christine Hartman (phonetic), and Kara Giblen (phonetic) from SWCA, as well as Leslie Hollaway and Connor Stokes from Hollaway Environmental and Communication Services, who will be assisting me today.

During the meeting today, Colonel Timothy Vail, Commander of the U.S. Army Corps of Engineers Galveston District, will provide opening remarks followed by presentations about the proposed project from the Corps and the Dow Chemical Company.

After the presentations, you will be provided with the opportunity to speak directly to the project team. If you did not sign up to speak when you registered for today's meeting, you may do so at any time during the meeting by using the "raise hand" feature located at the bottom of the WebEx participant list. Please see the screen for additional instruction about using the "raise hand" feature through WebEx. Please note that you must access the WebEx portal online to sign up to speak today.

Speakers will be called on to provide comments in the order in which they have signed up. We will announce upcoming speakers in groups of five, so you are aware of when you will be called to speak.

For individuals who have only called in through the phone line, you have the option to submit written comments through mail, online through the project site, and by texting or calling the project phone number, (855) 925-2801 and entering code 8816. I repeat, that number is (855) 925-2801 and the access code is 8816.

We will now begin the presentation portion of the meeting with opening remarks from Colonel Timothy Vail, Commander of the U.S. Army Corps of Engineers, Galveston District.

COLONEL VAIL: Hello. I'm Colonel Timothy Vail, Commander of the Galveston District for the U.S. Army Corps of Engineers. Welcome to today's scoping meeting for the Department of the Army's Permit for SWG 2016 01027, the Dow Chemical Company's Harris Reservoir Expansion Project.

The public plays an important role in this permitting process, and as always, the Corps

values your attendance here today as we consider this application.

Dow Chemical Company is proposing to construct a 2000-acre off channel impoundment, referred to as the Harris Expansion to supplement total available storage capacity of the existing Harris and Brazoria Reservoirs. This Harris Expansion would be capable of a nominal storage capacity of 50,000 acre-feet, providing a reliable water supply from the Brazos River for Dow's operations in Freeport, Texas, and other users of Dow's water supply system, including the Brazosport Water Authority during extended periods of drought and low stream flows.

The Army Corps of Engineers is neither a proponent nor opponent of this project. We will ultimately decide if the proposed project is not contrary to the public's interest.

In order to make that decision, we must gather as much information as possible within the time allowed. This meeting will give individuals the opportunity to comment on the scope of the environmental impact statement or EIS for the proposed project, and all comments become part of the official record.

After Dow Chemical Company provides a brief description of the proposed project, we'll provide an overview of the Department of the Army permit procedure and the National Environmental Policy Act Process. Then we will begin calling on individuals who signed up in advance to submit their comments.

Today's meeting is not a vote for or against the project. It's an opportunity for you to comment on the types of information that should be evaluated to develop the scope of the EIS. In determining the scope of the EIS and evaluation of this permit evaluation, we'll begin considering all relevant factors identified during the scoping and in response to the public notice, including the needs and welfare of people, the project's impact on fish and wildlife, historic properties, fisheries, economic activity, navigation, safety, and recreational use.

As both a Texan and Commander of the Galveston District, I'd like to thank you for participating in this process by attending this meeting. The information and issues identified during this meeting, along with information and

issues provided in written comments will be considered in the determination of the scope of the environmental impact statement and subsequent evaluation of the permit application.

MR. HUDSON: Thank you, Colonel Vail. We will now proceed with the Dow Harris Reservoir EIS presentation, describing the proposed project.

MR. BOND: Hello. My name is Greg Bond, and I'm the Project Manager for the Harris Reservoir Expansion Project, and I work for Dow Chemical Company. What I'd like to do today is to spend a few minutes talking about the high level scope of the Harris Reservoir Expansion Project.

On the slide that you see at the moment, slide on the screen, there's the existing Harris Reservoir, which is on the right-hand side of the screen, and existing pump station. So that's actually in the field already, and then you have an artist's rendition of the new Harris Reservoir Expansion, new pump station associated with it, and what it would look like once it was built. So I wanted to share that with you as well.

And so over the next few minutes I'd

like to share with you a high level review of this project.

The high level scope - this project is to construct a new off channel reservoir and pump station. The facility would be located in Angleton, Texas, directly north of the existing Harris Reservoir. The new reservoir will expand storage capacity by about 50,000 acre-feet. It will add a new 150,000 gallon a minute pump station, which will improve reliability during drought conditions.

Why do we want to do this project? Additional pumping and storage capacity is required to provide protection against drought events for Dow as well as other industrial and municipal users. Extreme drought events, like what we had in 2009 and 2011, resulting in low flow along the Brazos River that created a frequency that can be expected to impact Dow's ability to supply fresh water 6 to 12 percent of the time without any action.

The project will allow region to meet requirements for the TCEQ for 180 days of stored water, which is needed to provide adequate protection against these seasonal drought events.

Current reservoir system including Brazoria and Harris Reservoirs holds approximately two months of river water supply for our regional partners Dow. The proposed reservoir will add the recommended additional four months of river water supply.

Dow has previously relied on utilized stored water resources of others, primarily we've contracted with the Brazos River Authority for their reserves as a supplement during these low flow events. However, increasing basin-wide demand, increased awareness of drought issues brought on especially by recent drought events have reduced and could soon entirely eliminate the availability of these supplies.

And finally, I just want to mention that current water rights will not change with installation of the new reservoir.

So we want to spend a few minutes talking about the technology, and to start I'd like to talk about what our current system looks like. We have the Harris Reservoir and the Brazoria Reservoir. On the Harris Reservoir, we have a pump station that pumps from the Brazos River, and then the water goes from the Harris

Reservoir and siphons through a pipe into the Oyster Creek. It follows the same path down the Oyster Creek through what's called our Lake Jackson pump station that pumps it into our Dow Canal, and then Dow Canal sends that water and sends it to Dow Texas operations, other industrial users, and community users as well.

The Brazoria Reservoir does something very similar. It has a pump station that takes from the Brazos River, puts it in the reservoir, and then we have a pipe that will siphon the water from the reservoir to the Buffalo Camp Bayou. At Camp Bayou, it also goes into the Dow Canal. That water is used for our industrial users, community users, and Texas operations of Dow Chemical plant.

So the Harris Reservoir Expansion will be installed directly north of the existing Harris Reservoir. Water will do the same thing. It will siphon through pipes into Oyster Creek, follow the same path as the water from the existing Harris Reservoir. So I just wanted to mention that.

So now what we're going to talk about is different technologies that were used in our new

Harris Reservoir expansion. We'll talk about the intake -- intake screens, new pump station, that line going to the reservoir embankment discharge and some flood mitigation projects that are part of this project as well.

So first we'll talk about the intake screens. They will be compliant with environmental regulations, and they will have mechanical cleaning to kind of keep them clean and operational. You can see -- on the bottom right here, you can see the two T screens. You will have section lines coming from those T screens that will go underground to the pump station, which you can see in that same drawing a little farther up in that building, right above it.

And on a small drawing in the upper right-hand corner, you'll see a white dot. That white dot shows the location of these intake screens. So each one of these technologies, when we talk about it, you'll see a mark or line, top right-hand corner, which will show the location of the technology or the piece of the property that we're discussing.

We're not going to talk about the pump

station, top right. You can see the white dot, which shows where the pump station will be located. It will take the section pipes from your T screens. It will go to these horizontal pumps. The horizontal pumps will have discharge piping coming out vertically and then going towards the reservoir on the ground level of the pump station. The pump station is designed based on the Brazoria Reservoir pump station, which has been working since the 1950s in good working operation, and so we want to design this pump station similar to that Brazoria Reservoir pump station.

On the left you can see an artist rendition of our pump station building in the center. On the left-hand side you can see the operations building. The right-hand side you can see our MCC building.

Technology being used for the embankment. On the top right, you can see the embankment will be all the way around the reservoir. This is the design of the actual levy around the reservoir. Looking from the left-hand side first, we'll have some sacrificial fill that will protect the embankment fill on the inside of

the reservoir, and this is below the water level.

Towards where the water level will be on the embankment fill, we will have soil cement, and that will be used to protect the embankment against any issues at the air-water interface.

Below the embankment fill on the inside, we will have a seepage barrier wall that we use to help water not -- well, to help stop water from going underneath the embankment.

At the top of the embankment or the levee, left-hand side will have a wave wall, which will help us to protect the top of the levee against waves coming across the reservoir. We'll have a 12-foot road that you can use to drive along the top of the reservoir for inspection or anything else that you might need to do on the top of the reservoir.

Right below that we have a chimney drain and a blanket drain that are made of sand to capture any water coming through the embankment, and then it can be captured under the PVC pipe, which is also in the diagram.

On the inside of the embankment, it's a three-to-one slope. On the outside it's a three and a half-to-one slope to help with stability of

the embankment fill. It will be topped with topsoil and grass.

And then on the very outside of the embankment, you have an access road. It's also going to be 12-foot wide to allow access all the way around the embankment on the outside.

Reservoir inlet pipe. In this drawing in the back you can see two pipes coming out of the building. That's the pump station. Those two pipes will connect into one pipe that will come into the reservoir. The majority of the way it's underground, and then at the embankment it comes above ground. It has a little fence and then goes into the reservoir. And especially when the reservoir is not filled, there will be a cement stilling basin that that water will go into so that it will not have any issues with -- or concerns when you're filling the reservoir with the water being pumped into it. So it will have a stilling basin in the reservoir itself.

And at the top right you can kind of see where that reservoir inlet type will be. The next thing we want to talk about was the discharge to combine emergency outlet and outlet structure. It is somewhat into the reservoir, so

that keeps it out of the -- keeps it out of the embankment.

And at the bottom, that's where the normal outlet will be, and the water will be flowing through that outlet, through the embankment, and then out to the Oyster Creek. The emergency outlet on the top as needed. You could also have water coming through the emergency outlet on the top of this structure. It will go through a baffle structure to dissipate any energy from the drop in height from the top of the reservoir down to the outlet. And then it will go through the same outlet structure over to the Oyster Creek.

So what we want to do now is we want to talk about three floodplain mitigation projects. As part of the Harris Reservoir Expansion Project, Oyster Creek restoration is planned. We have three projects that we're going to talk about as far as part of that plan.

Portions of the projects include flood capacity, provide repair, restoration and enhancements. Stream restoration projects will compromise of bed fill (indiscernible), 100-foot buffer preservation, buffer reestablishment out

to 200 feet.

So project one, which is this first one, is located on an unnamed tributary to Oyster Creek. You can see it on the top right-hand corner, see the white line. That's where this unnamed tributary is. We'll align the flow of the channel with floodplain mitigation requirements. We'll have flood mitigation and stream enhancement design, which will follow industry best practices. It will encompass about 2400 feet of the floodplain conveyance, incorporate floodplain bench on both channel banks, add some layback of channel banks as well, and it will preserve existing riparian buffer.

The second floodplain mitigation project. You can see it on the top right again. This is part of the Oyster Creek itself. Again, the flow of the channel will align with floodplain mitigation requirements. We will have floodplain and stream enhancement design, which will follow best practices in industry. This covers about 7800 feet of the floodplain -- 7800 of the Oyster Creek with floodplain conveyance and storage improvements. Incorporated floodplain bench on the west channel bank,

preserves existing riparian buffer, and then buffer reestablishment will also be part of this project.

Project number three, again, aligns the flow of the channel with floodplain mitigation requirements. Floodplain mitigation and enhancement design follow industry best practices. Establishes an ephemeral channel within the existing floodplain.

There will be a broad crested weir on the south bank of Oyster Creek to maintain low flows in Oyster Creek, but as the flows get higher, conveys overflows from Oyster Creek during high flows. Approximately 10-year range at greater magnitude flood events will go into this overflow. And that overflow project will also accommodate the reservoir outlet and spillway.

Finally, I wanted to talk a little bit about the master project schedule. We have turned in our permit in February of 2018. We plan to do a detailed design kickoff of our engineering in January of 2021. We are planning to receive our permit approval in April of 2022, start construction of the reservoir in August of

2022, detailed design in March of 2023, complete our construction in August of 2025, release to operations the following month, and then we'll have a few months to go ahead and fill the reservoir, finishing that up in January of 2026.

So this is a very high level review of the Harris Reservoir Expansion Project, and I appreciate you listening. And I thank you for your time.

MR. HUDSON: Thank you, Greg.

As a reminder, if you have not registered to speak during the meeting today and would like to, you may do so at any time by using the raise hand feature located at the bottom of the WebEx participant list. Please note that you must access the WebEx portal online to sign up to speak tonight.

And now we will provide you information about the U.S. Army Corps of Engineers EIS process, including the purpose and need, potential project alternatives, as well as an overview of the known environmental concerns.

(Recording played)

MR. HUDSON: Hello. My name is Jayson Hudson, and I am the Corps Regulatory

Project Manager for the Dow Chemical Company's Harris Reservoir EIS. I will present to you an overview of the Corps EIS process and the results of our early scoping.

The objectives of my presentation are to provide you an overview of the relevant laws, introduce the Corps project team, describe some of the content of the EIS and some of the alternatives and environmental concerns that have been identified.

The Dow permit application is subject to Sections 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. The project is also subject to Executive Order 13807, which streamlines the interagency coordination and development of the EIS.

The project must also be coordinated with State and Federal agencies pursuant to Section 401 of the Clean Water Act, the Coastal Zone Management Act, the Endangered Species Act, and the National Historic Preservation Act.

The EIS team is comprised of the Corps as the lead Federal agency, with the Environmental Protection Agency and U.S. Fish and Wildlife Service cooperating in the development

of the EIS.

Several state agencies, including the Texas Commission on Environmental Quality, Texas Parks and Wildlife Department, and the Texas Historical Commission are also participating or commenting on the development of the EIS.

The EIS contractor is SWCA Environmental Consultants and Dow Chemical Company is the applicant.

Due to limited resources, the Corps regulatory program utilizes a third-party contractor process to develop an EIS. In this process, the lead Federal agency, applicant, and environmental consultant enter into an agreement where the applicant contracts and pays for the environmental consultant who prepares the EIS under the direction of the Corps.

As you can see in the diagram, the Corps directs the environmental consultant on the development of the EIS independent of the applicant. It's important to emphasize that ultimately, the Corps is responsible for the development and content of the EIS.

Here we have a timeline of major

milestones. Dow submitted their application in February of 2018 and after an initial public notice in March, the Corps determined an EIS would be required in October of 2018.

After working with Dow to develop additional information for the project, the Corps coordinated with the cooperating agencies to develop a purpose and need for the project, which we will discuss later in the presentation.

The Corps published a notice of intent to develop the EIS in April of 2000 of this year, which initiated the scoping period we are currently in.

The draft EIS is scheduled to be provided to the public in June of 2021, with a public hearing and comment period in July. The final EIS is scheduled to be provided to the public in January of 2022, followed by a permit decision which will be documented in a record of decision in April of 2022.

This EIS flowchart shows the sequential process for developing and publishing an EIS. We are currently in the scoping stage of the EIS, where we are soliciting your input. The information and issues identified during scoping,

along with the information and issues provided in letters sent in response to the public notice, and all other pertinent data, will be considered in the determination of the scope of the EIS and subsequent evaluation of the permit application.

The scoping process is an integral step in the development of an EIS, with the overall goal of defining the scope of issues to be addressed in-depth in the analysis.

Listed here are the typical sections of an EIS. The first chapter will provide an introduction to the project and the Corps' stated purpose and need for the project. The second chapter describes the alternatives to the applicant's proposed project, and the subsequent chapters assess the impacts of all of the alternatives evaluated. The assessments will cover a wide range of environmental impacts including the cumulative impacts.

In addition, studies that supported the analysis will be provided in the appendices of the EIS. These may include, but are not limited to the Endangered Species Act assessments, cultural resource studies, hydrology and hydraulic studies, and compensatory

mitigation plans.

The Corps is required to restate the purpose and need for the project from the public interest perspective. The Corps, after coordinating with the cooperating agencies, developed two purpose statements: a basic purpose and an overall purpose.

The basic purpose is developed to determine if the project requires siting in or proximity to a special aquatic site such as a wetland. Based on the Corps' basic project purpose, shown here, the project was determined not to require siting in or proximity to a special aquatic site such as a wetland. Therefore, it is presumed that an alternative that does not affect special aquatic sites is available.

The overall purpose is developed to identify and screen alternatives to the applicant's proposed project. The Corps has determined that the overall project purpose from the public interest perspective is to utilize Dow's existing run-of-river water rights from the Brazos River to improve reliability during extended drought conditions over the existing

water supply system that serves Dow's Texas operations in Freeport.

Based on modeling, Dow estimates that 78,000 acre-feet of water storage capacity is necessary to provide the Texas Commission on Environmental Qualities recommended 180 days of drought resilience.

Alternatives that were identified during the initial public notice, which is an early scoping step, include the no action alternative, which in this case would be permit denial, the applicant's preferred alternative, as well as alternatives to the reservoir such as deepening and expanding the existing reservoirs or a desalination plant.

It is not uncommon in complex projects such as this one to have alternatives developed for subcomponents of the project: in this case, alternatives to the floodplain mitigation designs on Oyster Creek.

In addition to the alternatives that were identified during the public notice, several environmental concerns were raised. Many of the comments received focused on floodplain impacts as well as changes and sedimentation and erosion

of the Brazos River and Oyster Creek. Additional comments were received on Fish and Wildlife impacts, including endangered species as well as overall water quality.

I thank you for your interest in the development of the EIS for the Dow Chemical Companies Harris Reservoir Expansion Project. I look forward to receiving your comments and suggestions. We will be accepting scoping comments through July 2nd of 2020. If you would like to submit written comments, you may do so at the mailing address or electronic email address shown on your screen.

(Recording stopped)

MR. HUDSON: That concludes the presentation portion of today's scoping. We will now begin the commenting period. As a reminder, if you have not registered to speak during the meeting today and would like to, you may do so at any time by using the raise hand feature located next to your name in the WebEx participant list.

Please note that you must have access to the WebEx portal online to sign up to provide a comment.

Due to the nature of today's virtual

meeting, the formal public commenting portion of today's meeting will be conducted in the following way. First, Federal, State, and local elected officials who wish to speak will be called on to do so. Then everyone else who has indicated a desire to speak will be given the same opportunity. I will then call on each member of the public who has signed up to speak by the name used during the meeting registration.

Each speaker will be given three minutes to make their comments. When it is your turn to speak, please mute your computer audio to avoid feedback. A countdown timer will be displayed on the meeting broadcast screen for each speaker to indicate their remaining time. As your time ends, please be courteous to the other members of the public who wish to provide comments and quickly wrap up your comments to ensure that everyone who would like to speak has the opportunity to do so.

If you do not need the entire time allotted, help us to include everyone by only using the time you need. If you complete your comments in less than three minutes, we will restart the clock for the next speaker.

Remaining time cannot be reserved or transferred to another speaker.

Please keep in mind that we reserve the right to mute your microphone if this instruction is not followed.

We ask that you support us in conducting a respectful, orderly, and courteous meeting. We want to be sure we get all of your comments recorded, and we need your cooperation to do so. So here are a few ground rules for the meeting today.

Since this meeting is being held virtually, we will keep all participant microphones muted to avoid any background noise that may make the presentation difficult to hear. When it is your turn to speak, Connor will notify you when your microphone has been unmuted. Please make sure you have also unmuted your phone too or computer.

When it is your opportunity to speak, please state and spell your first and last name. We will not respond today to the comments submitted. However, all comments made today will be documented and reflected in the development of the EIS.

Just a reminder, you may not defer your time to others. The public scoping meeting will adjourn at 7:00 p.m. today. If you have additional comments that you would like to submit beyond what you are able to address during your comment period, please submit them in writing or by calling (855) 925-2801 and entering code 8816. Again, that's (855) 925-2801 and the code is 8816.

Speakers will be called on to provide comments in the order in which they have signed up. We will announce upcoming speakers in groups of five, so you are aware of when you will be called to speak. If you do not wish to provide a comment today but would like to submit comments to the project team, there are other ways to do so. You have the option to submit comments through mail, online through the project website, and by texting or calling the project number, (855) 925-2801, and you enter code 8816.

All comments received during the formal commenting period through July 2, 2020, will carry the same weight as the comments submitted today. You do not have to comment today, and you will be heard just as clearly as those who speak

today. Additional information about submitting comments is provided on the project website.

We will begin with comments from public officials.

Connor, do we have any public officials who wish to provide comments today?

MR. STOKES: Thank you, Jayson. We do not have any public officials that have signed up to comment today.

MR. HUDSON: Okay. Thank you. Connor, who are our first five public speakers?

MR. STOKES: We currently have four speakers that have signed up already. Those speakers are Brandt Mannchen, Michael Thomas, Preston Black, and Lisa Gasset (phonetic). We'll begin with Brandt Mannchen.

Brandt, your microphone has now been unmuted, and you can begin providing comments at this time.

As a reminder, please make sure to unmute your own device during your comment.

Again, Brandt, you can begin providing comments at this time.

MR. MANNCHEN: Hello? Can you hear me?

MR. HUDSON: Brandt, we can barely hear

you.

MR. MANNCHEN: Can you hear me now?

MR. STOKES: That's better.

MR. MANNCHEN: Can I go now? My name is Brant --

MR. STOKES: Yes. You can --

MR. MANNCHEN: B-r-a-n-d-t, M-a-n-n-c-h-e-n. I volunteer for the Houston Sierra (indiscernible). Some of our concerns deal with climate change. (Indiscernible) on this particular project at Dow Chemicals operations release a lot of C02 into the atmosphere. We would like an accurate climate change analysis for this particular proposal. Also (indiscernible) carbon dioxide (indiscernible) pollutants.

We also support alternatives with water conservation. We're very concerned that the alternatives that were shown do not show (indiscernible) floodplain (indiscernible), which to us (indiscernible) off channel reservoir alternative. So we would very much like to see that as an alternative.

It's also of great concern about this particular project is it has the potential for

(indiscernible) and reroute the Brazos River during a flood event and capturing (indiscernible). (Indiscernible) Brazos River channel. So it's very important that (indiscernible) as well as what the flood effects might (indiscernible). Those are all the comments I wish to make.

MR. STOKES: Thank you for your comments.

As a reminder, once you unmute your microphone, please make sure you get closer to the mic so we can all hear the comments being provided.

We will now move to the next speaker, Michael Thomas.

Michael, your microphone is now unmuted, and you can begin providing comments at this time. Again, Michael, your microphone has now been unmuted, and you can begin providing comments at this time.

(No audible response)

We'll move on to the next speaker for now, and we'll circle back with Michael once we get through our current list.

Our next speaker is Preston Black.

Preston, your microphone is now unmuted, and you can begin providing comments at this time.

MR. BLACK: Okay. Mr. Stokes, can you hear me?

MR. STOKES: Yes. We can hear you.

MR. BLACK: Okay. I've been researching all the information that you provided online, and I have great concern on the floodplain that's going to be affected by the placement of this reservoir. I've not been able to find the three studies that were mentioned in the presentation anywhere, the details. I would like to see those.

And furthermore, I have seen no study or no comments through the entire process on how this project is going to affect the west side of the Brazos River flood basin. And I'm afraid when you take 10,000 acre-feet out of the storage unit, your -- it's got to go somewhere. And it looks to me like it's going to west side, and none of this has ever been addressed. So I would like to see some studies or some comments along those lines. They might be out there. I've yet to see them though, and that is my primary

comment of what I'm concerned with.

MR. STOKES: Thank you for your comments. Your microphone has been muted as this time.

Our next speaker is Lisa Gasset.

Lisa, your microphone is now unmuted, and you can begin providing comments at this time.

MS. GASSET: Okay. Confirming that you can hear me.

MR. STOKES: Yes, ma'am. We can hear you.

MS. GASSET: Okay. My name is Lisa Gasset. My family owns a home off the Brazos River downstream of the proposed project. This home has been flooded by the river five times between June 2015 and June 2019. Prior to that, the property did not have a river flood in over 20 years.

The Corps is requiring an EIS for this project, and I thank you for that. Citizen involvement and the development, availability, and review of information about the proposed project are key parts of this EIS process.

As part of the federal register notice

published on April 7, 2020, for this scoping period, this notice identified three studies and assessments that were prepared in response to issues raised by myself and others in 2018. Also referenced is a wetlands delineation that was verified by the Corps in October of 2019.

Weeks ago I asked if these might be available and understood that additional information will be posted on the scoping website. There's very little information there. None of these assessments reports on the wetland delineation seem to be available online for review by the public.

When critical information is not available for review, genuine public feedback cannot occur. I requested these reports and studies be made available to the public online and that the scoping period be extended to allow a response related to the issues that are raised.

Another key part of the EIS process is the identification, analysis, and review of alternatives to the proposed project. I urge consideration of a broad range of alternatives to increase drought reliability, not just focusing on this specific project alone, looking at the

broader purpose. These can include storage at this location, storage at other locations, but I don't know that it needs to be focused on a specific volume without looking more broadly.

Alternatives could include conservation, operational changes, a salt wedge barrier, storage at other locations outside the floodplain, redesigning or reducing the footprint and flood impacts, and a range of other options.

Impacts of concern, again, include the flooding downstream of the proposed reservoir, particularly in the Brazos River. The one-page summary that was posted raised more questions than it answers. It seems to focus on Oyster Creek while not addressing the known interconnection and impacts on the Brazos River that occur during flooding events.

I will leave additional discussion for my written comments.

MR. STOKES: Thank you for your comments. Your microphone has now been placed back on mute.

At this time we will circle back to Michael Thomas.

Michael, your microphone is now unmuted,

and you can begin providing comments at this time.

MR. THOMAS: Okay. Again, my name is Michael Thomas. Can you hear me?

MR. STOKES: Yes. We can hear you, Michael.

MR. THOMAS: Apparently the timer is running. Okay.

(Audio cutting out - indiscernible)

And again, I see focus on Oyster Creek (indiscernible) for the reservoir expansion, but I don't see any benefit (indiscernible).

I also am very concerned about the (indiscernible) of the (indiscernible) with the Brazos River and (indiscernible) version of the (indiscernible) and how that may impact the river all with irrigation and all the impact to -- wildlife (indiscernible). So that pretty much wraps up my -- my comment.

MR. STOKES: Thank you, Michael.

I apologize. I had a little difficulty muting the microphone there.

At this time, Jayson, that is all of our registered speakers, and I do not see any raised hands.

MR. HUDSON: Thank you, Connor. Since we've gone through all of our commenters, the formal commenting period for tonight is closed. All statements placed in the record will be given consideration. It should be noted that comments on the proposed project can be submitted at any time during the NEPA process, but only those submitted during this and the previous formal scoping periods will be included in the summary reports and will be guaranteed to be addressed in the final environmental statement. We will accept comments on the Dow scoping through July 2, 2020.

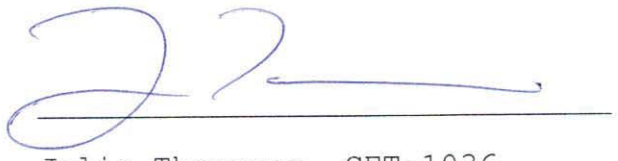
I thank you for your participation today and the interest that you have shown in the proposed project. The public scoping meeting is adjourned at 4:44. Thank you.

(END OF VIDEO FILE)

CERTIFICATE OF TRANSCRIPTIONIST

I certify that the foregoing is a true and accurate transcript of the digital recording provided to me in this matter.

I do further certify that I am neither a relative, nor employee, nor attorney of any of the parties to this action, and that I am not financially interested in the action.



Julie Thompson, CET-1036

APPENDIX K

Engineering Drawings

Note: The Section 508 amendment of the Rehabilitation Act of 1973 requires that the information in federal documents be accessible to individuals with disabilities. The U.S. Army Corps of Engineers (Corps) has made every effort to ensure that the information in this appendix is accessible. However, this appendix is not fully compliant with Section 508, and readers with disabilities are encouraged to contact Mr. Jayson Hudson at the Corps at (409) 766-3108 or at SWG201601027@usace.army.mil if they would like access to the information.

N

0 1000 2000 3000

Scale In Feet

FOR NORTH HALF OF RESERVOIR, SEE FIGURE 5

FLOODPLAIN ENHANCEMENT/ STREAM RESTORATION AREA

RAMSEY BRIDGE

FLOODPLAIN ENHANCEMENT/ STREAM RESTORATION AREA

TEMPORARY WORK SPACE

OYSTER

FLOODPLAIN ENHANCEMENT/ STREAM RESTORATION AREA

WEIR FOR FLOOD MITIGATION CHANNEL

CR

OFF-CHANNEL RESERVOIR

FLOODPLAIN ENHANCEMENT/ STREAM RESTORATION AREA

PROJECT BOUNDARY

CONTRACTOR STAGING AREA

RESERVOIR OUTLET AND SPILLWAY, SEE FIGURE 12

FOR OYSTER CREEK COVERAGE SEE FIGURE 14

EMBANKMENT, OFF-CHANNEL RESERVOIR

RESERVOIR INLET

BRAZOS RIVER

SITE ACCESS / RESERVOIR PERIMETER ROAD

SE ENTRANCE ROAD

INTAKE AND PUMP STATION SEE FIGURE 8

FOR SOUTH HALF OF RESERVOIR, SEE FIGURE 6

CONTRACTOR STAGING AREA, AND TEMP WORK SPACE

TEMPORARY WORK SPACE

EXISTING HARRIS RESERVOIR

FIGURE 4
OVERALL SITE PLAN AND KEY MAP

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

699038

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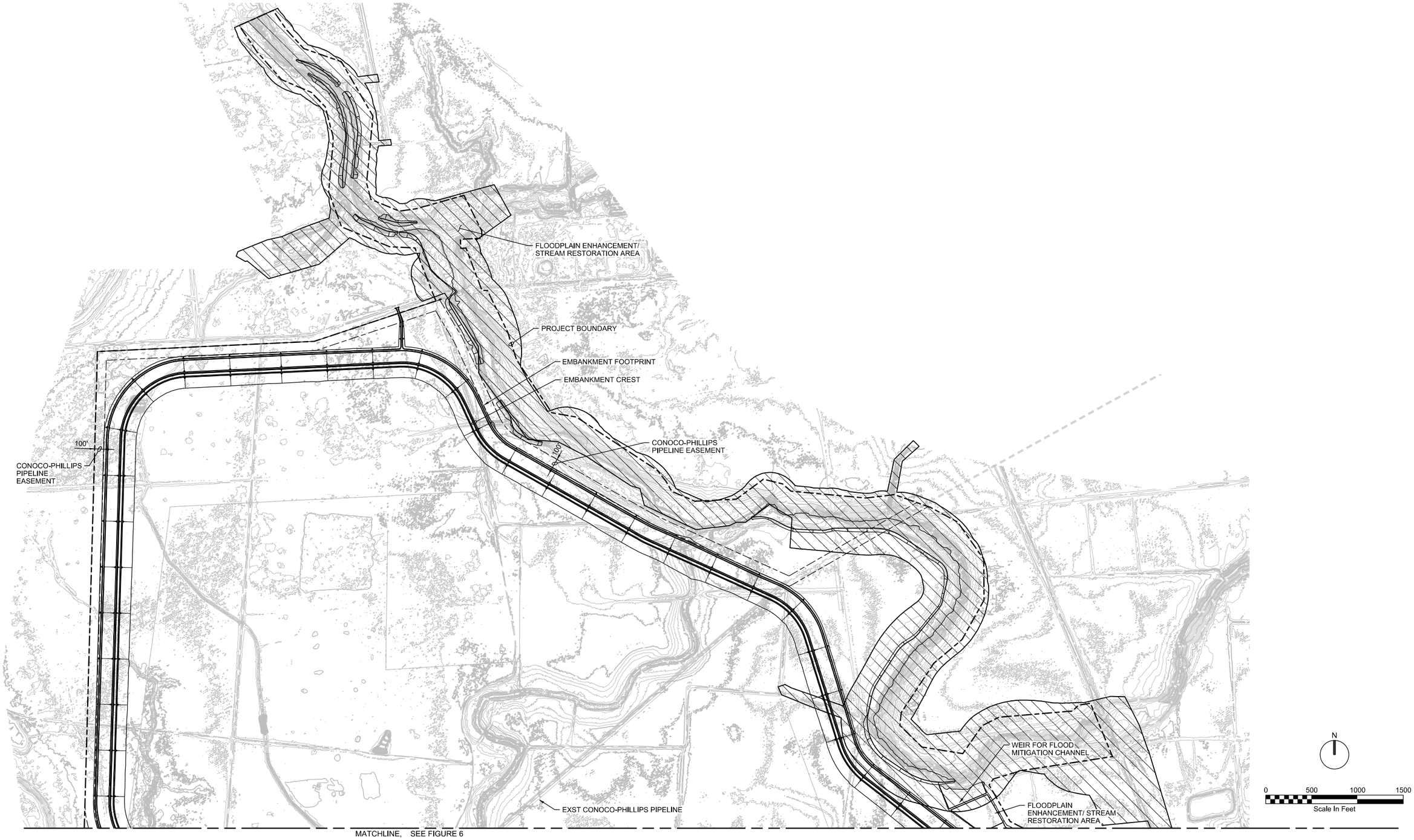

FIGURE 5
PLAN - NORTH HALF OF RESERVOIR

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

699038

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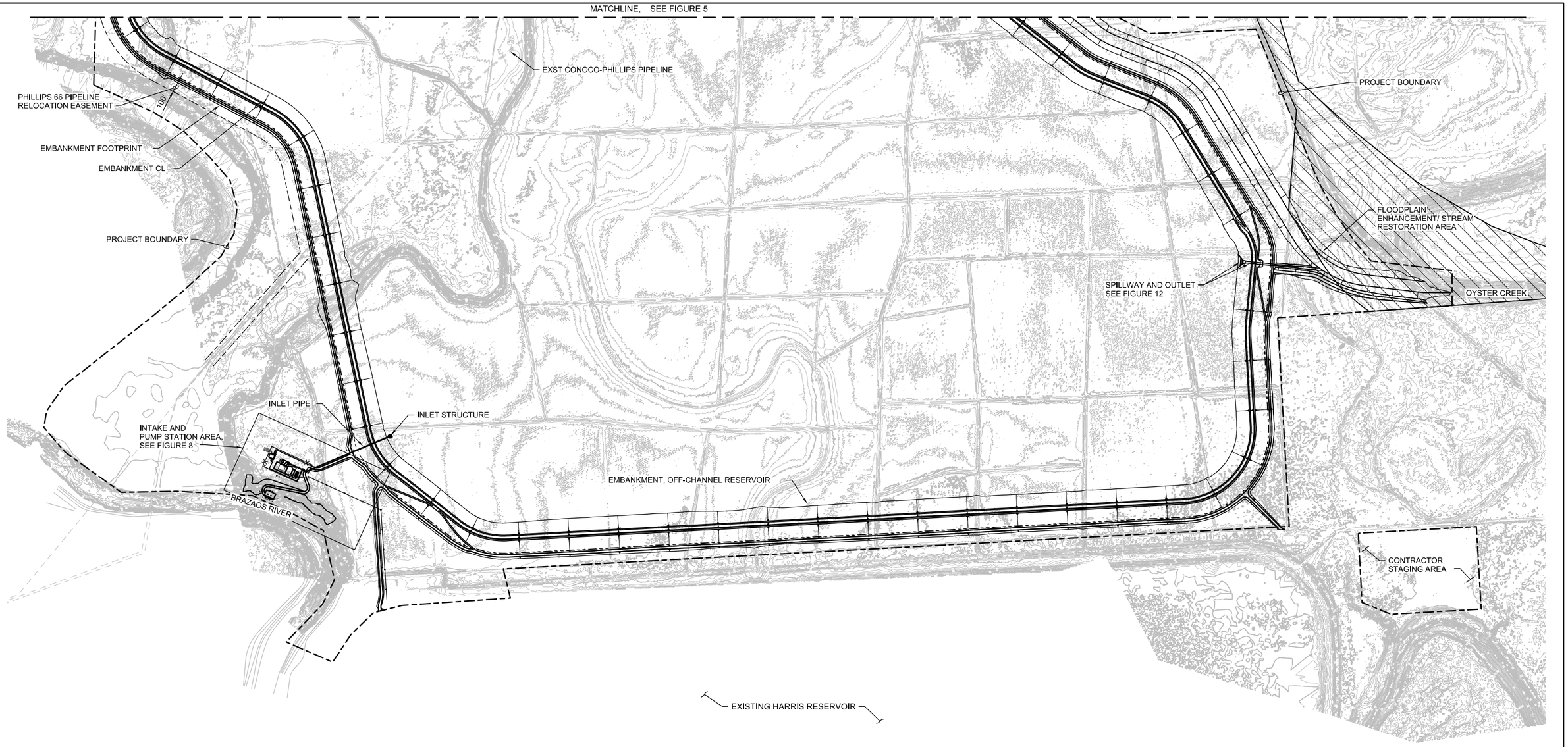

FIGURE 6
PLAN - SOUTH HALF OF RESERVOIR

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

699038

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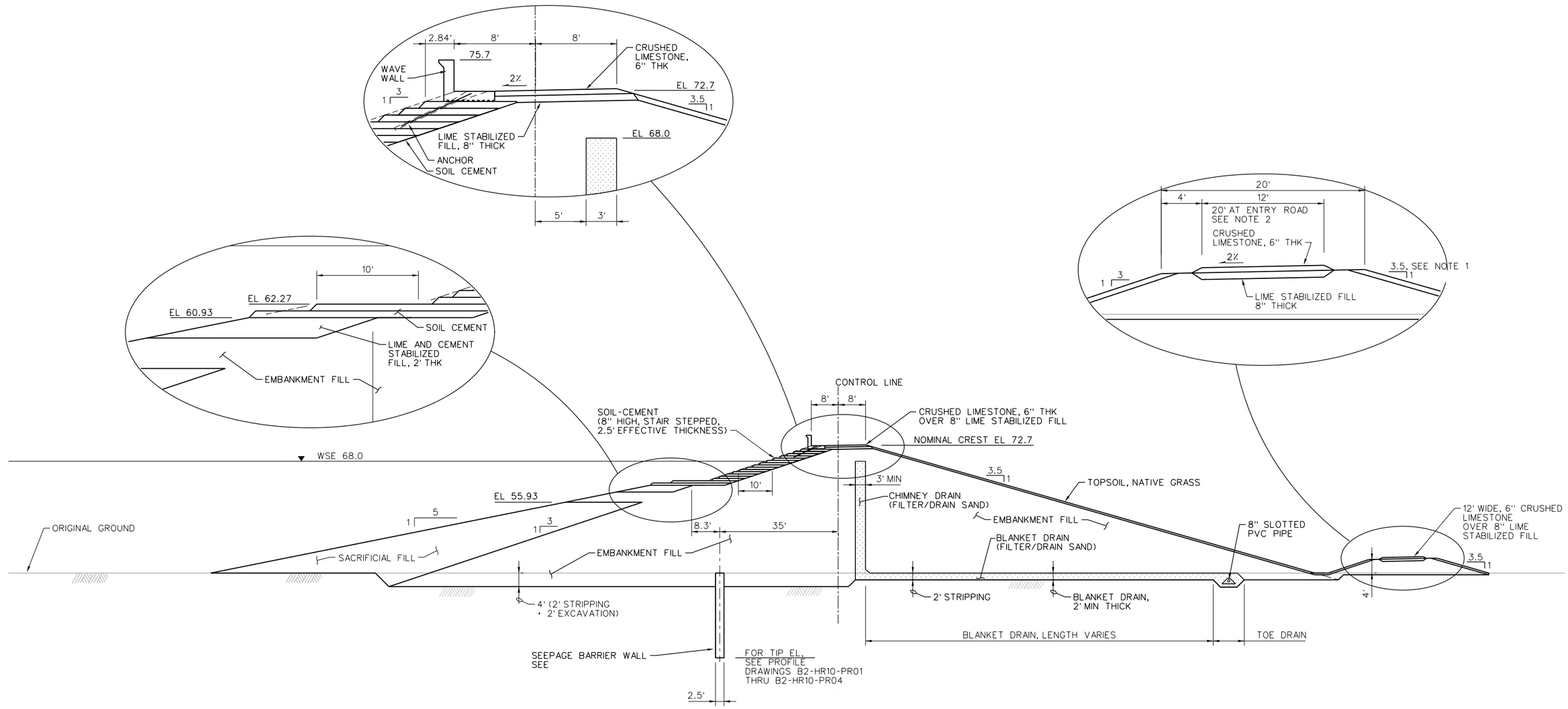

TYPICAL EMBANKMENT SECTION

1"=15'

FIGURE 7
TYPICAL EMBANKMENT SECTION

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

699038

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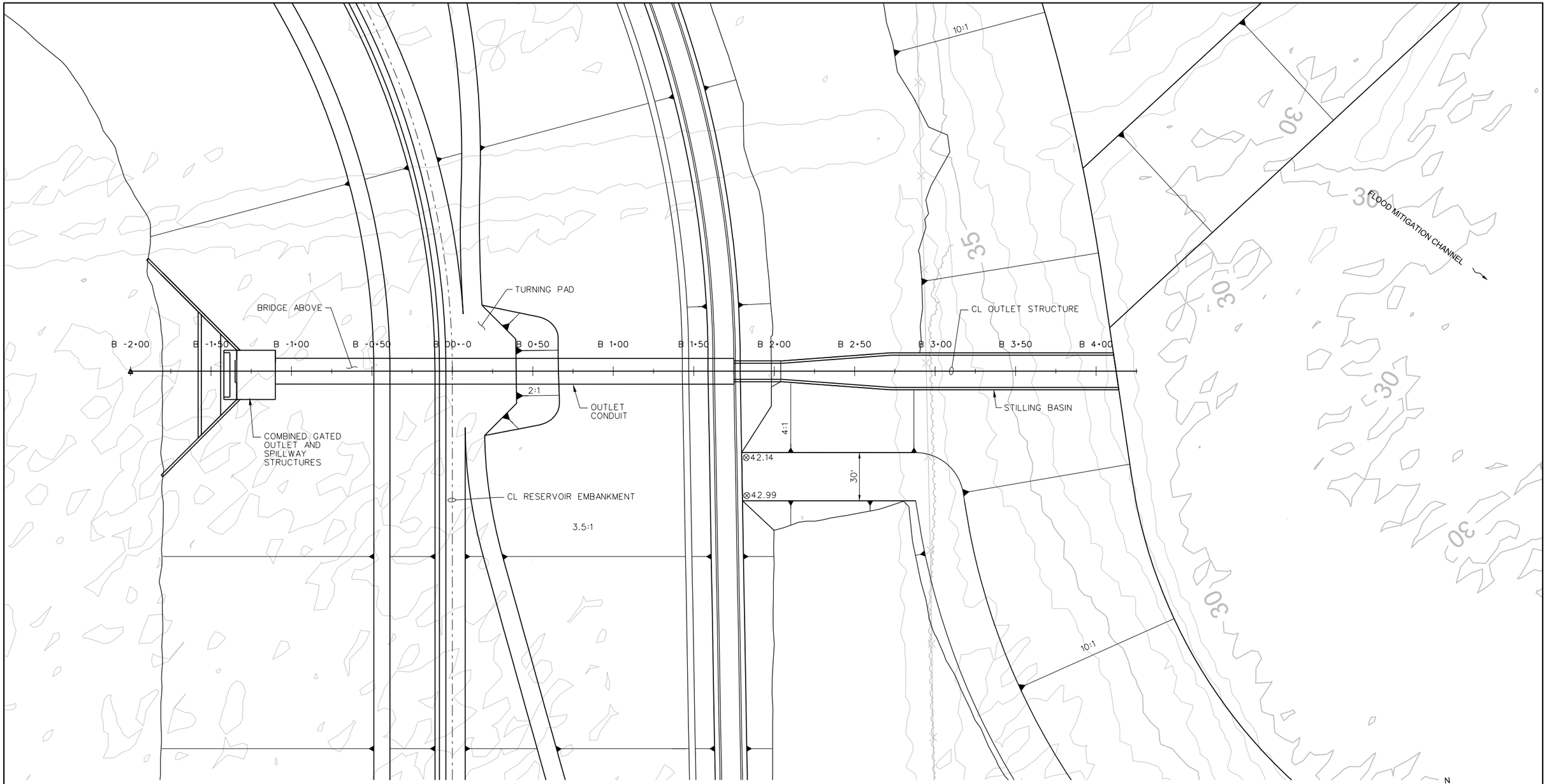

OUTLET AND SPILLWAY PLAN
1"=30'

FIGURE 12
OUTLET AND SPILLWAY PLAN

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

699038

JACOBS

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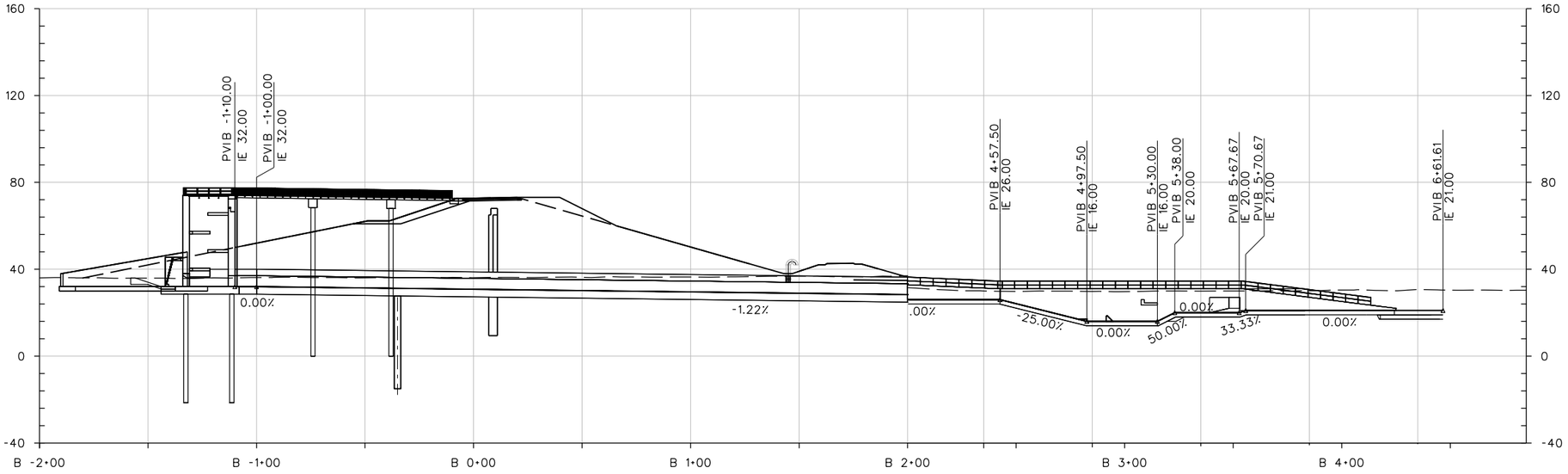

FIGURE 13
OUTLET STRUCTURE - PROFILE

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

692350

JACOBS

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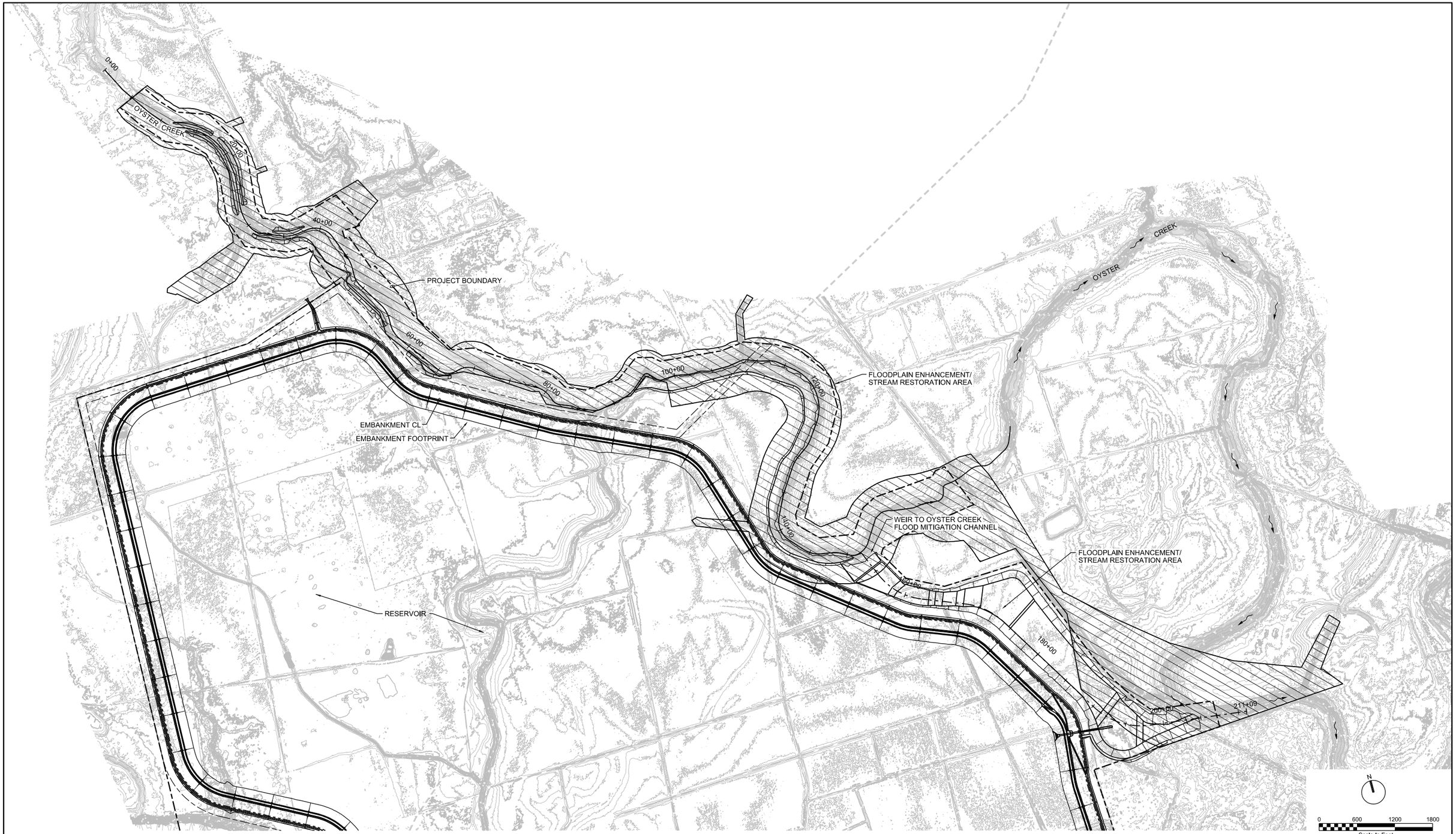

FIGURE 14
OYSTER CREEK - OVERALL PLAN

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

699038

JACOBS

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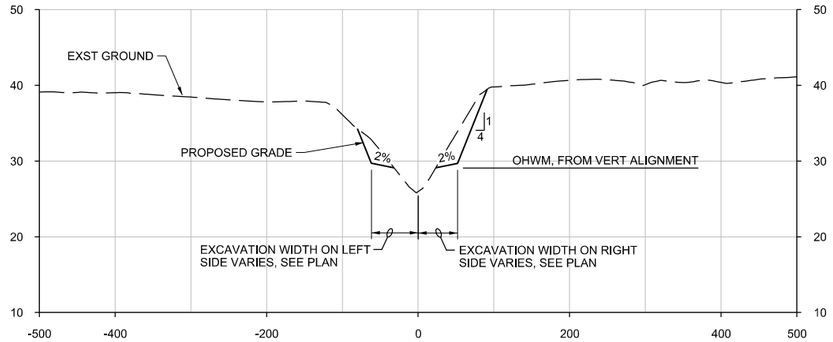

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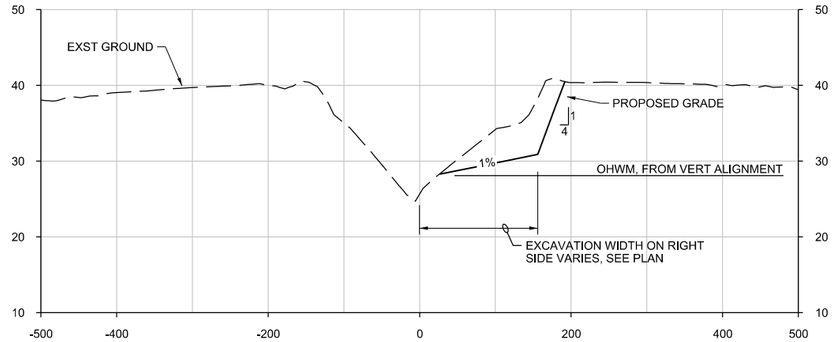
1"=10' VERT



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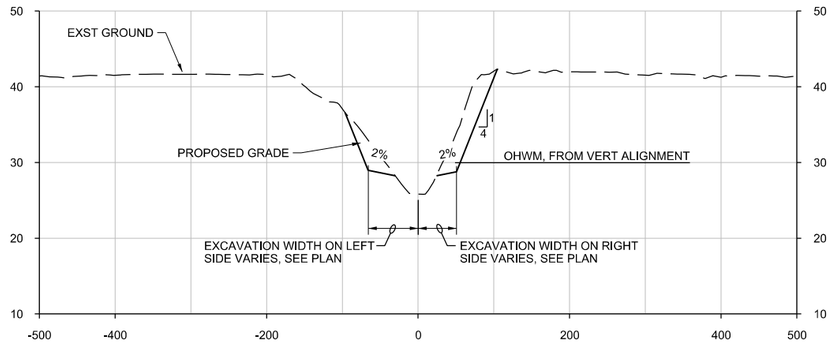

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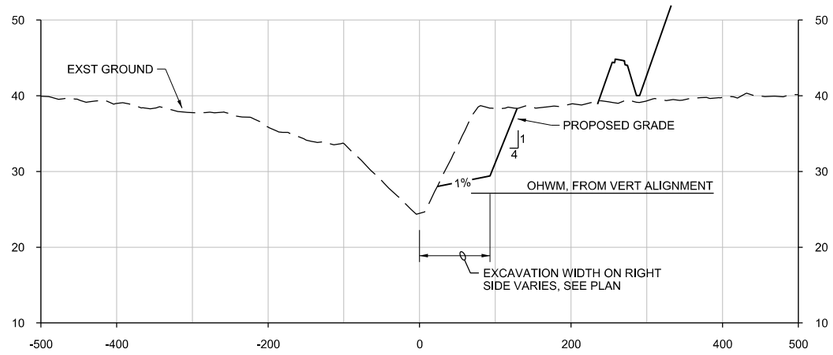

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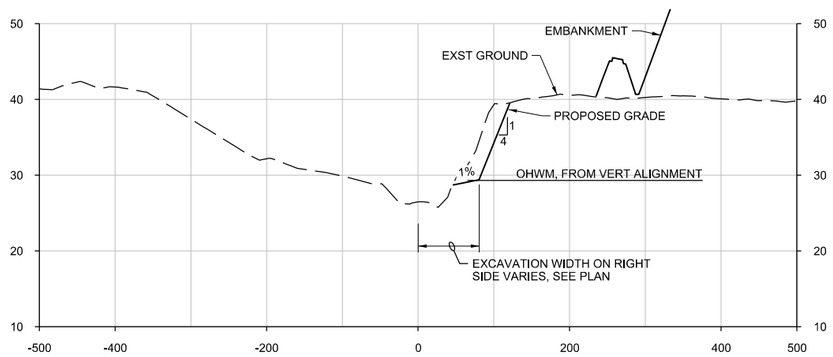

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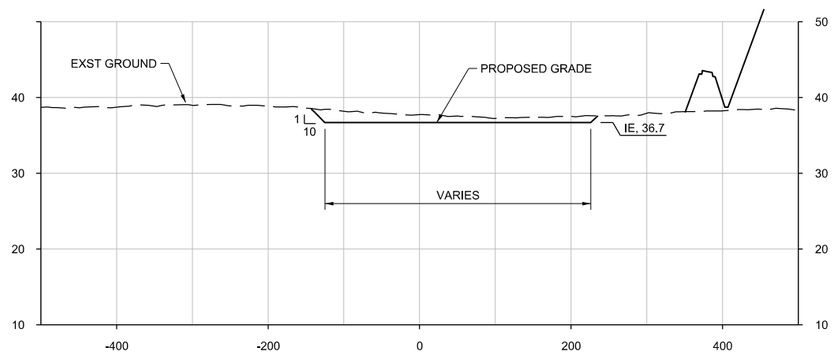

STA F 2+75± TO STA F 6+25±

1"=100' HORIZ
1"=10' VERT

FIGURE 15
OYSTER CREEK - CROSS SECTIONS

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

699038

JACOBS

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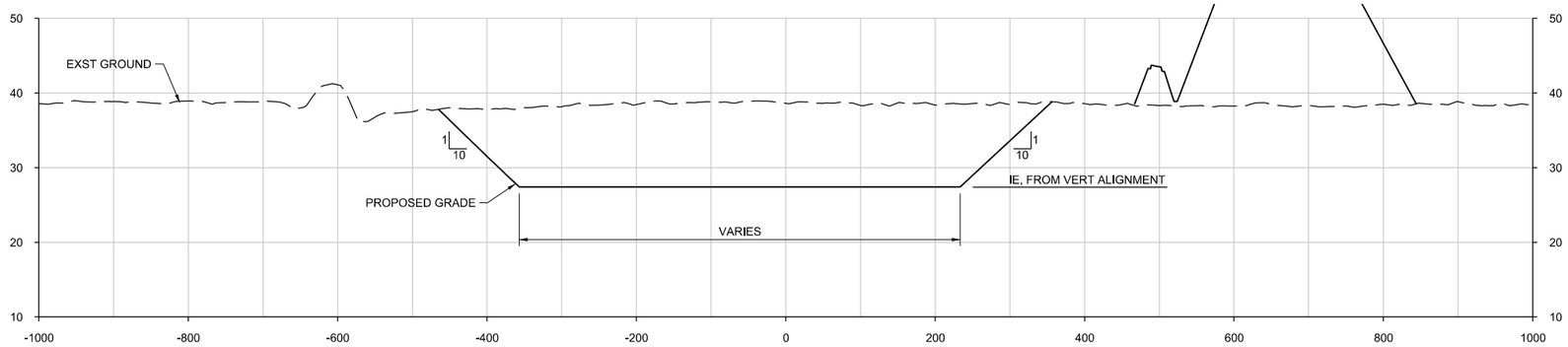

STA F 6+00± TO STA F 38+00±

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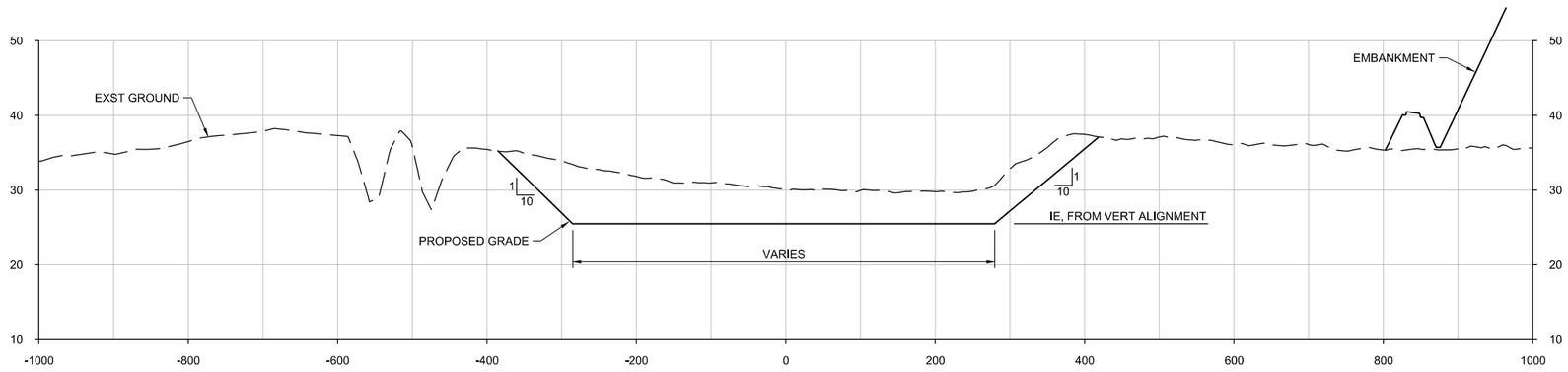
1"=10' VERT



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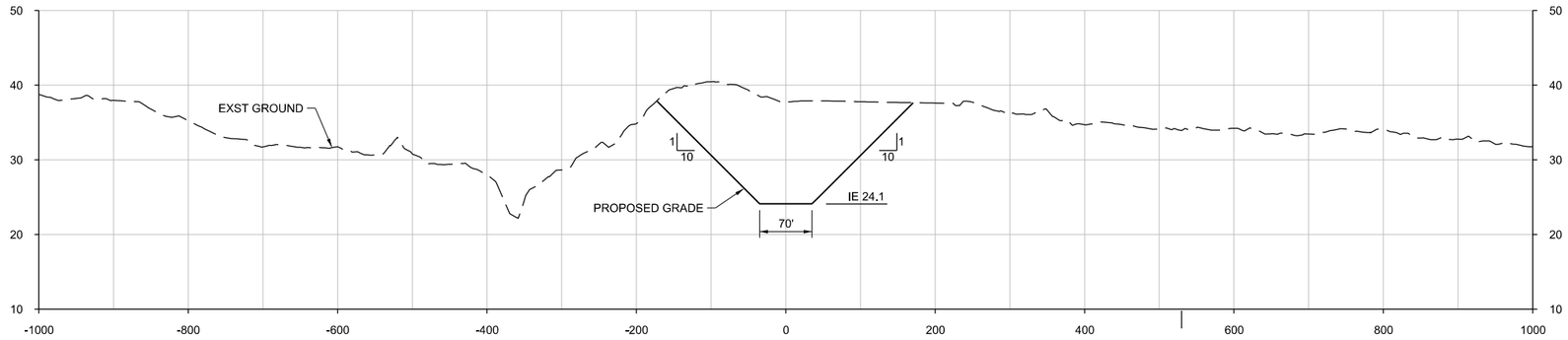
1"=10' VERT



STA F 50+50± TO STA F 54+25±

1"=100' HORIZ
1"=10' VERT

FIGURE 16
OYSTER CREEK - CROSS SECTIONS

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

699038

JACOBS

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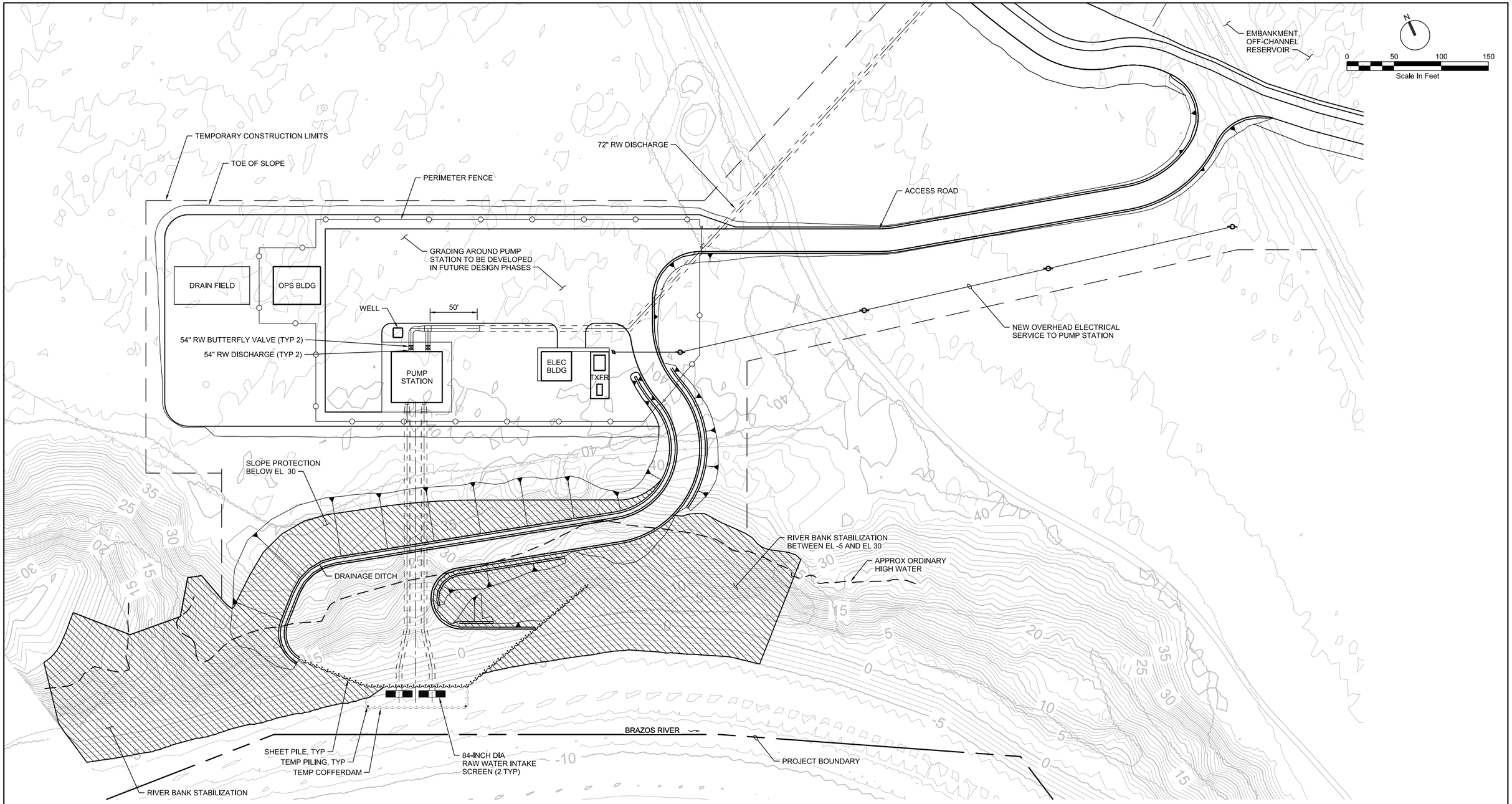

FIGURE 3-1
INTAKE AND PUMP STATION - SITE PLAN

HARRIS EXPANSION PROJECT
BASIS OF DESIGN REPORT

672534

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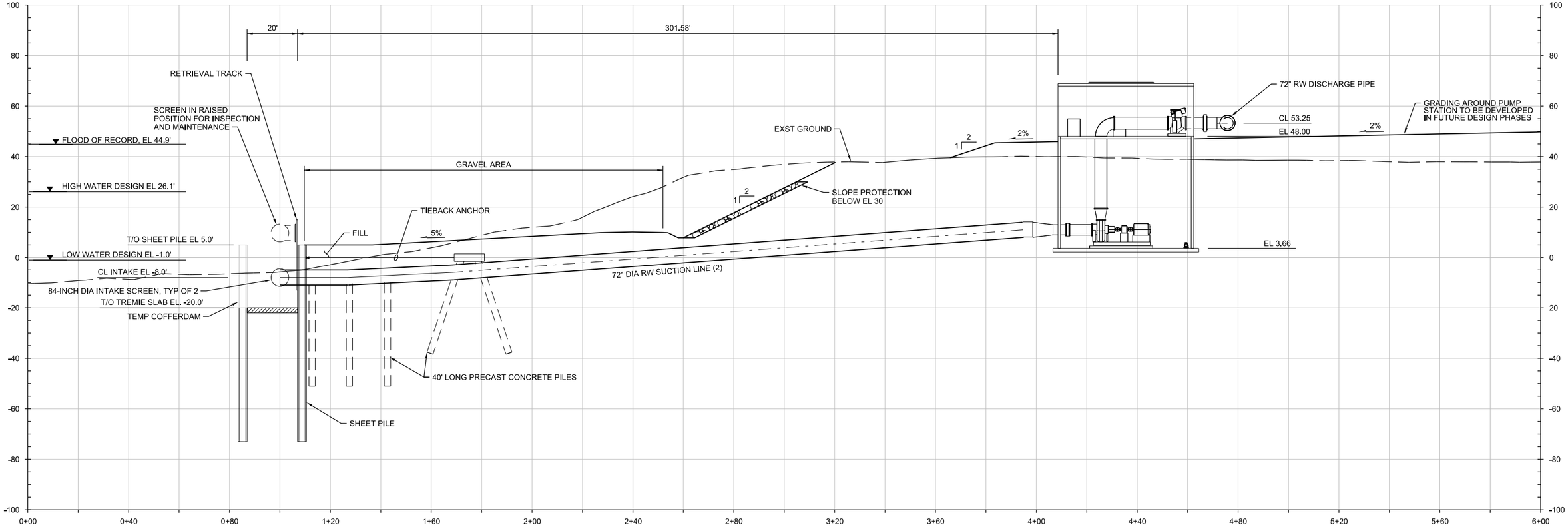

INTAKE SECTION

1"=20'

0 20 40 60

Scale In Feet

FIGURE 3-2
INTAKE AND PUMP STATION - SECTION

HARRIS EXPANSION PROJECT
BASIS OF DESIGN REPORT

672534

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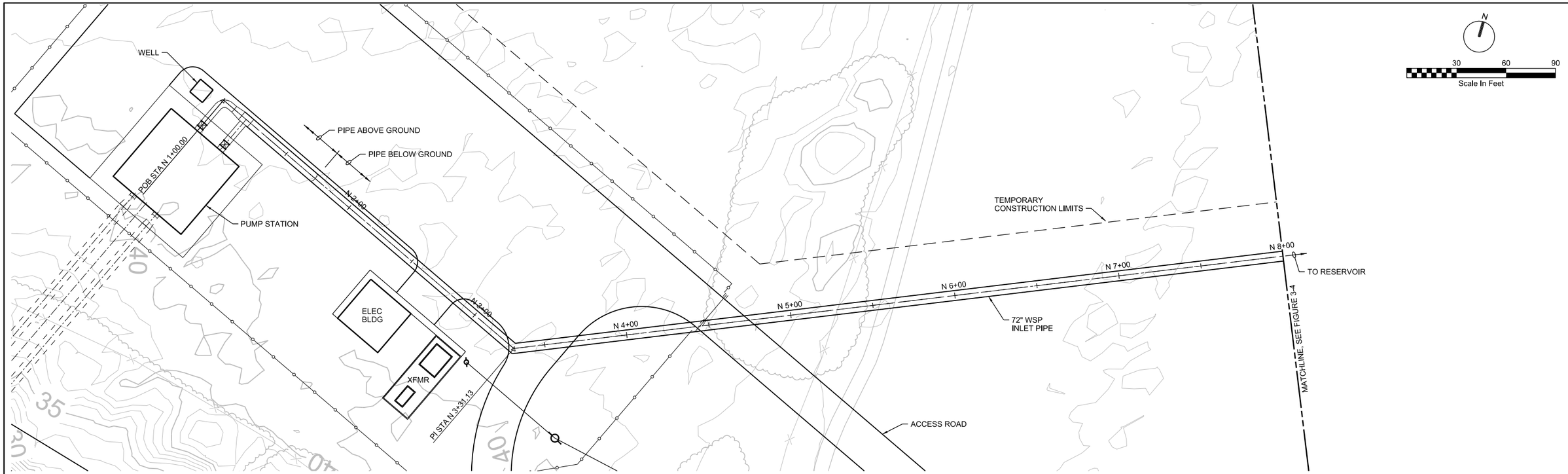
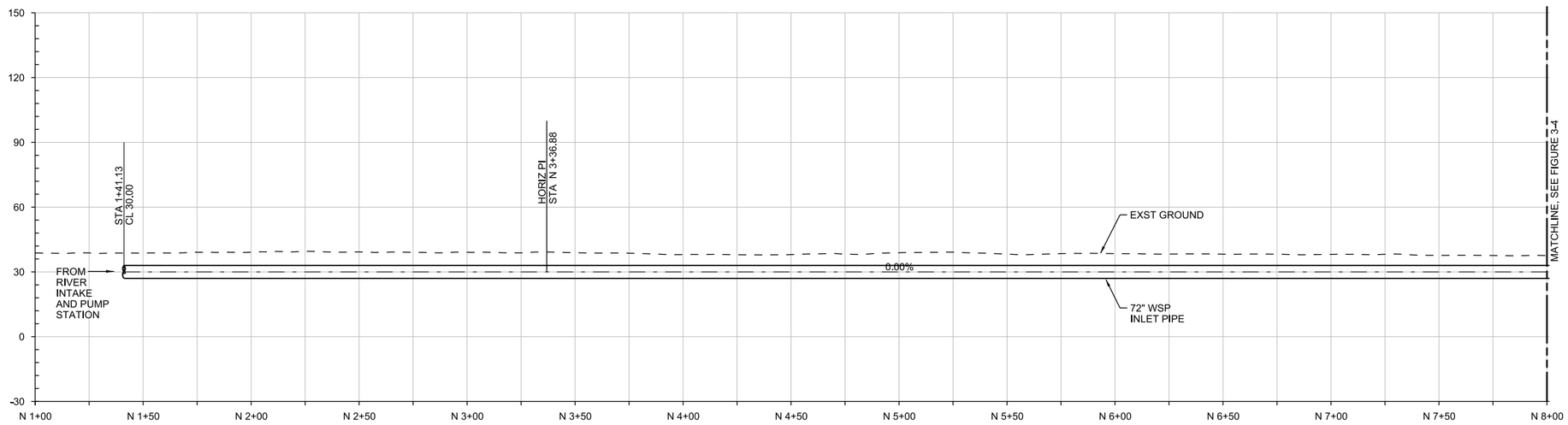


INLET PLAN
1"=30'



INLET PROFILE
1"=30'

FIGURE 3-3
RESERVOIR INLET - PLAN AND PROFILE

HARRIS EXPANSION PROJECT
BASIS OF DESIGN REPORT

672534

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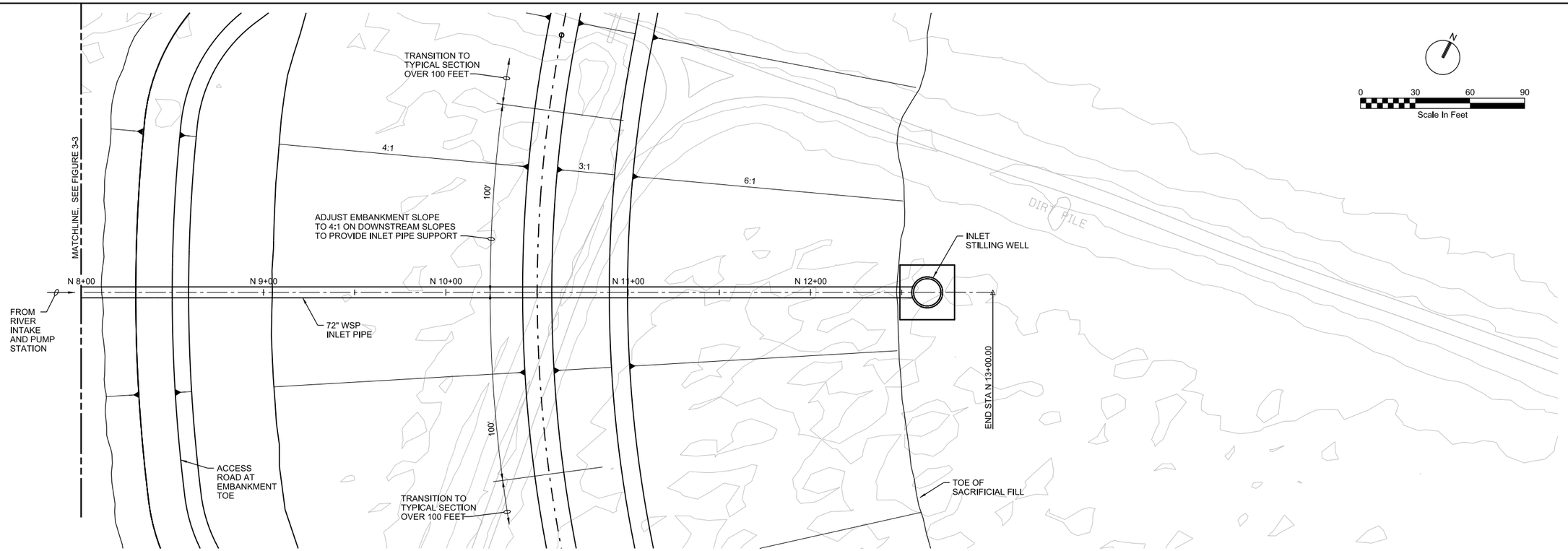
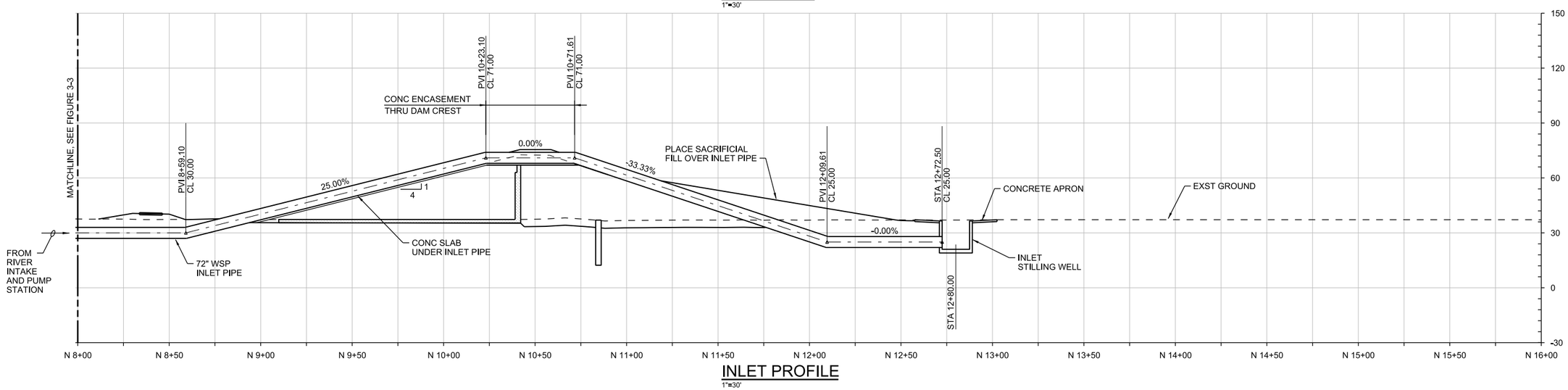


INLET PLAN
1"=30'



INLET PROFILE
1"=30'

FIGURE 3-4
RESERVOIR INLET AT EMBANKMENT

HARRIS EXPANSION PROJECT
BASIS OF DESIGN REPORT

672534

APPENDIX L

Operations and Maintenance Plan

Note: The Section 508 amendment of the Rehabilitation Act of 1973 requires that the information in federal documents be accessible to individuals with disabilities. The U.S. Army Corps of Engineers (Corps) has made every effort to ensure that the information in this appendix is accessible. However, this appendix is not fully compliant with Section 508, and readers with disabilities are encouraged to contact Mr. Jayson Hudson at the Corps at (409) 766-3108 or at SWG201601027@usace.army.mil if they would like access to the information.

The Dow Chemical Company

Texas Operations

Harris Expansion Reservoir

DRAFT OPERATION AND MAINTENANCE PLAN

01/14/2022



Prepared
by:

The Dow Chemical
Company

DRAFT OPERATION AND MAINTENANCE PLAN
The Dow Chemical Company
Texas Operations
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Texas Operations

LOG SHEET OF CHANGES

Date	Change Made	Signature
01/14/2022	Revised Initial Preliminary Version	

APPROVAL AND IMPLEMENTATION

OPERATION AND MAINTENANCE PLAN

Reservoir Operations

This Preliminary Operation and Maintenance Plan is hereby approved. This plan is effective immediately and supersedes all previous editions.

Official signed copy kept in the B-3501 Library

_____ _____

Name and Title of Appropriate Manager for Owner Date

GLOSSARY

As-built drawings: Plans or drawings portraying the actual dimensions and conditions of a dam, dike, or levee as it was built. Field conditions and material availability during construction often require changes from the original design drawings.

B-3501: B-3501 is a building located at Plant B.

B-309: B-309 is Water Distribution (WD) control room building located at Plant B.

BM-6: BM-6 is a building located at Brazoria Pump Station.

Board Operator: Board Operator uses process controls and communication systems to proactively operate the asset in a safe, reliable and optimal manner. Works with Shift Team members to efficiently anticipate and resolve unplanned events within the capabilities of the shift team and effectively escalates issues that cannot be resolved to the appropriate support roles.

Cathodic Protection Inspection: Inspection of systems preventing corrosion of underground piping, underside of storage tanks, etc. by certified personnel, required every 3 years

Civil Engineer SME: The Civil Engineer Subject Matter Expert (SME) provides technical expertise in the area of infrastructure design, assessment and repair. Civil Engineer SME shall have twenty (20) year experience in design of embankments, spill prevention, water front structures, Pump Stations, steel and concrete structures, pipe racks, Industrial buildings, deep and shallow foundations, tanks, well pads, roads, drainage, other equipment, site Inspection & Analysis of existing structures and foundations for repair, renovation, or additions. The Civil Engineer provide expertise to interpret codes and maintain best practices (ASCE, ACI, AISC, IBC). Review, validate/challenge, and provide constructive feedback on new and revised Technical Standards and Site Practices relating to civil/structural engineering. Civil Engineer SME shall be registered Professional Engineer (PE) with Texas Board of Professional Engineers (TBPE).

Diamond Learning Platform: Internal Dow Diamond Learning online platform is utilized to train staff. Training curriculum is assigned to staff by Operations Leader with the consultation of Production Leader. This is Dow's standard platform for all new and reoccurring trainings. Usual span of reoccurring trainings is every three years.

Electronic Log Book: Microsoft Excel Sheet designed for specific data recording.

Environmental Operations (EOB): Environmental Operations covers Wastewater Treatment, Landfill, Incineration facilities and Production and Distribution of Treated Water, Outfalls, Potable Water, Fire Water, Cooling Water, Sea Water and Storm Water.

ESRA: Electrical Safety & Reliability Assessment checks the integrity of electrical equipment every 3 years, required per LPP 3.8.

Facility Condition Assessment (FCA): Facility Condition is the Physical Condition of the

Assets used to Manufacture and Deliver Dow Products. This includes not only the direct manufacturing plants, but the supporting infrastructures necessary for operations.

Geographic Leadership: Regional area Presidents, CEO's, Vice Presidents or Site Leaders.

Global Equipment Maintenance Tracking System (GEMTS): The standard equipment event tracking and recharge system for maintenance.

GMISS: Global Mechanical Integrity Safety Standard specifies required compliance inspections and frequency for registered piping, pressure vessels, tanks, cooling towers, etc.

I&E: Instrument and Electrical

Infrastructure: System of facilities, equipment and services needed for the operation of an organization.

Loss Prevention Principles (LPP): The Loss Prevention Principles consist of design, installation, modification and operating practices that relate to Process Safety and Loss Prevention. Experience has shown that application of these practices, developed through the combined efforts of process and design engineering groups, business Technology Centers, manufacturing units and Process Safety Subject Matter Experts, result in safer and more reliable operations. These practices often reflect the learning experiences from significant incidents and Near Miss events within Dow or the chemical industry. Hence, Loss Prevention Principles represent the institutional memory for our company in the areas of Process Safety and Loss Prevention.

Maintenance Engineer: The Maintenance Engineer (ME) provides engineering support on plant issues that impact production or operational reliability over a short period of time. The ME provides technical expertise, which may be equipment based or repair technique based, which impacts the availability and maintainability of the facility. The ME also provides technical support for Turnarounds and serves as a subject matter expert for methods of equipment disassembly, existing condition evaluation and assembly. ME also ensures equipment repair documentation is maintained, appropriately.

Management of Change (MOC) Process: Management of Change is a discipline that shall be applied to assure that all changes have appropriate reviews and approval, that training is conducted, documentation is in place, and appropriate communication to affected personnel is completed. It can be applied to all activities, procedures, processes, guidelines, policies, etc. that are currently in effect.

Management of Change (MOC) Record - The record that documents the use of the MOC process when a change was made. The MOC Record is used as evidence of compliance with the MOC requirements, including all issues resolved and actions taken.

GLOSSARY (continued)

Master Task List (MTL): Dow uses MTL as an enabling tool for the planning and scheduling of plant Operations roles/empowered work teams' resources for routine, non-routine, Open Plan (OPP), and Compliance (CTT) tasks. Effective use of MTL will improve plant performance by ensuring that: Plant defined best practices/job procedures are utilized for every task every time (according to the department's Procedure Usage Policy - PUP), Value-added tasks are scheduled and completed in accordance with need date and resources, Low value-added tasks are eliminated, All tasks for the Operating the Plant role are managed through MTL (except where noted) which enables the Activity Coordinator to effectively plan, schedule, and manage the tasks.

Operations Leader: Reservoirs Operations Leader has shared responsibility and accountability for plant personnel, assets and achievement of the plant related site, business, and corporate goals. Dow Operation Leaders provide leadership to the plant operations team and act as the primary back-up to the Production Leader. Typical 8+ Years Manufacturing and Engineering Experience. Proven influential leadership skills in previous areas of responsibility

Paint Assessment: Condition assessment (level 1 thru 8) of external paint on piping, vessels, tanks, structural supports, etc. (includes non-registered assets not in GMISS) used as input to global maintenance paint program. Frequency of assessment varies based on several criteria

Plant Maintenance order (PMO): Any Dow Employee with right privileges can generate a PMO to correct any gap in any areas based on inspectional evidence or SME recommendations.

Production Leader: Environmental Production Leader has overall responsibility and accountability for plant personnel, assets, and achievement of plant related business, site, and corporate goals. Typically, 10+ Years Manufacturing and Engineering Experience. Proven strong EH&S record in current and previous areas of responsibility. Environmental Operations Water Distribution and Reservoirs provides all influent water to the Site, including river water, sea water, and potable water. In addition, this department ensures all storm water and untreated effluent water is removed from the Site.

Pump Rotation System: Use a pump rotation system to keep track of which pumps with in-line spares are running and which ones are not. Operations will switch between pumps on a given frequency to prevent pumps from sitting idle for long periods of time. There will be an MTL task imputed for operations to swap pumps per the sheets.

Reservoir Operations: Reservoir Operations is a sub department of Water Distribution (WD). Reservoir Operations is responsible for river water collection, storage and distribution to Dow internal and external customers.

Reservoir Technician: The Reservoir Technician role is responsible for the operation of all assets, equipment and processes in the Reservoirs area including Harris, Harris Expansion and Brazoria Reservoirs, reservoir intakes, canals and pump stations and off-site Dow-owned Public Water Systems. The Reservoir Technician typically has 15+ years of operations and maintenance experience. The Technician is trained in Dam Safety for Owners and Operators by TCEQ, The Technician utilizes process knowledge, technical expertise and operations experience to assist in correcting process or equipment issues and improving process performance and reliability and developing operating procedures for all Reservoir areas and may also assist in the operation of the above named in-plant assets. The Technician will direct the day to day activities of the contract technician at the reservoir operations to ensure that the routine maintenance and operating duties are accomplished. Key Job Responsibilities: Monitor process conditions, process equipment and control systems for Reservoirs assets., Prepare for and coordinate equipment shutdowns and repairs., Develop, review and update procedures for all Reservoir assets., Use troubleshooting skills to resolve equipment and process related problems., Perform tasks assigned per Master Task List., Ensure process performance and operational activities are aligned with Dow goals., Perform the duties of the Certified Operator, monitor and sample off-site drinking water wells., Communicate directly with the public and property owners adjacent to Dow waterways and reservoirs with assistance from Dow Public Relations and site leadership., Issue Safe Work Permits., Perform lubrication and some mechanical repairs., Manage maintenance, repair, and demo projects for all Water Distribution and Reservoir assets, including scoping, permitting, coordinating with the department for operator permitting and maintenance resources, etc.

SAP (Systems, Applications & Products in Data Processing) Enterprise Resource Planning System (ERP): SAP ERP System is used to manage Dow's Asset & Business operations. Each department within Dow generates, accesses, and depends on information to get work done, whether that information is asset management, equipment data, invoicing, maintenance data, work order generation, plant maintenance order (PMO), customer data, inventory details, employee information, or financial figures. Between departments like finance, marketing, sales, customer service, and more, it can be challenging to keep the information accurate and up to date if every team is working in a silo with their data. ERP systems bring data and people together by sharing, integrating, and synchronizing business information and processes in a centralized database. Everyone across an organization has access to the same data at the same time, and that data is integrated seamlessly into the other systems your business uses. ERPs reduce the need for manual processes and data entry, ensuring high-quality and up-to-date information for everyone.

Structural/civil Assessment: Condition assessment of structural steel, concrete dikes, sewers, buildings, pipe bridges, roads, railroads, etc. on an as-needed basis. LPP 10.13 requires annual inspection of fireproofing.

Texas Operations Emergency Operations Planning Committee (EOPC): The EOPC is a group of individuals who meet once per month or as required to discuss emergency planning issues. EOPC members include Geographic leadership. The EOPC also coordinates the calendar for on-call Site Emergency Managers (SEMs).

Water Distribution (WD): Water Distribution is a sub department of Environmental Operations. WD is responsible for collection and distribution of river water, seawater, firewater and potable water. WD is also responsible for production of treated water proper drainage of storm water.

WD Approved Folder: Shared electronic storage folder located at Water Distribution (WD) Department Dow server with specific read/write privileges.

OPERATION AND MAINTENANCE PLAN

Reservoir Operations

1. Purpose

This Operation and Maintenance Plan defines responsibilities and prescribes guideline procedures for inspection, maintenance, repairs, and operation of the Harris Reservoir of The Dow Chemical Company's Texas Operations site. Currently, the Freeport site maintains three reservoirs Brazoria, Harris, and Harris Expansion Reservoirs. This Operation and Maintenance Plan is specific to the Harris Expansion Reservoir.

2. Project Description and Components

The project site is located between the Brazos River and Oyster Creek, approximately eight miles northwest of the City of Angleton and abuts the Brazos River, in Brazoria County, Texas. The project can be located on the U.S.G.S. quadrangle map titled: OTEY, Texas.

LATITUDE & LONGITUDE (NAD 83):
Latitude: 29.2709860466716
Longitude: -95.543090603221

The Harris Expansion Reservoir is an off-channel reservoir located immediately north of the existing Harris Reservoir site. The off-channel reservoir includes a 1,929-acre impoundment with a nominal storage capacity of 50,000 acre-feet, an intake and pump station to divert Dow's surface water rights from the Brazos River, an outlet to Oyster Creek and an emergency spillway. The Project also includes floodplain enhancements in Oyster Creek and stream restoration features.
The proposed off-channel reservoir is operated in conjunction with the existing Brazoria and Harris reservoirs to supplement the total available storage capacity and to provide additional operational flexibility. The project components include the following:

2.1 Off-channel impoundment – An approximately 40-foot-high by 36,200-foot-long upland earthen embankment forms the reservoir impoundment. The components of the embankment section include a stabilizing berm, soil-cement armoring, wave wall, main embankment, chimney and blanket filters and drains, perimeter toe ditch, seepage barrier wall, and a perimeter road embankment.

2.2 River intake and pump station –The river intake consists of an in-channel intake structure including a sheet pile structure with concrete head wall in the Brazos River, mechanically cleaned T-screens, inlet pipes from the screens to the pump station building and stabilization of the Brazos riverbank near the intake. The pump station contains two pumps each capable of pumping 75,000 gallons per minute (gpm) from the River to the

reservoir. Streambank stabilization measures are installed in the immediate vicinity of the intake structure, approximately 200 feet upstream and 100 feet downstream. The streambank stabilization measures include riprap and bio-engineered measures.
Other facilities associated with the pump station include the Operations Building,

Electrical Motor Control Center (MCC) Building, and Transformer area.

2.3 Discharge line/reservoir inlet structure - The welded steel discharge lines from the pumps run above-grade to where they exit the building and combine into the common header. When the reservoir is at or near empty the structure will provide energy dissipation from the high velocity of water flowing by gravity from the top of the embankment to the bottom of the reservoir.

2.4 Reservoir outlet and Emergency Spillway - Water stored in the off-channel reservoir will be released into the Oyster Creek flood bypass channel through the outlet works. The outlet works consists of Baffle Drop Structure which consists of:

- A spillway crest shaped with a 16-foot rectangular weir opening on the side of the outlet structure.
- Downstream of the spillway crest, the water ultimately falls vertically in a series of baffles to develop a cascading drop shaft, resulting in hydraulic drops.
- The outlet conduit transition that connects the cascading drop shaft into the receiving outlet conduit at the bottom of the drop shaft.
- The outlet conduit conveys the flows from the combined gated outlet works and spillway through the dam embankment and to the stilling basin, which is near the flood mitigation channel for Oyster Creek.

2.5 Conveyance – Water is released from the off-channel reservoir into Oyster Creek via a bypass channel, supplementing releases from the existing Harris Reservoir discharge facilities. Existing pump stations and industrial canals will convey the water to Texas Operations for use.

2.6 Drainage enhancement project – The proposed Harris Expansion Project is located within both Brazos River and Oyster Creek's 100-year FEMA regulatory floodplains with designated special flood hazard zones AE and AO on the Brazoria County Flood Insurance Rate Map (FIRM). The proposed storage facility is above existing ground elevation with a constructed berm surrounding the reservoir. It has an approximate footprint of 1,900 acres. The reservoir embankment is fully contained within the Oyster Creek floodplain and does not impact the Brazos River floodplain.
The proposed Project includes floodplain enhancement projects along Oyster Creek that include three areas where the hydraulic capacity of the Oyster Creek channel above the Ordinary High-Water Mark line will be changed. Project scope also include flood mitigation overflow channel. A fixed elevation weir would prevent flows from Oyster Creek from spilling into the overflow channel until the existing Oyster Creek main channel exceeds its 25-year water surface elevation (WSEL).

2.7 Other facilities - Access to the embankment for maintenance and inspection will be provided by a road on the embankment crest and another around the perimeter of the embankment.

Responsibilities

The Dow Chemical Company is responsible for Harris Expansion Reservoir operation and all maintenance. The Reservoir Technician, Operations Leader and Production Leader are Dow Chemical Employees.

The **Reservoir Technician** is responsible for:

- General Operations of Reservoir.
- Contacting Dow emergency personnel and/or Brazoria County Sharif Dept. in the event of an emergency.
- Ensuring the reservoir maintenance and inspection activities are conducted, including:
    - Conducting routine maintenance activities (such as annual brush control)
    - Conducting integrity inspections
- Completing an annual O&M review and updating the O&M manual accordingly to ensure the manual is always maintained and up to date.
- Monitor process conditions, process equipment and control systems for Reservoirs assets.
- Prepare for and coordinate equipment shutdowns and repairs.
- Develop, review and update procedures for all Reservoir assets.
- Use troubleshooting skills to resolve equipment and process related problems.
- Perform tasks assigned per Master Task List (MTL).
- Ensure process performance and operational activities are aligned with plant goals.
- Perform the duties of the Certified Operator, monitor and sample off-site drinking water wells.
- Communicate directly with the public and property owners adjacent to Dow waterways and reservoirs.
- Issue Safe Work Permits
- Perform lubrication and some mechanical repairs.
- Generate Plant Maintenance Orders (PMO), Manage maintenance, repair, and demo projects for all Reservoir assets, including scoping, permitting, coordinating with the Water Distribution Department for operator permitting and maintenance resources, etc.
- Escalating any issues to Operations Leader.

The **Operations Leader** is responsible for:

- Coordination with Texas Operations Emergency Operations Planning Committee (EOPC) and Site Emergency Managers (SEMs) regarding implementation of Drought Section 10 site plan, Hurricane management site plans and any emergency event which may cause adverse effects to the integrity of reservoir assets.
- Contacting Dow emergency personnel, Brazoria County Sharif Dept, Brazos River Water Authority, TCEQ Reservoir Safety Program, National Weather Services, Brazoria County Emergency Manager, Texas Department of Public safety, Downstream residents, Emergency Contractors and Dow public relations in the event of a condition that could lead to an emergency, up to and including when a reservoir failure is imminent.
- Coordination with Dow Civil Engineer SME, Maintenance Engineer and other internal and external experts in order to meet reservoirs O&M objectives.
- Partners with the Production leader to drive a strong personal safety, process safety, and environmental improvement plan to achieve EH&S goals and ensure compliance with regulatory and permit requirements.
- Relentlessly pursues maximum plant reliability to reduce department unplanned events and support safe operations. Teaches and encourages behaviors to support reliable operations.
- Knows and advocates Life Critical Standards within the facility. Demonstrates priority and commitment through personal behavior and coaching in the field. Provides the needed positive and negative reinforcement to address deviations with urgency, and ensures appropriate follow up and investigations.
- Ensures appropriate technical review of work plans (maintenance or improvement) such that Life Critical Standards are applied appropriately for the job.
- Partners with Production Leader to ensure capital is allocated appropriately to design out industrial hygiene hazards, improve environmental compliance, and reduce personal/process safety hazards. Implements administrative controls and process controls for safe and reliable operation.
- Shows courageous leadership by coaching, asking questions, and intervening when needed. Challenges status quo and past norms to make the operation safer and more effective.
- Keeps active field presence and assesses work activities routinely to maintain awareness of plant needs and understanding of personnel behaviors.
- Ensures the operation team is fully prepared for immediate response situations, including where technical resources might be needed to analyze process conditions and guide the response.

- Participates in cross-functional activities, including Sales and Operations Planning, Tech Center reviews, Corporate Audits, etc.
- Interfaces with third parties, customers, and external partners. Understands customer needs and drives technology, quality, service, delivery and reliability as appropriate to meet their needs.
- Maximizes value and plant competitive position through internal and external benchmarking, ensures the Most Effective Technology (MET) implementation and the specific Operating Discipline requirements are in place.

The **Production Leader** is responsible for:

- Represents the plant in the business strategy development and goal setting process.
  Example: operational costs, asset utilization, operational reliability, etc.
- Translates and communicates the business strategy and objectives to the plant personnel. Provides leadership, coaching and expectations for the personnel participating in the plant goal and budget setting processes. Challenges teams and individuals to set, monitor and achieve goals aligned to the business and site strategies and goals.
- Provides administrative leadership and coaching to the plant personnel. (i.e. role clarity and expectations, compensation, employee development, deployment, recognition systems, etc.)
- Ensures an effective EH&S program is in place to achieve EH&S goals and comply with regulatory and permit requirements. Demonstrates priority and commitment through personal behavior.
- Creates an environment that fosters team and individual empowerment. Establishes and models expected behaviors for an empowered organization. Personally communicates and establishes communication and learning systems.
- Ensures implementation and ongoing effectiveness of global work processes, Operating Discipline, management systems, enabling technologies and roles to become a Highly Reliable Organization.
- Ensures necessary resources are in place to meet production requirements and achieve the plant specific business goals.
- Ensures systems are in place to reduce variation, produce quality products and meet customer needs. Interfaces with customers as required.
- Ensures the linkages between plant operations and other functions are effective. Example: Maintenance, EH&S, Site Logistics, Process Control, etc.
- Assumes aspects of site leadership, integration responsibilities and other roles, as appropriate to the local area or business.

EXHIBIT 1: RESERVOIR OPERATIONS STAFF FLOW CHART

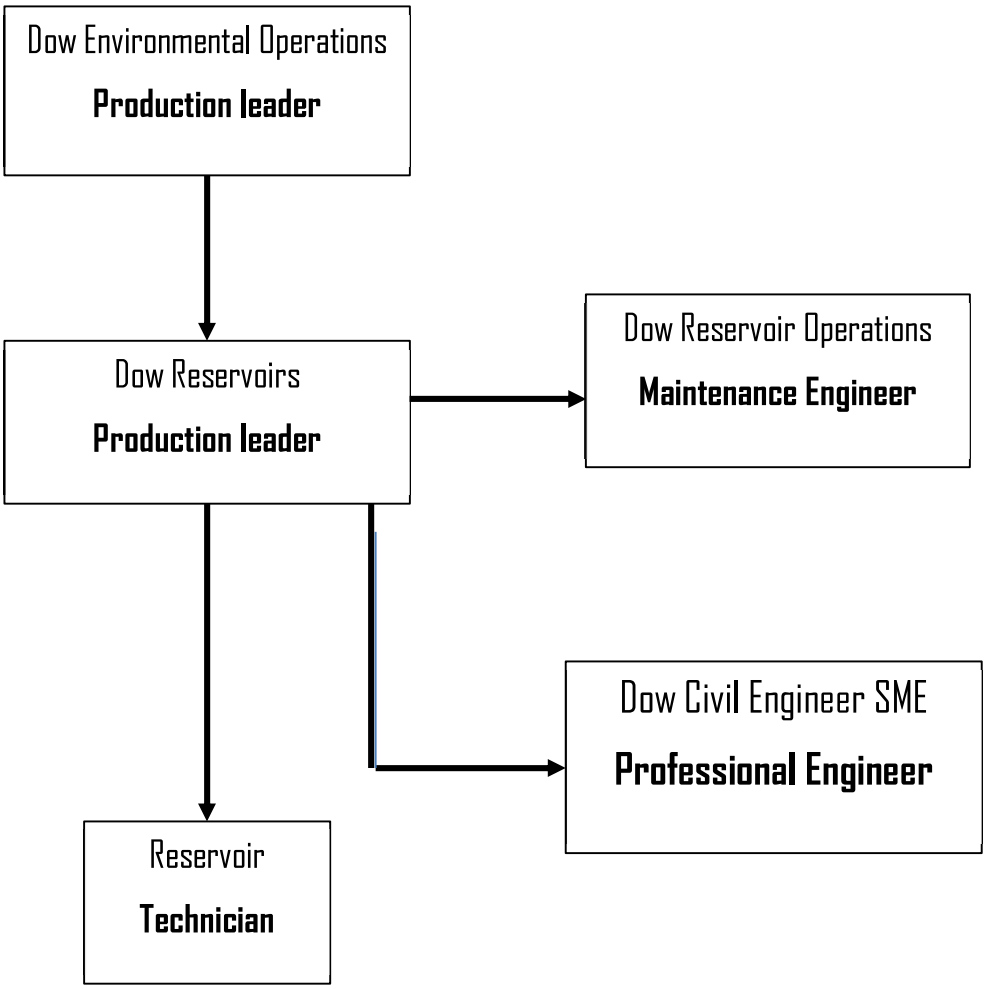
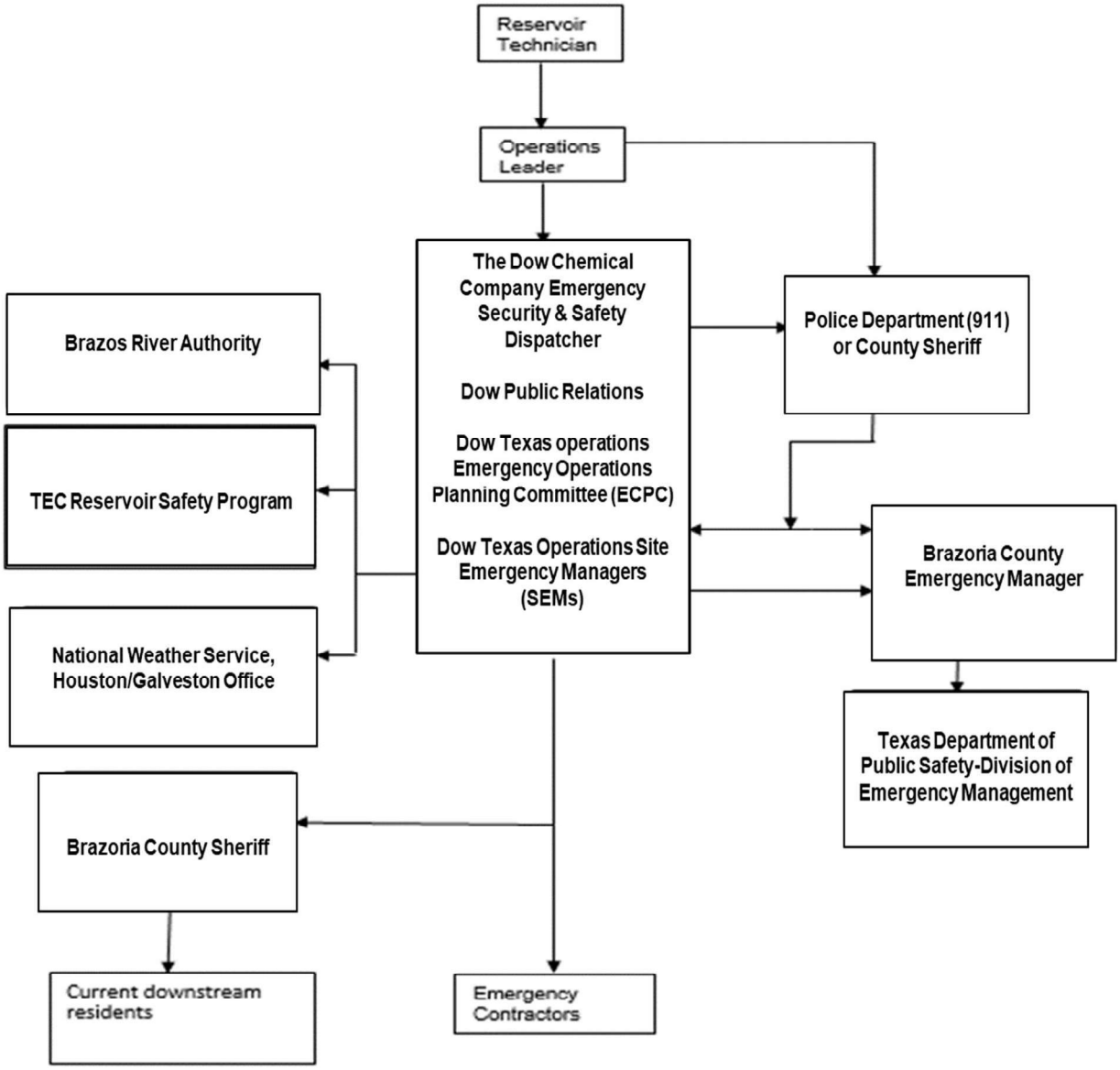


EXHIBIT 2: POSSIBLE, IMMINENT, OR DAM FAILURE CONDITION

NOTIFICATION FLOWCHART



4. Inspection Guidelines

4.1. Inspections

The Dow Chemical Company is responsible for monitoring the condition of the basin regularly. Refer Table 1 for the nature and frequencies of required inspections.

The Reservoir Technician will conduct weekly inspections for basin integrity. Brush-clearing activities along the basin will be conducted prior to or during the inspections. These inspection and maintenance activities are conducted by the Reservoir Technician to ensure the stability of the basin structure. During the brush-clearing maintenance, the basin structure should be inspected for integrity. The Inspection checklist (Appendix A) of evidence of distress should be completed and retained for the life of the dam. The inspection should include indicators of potential problems at the basin, such as:

- Slumping, sloughing, or slides on the basin or abutment
- Cloudy or dirty seepage, seepage with an increase in flow
- Cracks, settlement, misalignment, or sinkholes
- Erosion
- Animal burrows
- Presence of tree and brush growth
- Leakage into the intake
- Undermining of the spillway

Besides the basin, the Reservoir Technician should inspect the area downstream of the basin.

Table 1: Inspections & Operations Requirements

TABLE 1 INSPECTIONS & OPERATIONS REQUIREMENTS

Item To Inspect	Category	Frequency (Normal Inspection)	Frequency (Special Inspection)	Responsible Personnel	Form	Operating Discipline	Activity Tracking and Record	Records Storage Location	Final View Approval
Seepage / Wet Areas / Drains	Inspection	Weekly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Toe Drains	Inspection	Weekly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Reservoir Level	Inspection	Daily	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix M: Dow Reservoirs Daily Electronic Log Book	Appendix M: Dow Reservoirs Daily Electronic Log Book	Master Task List (MTL)	Electronic Log Book located book at the WD approved folder server	Operations Leader
Trash rack Debris	Inspection	Weekly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Slides / Cracks	Inspection	Weekly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader

TABLE 1 INSPECTIONS & OPERATIONS REQUIREMENTS

Item To Inspect	Category	Frequency (Normal Inspection)	Frequency (Special Inspection)	Responsible Personnel	Form	Operating Discipline	Activity Tracking and Record	Records Storage Location	Final View Approval
Rodent Activity	Inspection	Weekly	As needed	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Vandalism	Inspection	Weekly	As Needed	Reservoir Technician	Appendix G: TCEQ Reporting Suspicious Dam Incident	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)		Operations Leader
Vegetation Protection	Inspection	Weekly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Riprap Protection	Inspection	Yearly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Slope Erosion	Inspection	Yearly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader

TABLE 1 INSPECTIONS & OPERATIONS REQUIREMENTS

Item To Inspect	Category	Frequency (Normal Inspection)	Frequency (Special Inspection)	Responsible Personnel	Form	Operating Discipline	Activity Tracking and Record	Records Storage Location	Final View Approval
Vegetative Cover	Inspection	Yearly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Embankment Condition	Inspection	Yearly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Emergency Spillway Condition (Baffle Drop Structure)	Inspection	Yearly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
SPCC Inspection	Inspection	Weekly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix F: SPCC Checklist	Dow SPCC Standards, Dow LPP standards	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Oyster Creek Diversion Channel Weir	Inspection	Weekly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix D: TCEQ Inspection Guide Lines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader

TABLE 1 INSPECTIONS & OPERATIONS REQUIREMENTS

Item To Inspect	Category	Frequency (Normal Inspection)	Frequency (Special Inspection)	Responsible Personnel	Form	Operating Discipline	Activity Tracking and Record	Records Storage Location	Final View Approval
Mechanical Equipment Inspection	Inspection	Weekly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Appendix I: Pump Operations & Maintenance Guidelines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Electrical Equipment Inspection	Inspection	Weekly	Before and After 5 inches of rain, and/or greater than 74mph wind event.	Reservoir Technician	Appendix A: Inspection Check List	Dow ESRA Audit Guidelines	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library	Operations Leader
Formal Engineering Inspection	Inspection	5 Years	As needed per weekly inspection results	Civil Engineer SME	Appendix C: Five Year Inspection Form. Include cover page with Professional Engineer stamp.	Appendix D: TCEQ Inspection Guide Lines, Industry Standards, e.g. TCEQ, ASCE, USACE Design & Inspection manuals, ACI, ASTEM, AISC, Professional Engineer	Master Task List (MTL)	Place completed form in the binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library. Send Final Inspection Report to TECQ.	Operations Leader
Operations Process Data	Operation	Daily	As directed by Operations Leader per EOPC decision, may need to record hourly data	Reservoir Technician	Appendix M: Dow Reservoirs Daily Electronic Log Book	Harris Expansion O&M Manuel	Master Task List (MTL)	Electronic Log Book located book at the WD approved folder server	Operations Leader
Emergency Release	Operation		As directed by Operations Leader per EOPC decision	Reservoir Technician	Appendix N: Emergency Release Electronic Log Book	Dow Rough Weather Guidelines, Directions from EOPC and SEMs.	Master Task List (MTL)	Electronic Log Book located book at the WD approved folder server	Operations Leader

TABLE 1 INSPECTIONS & OPERATIONS REQUIREMENTS									
Item To Inspect	**Category**	**Frequency (Normal Inspection)**	**Frequency (Special Inspection)**	**Responsible Personnel**	**Form**	**Operating Discipline**	**Activity Tracking and Record**	**Records Storage Location**	**Final View Approval**
Pump Run Time Log	Operation	Daily		Reservoir Technician	Appendix D: Pump Swap Rotation Logbook.	Appendix H: Pump Swapping Guidelines	Master Task List (MTL)	Electronic Log Book located book at the WD approved folder server	Operations Leader
Reservoir Silt Analysis	Operation	Daily Visual Inspection to determine if Silt Analysis (settling test) is required.	Based on Daily Inspection	Reservoir Technician	Appendix M: Dow Reservoirs Daily Electronic Log Book	Dow Internal Process	Master Task List (MTL)	Electronic Log Book located book at the WD approved folder server	Operations Leader
River Chloride Analysis	Operation		Daily while any of the Brazoria, Harris and/or Harris Expansion pumps are running.	Reservoir Technician	Appendix M: Dow Reservoirs Daily Electronic Log Book	Drought Section 10 Site Plan	Master Task List (MTL)	Electronic Log Book located book at the WD approved folder server	Operations Leader

4.2. Organizing for Inspection

For the inspections, a record of the observations will be maintained. Appendix A will be used to record the details. The information required has three elements: location, extent or area, descriptive detail. Photographs should be taken and dated to substantiate the findings. A sketch of the basin with problem areas noted is helpful.

Following an inspection, observations should be compared with previous records to see if there are any trends that may indicate developing problems. If a questionable change or trend is noted, and failure is not imminent, please contact Operations Leader to determine if Civil Engineer SME should be consulted.

There are at least four special times when an inspection is recommended regardless of the weekly inspections:

- Prior to a predicted major rainstorm (5 inches or greater in 24 hours)
- During or after a severe rainstorm (5 inches or greater in 24 hours)
- During or after a severe windstorm (greater than 74 mph)
- Following a hurricane

4.3. Inspection of Upstream Slope

Upstream slope consists of compacted clay and soil cement surface. Typically, major problems encountered on an upstream slope are cracks, slides, cave-ins or sink holes, and severe erosion. An upstream slope should receive a close inspection because riprap, vegetative cover, and high-water levels can hide problems. To ensure adequate inspection and prevent potential seepage paths, keep the upstream slope free from obscuring weeds, brush, or trees.

4.4. Inspection of Downstream Slope

A downstream slope should be inspected carefully because it is an area where evidence of developing problems appears most frequently. To ensure adequate inspection, Reservoir Technician is responsible to keep this area free from obscuring weeds, brush, or trees. Some of the more threatening conditions that could be identified are cracks, slides, and seepage. When any cracks, slides or seepage are noted in the downstream slope, Reservoir Technician shall notify Operations Leader. Operations Leader shall notify internal and external stakeholders as shown in Exhibit 2 after consultation with Civil Engineer SME. Civil Engineer SME shall start monitoring the condition using Appendix B (Inspection monitor forms).

4.5. Inspection of the Crest

A basin's crest usually provides the primary access for inspection and maintenance. Because surface water will pond on a crest unless that surface is well maintained, this part of the basin requires periodic re-grading. Reservoir Technician shall follow Plant Maintenance Order (PMO) work process for periodic re-grading. However, problems found on the crest should not be simply graded over or covered up.
On the crest, some of the more threatening conditions that may be identified are longitudinal cracking, transverse cracking, misalignment, and sinkholes. In addition, the crest should be inspected for animal burrows, low areas, vegetative cover, erosion, slope

of the crest, narrowing of the crest, and traffic ruts.

4.6. Inspection of Seepage Areas

Although all basins have some seepage, it should be treated as a potential problem. Seepage can emerge anywhere on the downstream face of a basin, beyond the toe, or on the downstream abutments at elevations below normal reservoir levels.

A potentially dangerous condition exists when seepage appears on the downstream face above the toe of a basin. If seepage is found on the top half of the downstream slope, notify the Operations Leader. Operations Leader shall notify internal and external stakeholders as shown in Exhibit 2 after consultation with Civil Engineer SME. Civil Engineer SME shall start monitoring the condition using Appendix B (Inspection monitor forms). Seepage on the downstream slope can cause a slide or failure of the basin by internal erosion.

4.7. Inspection of General Areas

Other areas requiring inspection include mechanical and electrical systems, reservoir surface and shoreline, downstream floodplains, inlets and outlets. Refer Table 1 for types and frequencies of required inspections.

All mechanical and associated electrical equipment should be operated at least once a year. The test should cover the full operating range of the equipment under actual operating conditions. Each operating device should be permanently marked for easy identification, and all operating equipment should be kept accessible. All controls should be checked for proper security to prevent vandalism. All operating instructions should be checked for clarity and maintained in a secure, but readily accessible, location.

The reservoir surface and shoreline should be inspected to identify possible problems away from the actual structure. Large landslides into the reservoir could cause waves to overtop the basin.

Development in downstream floodplains is also very important to the basin owner as the extent of development and flood preparedness relates directly to loss of life and damages should the basin fail. Downstream development may raise the hazard rating of the basin; therefore, it should be accounted for during five-year inspections by Civil Engineer SME.

4.8. Inspection of Baffle Drop Spillway Structure

Defects in a baffle drop spillway can cause failure by rapid erosion. A spillway should always be kept free of obstructions in order to resist erosion and be protected from deterioration. The baffle drop spillway structure shall be inspected for following parameters:

- Obstructions
- Erosion
- Deterioration
- Cracks
- Open joints
- Undermining of the spillway outlet
- Deterioration of spillway gates.

4.9. Inspection of Inlets, Outlets, and Drains

A dam's inlet and outlet work, including internal drains, are essential to its operation. Items for inspection and special attention include:

- Reservoir pool levels
- Reservoir drains and internal drains
- Corrosion
- Trash racks on spillways
- Cavitation

The topics discussed above for spillways also are relevant. Reservoir pool levels are controlled by outlet gates. Pool-level drawdown should not exceed about 1 foot per week for slopes composed of clay or silt materials except in an emergency. Reservoir Technician shall record Emergency Release/draw down using Appendix N. Conditions causing or requiring temporary or permanent adjustment of the pool level include:

- A problem that requires lowering of the pool. Drawdown is a temporary solution until the problem is solved.
- Release of water downstream to supplement stream flow during low flow conditions.
- Fluctuations in the service area's demand for water.
- Repair of access areas and growth of aquatic vegetation along the shoreline.

5. Maintenance Guidelines

The Dow Chemical Company shall ensure that necessary maintenance; repairs, alterations, or modifications are initiated and completed in a timely manner following weekly and/or emergency inspections. Refer Table 2 for required maintenance items.

Table 2: Maintenance Requirements

TABLE 2 MAINTENANCE REQUIREMENTS									
Items to Maintain	**Category**	**Frequency (Normal Maintenance)**	**Frequency (Special Maintenance)**	**Responsible Personnel**	**Forms**	**Operating Discipline**	**Activity Tracking**	**Record Storage Location**	**Final Approval**
Exterminate or Remove Rodent	Civil	As needed bases on Inspection results.	As needed bases on Inspection results.	Maintenance Engineer	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Appendix D: TCEQ Inspection Guide Lines, Civil Engineer SME recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record	Operations Leader
Repair Rodent Burrows	Civil	As needed bases on Inspection results.	As needed bases on Inspection results.	Maintenance Engineer	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Appendix D: TCEQ Inspection Guide Lines, Civil Engineer SME recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record	Operations Leader
Remove Woody Vegetation including rootballs and repair embankment	Civil	As needed bases on Inspection results.	As needed bases on Inspection results.	Maintenance Engineer	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Appendix D: TCEQ Inspection Guide Lines, Civil Engineer SME recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record	Operations Leader
Re-establish Vegetative Cover	Civil	As needed bases on Inspection results.	As needed bases on Inspection results.	Maintenance Engineer	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Appendix D: TCEQ Inspection Guide Lines, Civil Engineer SME recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record	Operations Leader
Repair Erosion	Civil	As needed bases on Inspection results.	As needed bases on Inspection results.	Maintenance Engineer	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Appendix D: TCEQ Inspection Guide Lines, Civil Engineer SME recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record	Operations Leader
Clean Trashrack	Civil	As needed bases on Inspection results.	As needed bases on Inspection results.	Maintenance Engineer	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Appendix D: TCEQ Inspection Guide Lines, Civil Engineer SME recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record	Operations Leader
Repair Concrete	Civil	As needed bases on Inspection results.	As needed bases on Inspection results.	Maintenance Engineer	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Appendix D: TCEQ Inspection Guide Lines, Civil Engineer SME recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record	Operations Leader
Mow the embankment	Civil	As needed bases on Inspection results.	As needed bases on Inspection results.	Maintenance Engineer	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Appendix D: TCEQ Inspection Guide Lines, Civil Engineer SME recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record	Operations Leader

TABLE 2 MAINTENANCE REQUIREMENTS

Items to Maintain	Category	Frequency (Normal Maintenance)	Frequency (Special Maintenance)	Responsible Personnel	Forms	Operating Discipline	Activity Tracking	Record Storage Location	Final Approval
Instrumentation	I&E	6 months maximum or Manufacturer Recommendations	As needed bases on Inspection results.	Maintenance Engineer with consultation of I&E SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Electrical Motor Control Center	I&E	6 months maximum or Manufacturer Recommendations	As needed bases on Inspection results.	Maintenance Engineer with consultation of I&E SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Electrical Motor Control Center	I&E	6 months maximum or Manufacturer Recommendations	As needed bases on Inspection results.	Maintenance Engineer with consultation of I&E SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Electrical Transformers	I&E	6 months maximum or Manufacturer Recommendations	As needed bases on Inspection results.	Maintenance Engineer with consultation of I&E SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Electrical Motors	I&E	6 months maximum or Manufacturer Recommendations	As needed bases on Inspection results.	Maintenance Engineer with consultation of I&E SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Electrical Misc. Items	I&E	6 months maximum or Manufacturer Recommendations	As needed bases on Inspection results.	Maintenance Engineer with consultation of I&E SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader

TABLE 2 MAINTENANCE REQUIREMENTS

Items to Maintain	Category	Frequency (Normal Maintenance)	Frequency (Special Maintenance)	Responsible Personnel	Forms	Operating Discipline	Activity Tracking	Record Storage Location	Final Approval
Lubricate Gates and Valves	Mechanical	6 months maximum or Manufacturer Recommendations	As needed bases on Inspection results.	Maintenance Engineer with consultation of Mechanical SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Pumps	Mechanical	6 months maximum or Manufacturer Recommendations	As needed bases on Inspection results.	Maintenance Engineer with consultation of Mechanical SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Intake Screens	Mechanical	6 months maximum or Manufacturer Recommendations	As needed bases on Inspection results.	Maintenance Engineer with consultation of Mechanical SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
ESRA Audit	I&E	Every 3 years	As needed bases on Inspection results.	ESRA Audit Team	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	ESRA Guidelines	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Cathodic Protection Inspection	Civil	Every 3 years	As needed bases on Inspection results.	Cathodic Protection Group	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Cathodic Inspection Guidelines	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Paint Assessment	Civil	Every 3 years	As needed bases on Inspection results.	Maintenance Engineer with consultation of Civil SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Paint/Surface Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Fireproofing Inspection	Civil	Annual	As needed bases on Inspection results.	Maintenance Engineer with consultation of Civil SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader

TABLE 2 MAINTENANCE REQUIREMENTS

Items to Maintain	Category	Frequency (Normal Maintenance)	Frequency (Special Maintenance)	Responsible Personnel	Forms	Operating Discipline	Activity Tracking	Record Storage Location	Final Approval
Contour Survey of Reservoir to determine Storage Capacity	Civil	Every 10 Years	None	Maintenance Engineer with consultation of Civil SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Industry Standard for Reservoir Capacity Contour Surveys	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Evaluate Changes in Water Storage Capacity of Reservoir	Civil	Every 10 Years	Based on Contour Survey Results	Maintenance Engineer with consultation of Civil SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Evaluate current water demand verses available capacity	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Reservoir Sediment Dredging	Civil	Based on Contour Survey Results and current water demand.	Based on Contour Survey Results and current water demand.	Maintenance Engineer with consultation of Civil SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Industry Standards for Dredging Process and Obtain required permits at the time	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Trashrack Inspection at Outlet Structure	Civil	Every 5 Years	If reduced discharge is noticed at the outlet structure	Maintenance Engineer with consultation of Civil SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Submarine Camera Inspection	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Trashrack Cleaning	Civil	Every 5 Years	As needed bases on Inspection results.	Maintenance Engineer with consultation of Civil SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Divers Team (contractor)	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader
Rotating Cylindrical Wedgewire Screens Inspection	Civil	Every 5 Years	If cleaning brush cycles do not reduce differentail pressure to 3" or smaller.	Maintenance Engineer with consultation of Civil SME	Plant Maintenance Order (PMO) generated in SAP system based on Inspection findings. Maintenance Engineer is responsible for PMO generation.	Retract out screens to the upper platform, Manufacturer Recommendations	1- Master Task List (MTL) 2- SAP Enterprise Resource Planning System (ERP)	1- SAP Enterprise Resource Planning System (ERP) 2- Management of Change (MOC) Record 3- Global Equipment Maintenance Tracking System (GEMTS)	Operations Leader

5.1. Immediate Maintenance

The following conditions are critical and require immediate attention:

- A basin about to be overtopped or being overtopped
- Erosion or slope failure
- A basin showing signs of piping or internal erosion indicated by increasing cloudy seepage or other symptoms.
- A spillway being blocked or otherwise rendered inoperable or having normal discharge restricted.
- Evidence of excessive seepage appearing anywhere at the basin site (an embankment becoming saturated, seepage exiting on the downstream face of a basin) increasing in volume.

Although the remedy for some critical problems may be obvious, the problems listed above shall be consulted with Civil Engineer SME. The critical repairs or maintenance procedures are not covered in this O&M Plan.

5.2. Required Maintenance at Earliest Possible Date

The following maintenance should be completed as soon as possible after the defective condition is noted:

- Remove all underbrush and trees from the basin and establish good grass cover.
- Fill animal burrows.
- Maintain riprap or other erosion protection.
- Restore and reseed eroded areas and gullies on embankment basins.
- Repair any concrete or metal components that have deteriorated.

5.3. Continuing Maintenance

Several tasks should be performed continually:

- Routine mowing and general maintenance.
- Maintenance and filling of any cracks and joints on concrete.
- Observation of any springs or areas of seepage, comparing quality and quantity with prior observations.
- Inspection of the basin.
- Test, clean, and lubricate mechanical components.
- Inspect and maintain electrical components.
- Monitoring of development in the watershed which would materially increase runoff from storms.
- Monitoring of development downstream.

5.4. Specific Maintenance Items

1) Earthwork Maintenance and Repair- The surfaces of an earthen basin may deteriorate for several reasons (wave action, vehicle ruts, and erosion from runoff water, shrinkage cracks, or rodent damage). Damage of this nature must be repaired continually. The maintenance procedures below are effective in repairing minor earthwork problems. Severe conditions observed require repair procedures under the direction of an engineer.

- Fill erosion gullies with properly compacted cohesive soil material. Earth material should be free from vegetation, organic materials, trash, and large rocks
- Before placement of earth, prepare the repair area by removing all inappropriate material such as brush, roots, and tree stumps, along with any large rocks or trash.
- Following cleanup, shape and dress the affected area so that the new fill can be compacted and will properly tie into the existing fill.
- Erosion is one of the most common maintenance problems at embankment structures. An engineer should be contacted to assist in evaluation and repair procedures.

2) Riprap Maintenance and Repair- A serious erosion problem called benching can develop on the upstream slope of a basin. Waves can erode the exposed face of an embankment. Benching can also occur in existing riprap if the embankment surface is not properly protected by a filter. Severe conditions observed require repair procedures under the direction of an engineer.

- A riprap layer should extend a minimum of 3 feet below the lowest expected normal pool level.
- Rock riprap should consist of a heterogeneous mixture of irregular shaped stone placed over a sand and gravel filter.
- Large rocks should be heavy enough to break up the energy of the maximum waves and hold small stones in place. The smaller rocks help to fill the spaces between the larger pieces and form a stable mass.

3) Controlling Vegetation - Keep the entire basin clear of unwanted vegetation such as brush or trees. There are many problems associated with excessive growth.

- When brush is cut down, it should be removed to permit a clear view of the embankment. Root systems should be removed where possible and properly fill and compact the resulting holes. In cases where they cannot be removed, treat root systems with herbicide. Regulated Herbicides shall be applied following the provisions of General Permit No TXG870000 (Effective Date: 11/02/2021, Expiry Date: 11/02/2026) by a licensed (by the Texas Department of Agriculture) commercial applicator. Herbicides shall not be stored at Dow premises. A herbicide is a Regulated Herbicide if contains any of the following active ingredients:
  (a) 2,4-dichlorophenoxyacetic acid (2,4-D); including acid, amine, choline, ester and salt formulations;

(b) 2-methyl-4-chlorophenoxyacetic acid (MCPA);
(c) 3,6-dichloro-o-anisic acid (dicamba); including dimethylamine salt (DMA), sodium salt, diglycoamine salt (DGA), isopropylamine salts (IPA), N, N-Bis-(3-aminopropyl) methylamine (BAPMA), and potassium salt; and
(d) 3,7-dichloro-8-quinolinecarboxylic acid (quinclorac).

Formulations containing the active ingredients listed above are exempt from being classified as regulated herbicides if they meet one of the following criteria:

(1) is distributed in a container with a capacity less than or equal to one quart for liquid products or less than or equal to two pounds for dry or solid products;
(2) specialty fertilizer mixtures that are labeled for ornamental use and registered in the Texas Agriculture Code, Chapter 63, concerning Commercial Fertilizer; or
(3) products that are ready for use and require no further mixing or dilution before use and are packaged in containers with a capacity of one gallon or less for liquid products and four pounds or less for dry or solid products.

Products containing 2,4-dichlorophenoxyacetic acid (2,4-D) or 3,6-Dichloro-o-anisic acid (dicamba) are exempt from classification as a regulated herbicide when used in accordance with the approved product label for transgenic auxin herbicide tolerant crops, are applied by ground application equipment, AND are applied when winds do not exceed 10 miles per hour.

- Mow the crest and grass covered upstream and downstream slopes. Grass is not only an effective means of controlling erosion, but it also enhances the appearance of the basin and provides a surface that can be easily inspected.

4) Controlling Livestock - Livestock should not be allowed to graze on an embankment surface. Stock can damage vegetation and disrupt uniformity of the surface.

5) Controlling Animal Damage - Burrowing animals are naturally attracted to the habitats created by basins and reservoirs and can endanger the structural integrity and proper performance of the embankment.

- Barriers such as riprap and filter layers offer the most practical protection from the animals.
- Extermination of the rodent is the required first step.
- If the damage is shallow holes, tamping of soil fill into the holes should be sufficient repair. Soil should be placed deeply as possible with a pole or shovel handle.
- Large burrows should be filled with mud packing.

6) Controlling Fire Ants -These pests can cause problems with electrical components and reduce soil compaction. If left undisturbed they can build mounds so large that they can create problems for mowers.

- Fire ants can infest electrical equipment and utility housings causing corrosion.
  Equipment should be kept clear of any ant habitation.
- Use only pesticides labeled as suitable for the location you treat. Make every effort to avoid contaminating water.

7) Controlling Damage from Traffic - Vehicles driving across an embankment basin can create ruts in the crest and up and down a basin face. Repair these ruts using the guidelines in #1 noted above.

8) Mechanical Maintenance If routine (refer Table 2) inspection of mechanical mechanisms indicates the need for maintenance, the work should be completed as soon as access can be gained. Operations of mechanical mechanisms minimize the buildup of rust.

- Check the mechanical parts of the mechanism for adverse or excessive wear.
- Check all bolts, including anchor bolts, for tightness.
- Replace worn and corroded parts.
- Make mechanical and alignment adjustments as necessary.

9) Electrical Maintenance-It is important that an electrical system be well maintained, and necessary repairs should be performed immediately.

- **Check fuses and test system to assure all parts are properly functioning.**

- **System should be free from moisture and dirt, and wiring should be checked for corrosion and mineral deposits.**

10) Concrete Maintenance- Repair deteriorated concrete in early stages. Deterioration can accelerate and left unattended can result in serious problems or basin failure. Seal joints and cracks in concrete structures to avoid damage beneath the concrete.

6. Operations

The Reservoir Technician is responsible for the general operation of the reservoirs.

6.1 System Description

- **Harris Reservoir -** Located NW of Angleton, 46 River Miles from the Gulf, was put into service in 1947. The reservoir is approximately 1600 acres surface area with an average depth of 5.5 ft. and has a water storage capacity of approximately 9,000 acre-ft. Water is pumped into the reservoir via 1-50,000 GPM pump(P2) and 1-80,000 GPM pump (P1). The water is then discharged by siphons into Oyster Creek and flows down the creek to the Lake Jackson Pump Station. It takes approximately 30-34 hours for water from the siphons to reach the Lake Jackson Pump Station. Harris becomes the primary reservoir when the river flows decrease and the chlorides at the Brazoria Pump Station reach 300 ppm.
- **Harris Expansion Reservoir -** Located north of Harris Reservoir, 46.5 River Miles from the Gulf. The reservoir is approximately 1900 acres surface area with a nominal capacity of 50,000 acre-feet. Water is pumped into the reservoir via two 75,000 GPM pumps. The water is then discharged by baffle drop structure into Oyster Creek and flows down the creek to the Lake Jackson Pump Station. It takes approximately 30-35 hours for water from the reservoir outlet to reach the Lake Jackson Pump Station. This reservoir is used mainly as an additional storage to Harris and Brazoria Reservoirs. Harris Expansion becomes the primary reservoir during drought conditions.

Picture 1



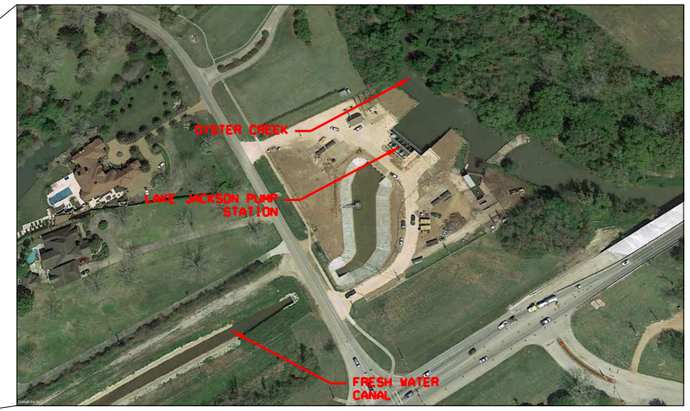
- **Lake Jackson Pump Station –** The Lake Jackson pump Station is located at the intersection of Oyster Creek and F.M. 2004 in Lake Jackson. The station has five pumps P-BML416A (40,000GPM), P-BML416B (40,000GPM), P-BML416C (40,000GPM), P-BML416D (20,000GPM) and P-BML416E (10,000GPM). These pumps can be run in combination to deliver maximum 150,000 GPM flow. The pumps may be used in different combination to deliver varying amounts of flow to the plants. Discharge flows from Harris and/or Harris Expansion Reservoirs must be slightly over the Lake Jackson Pump Station intake to ensure water flow over the dam in oyster creek. It takes approximately 1 hour for water to reach the canal at the diversion works when pumped from oyster creek at Lake Jackson Pump Station.
- **Brazoria Reservoir-** Located approximately 5 mile west of Lake Jackson on Hwy. 332. Surface area of the reservoir is 1865 acres and average depth is approximately 9.5 ft. The reservoir has a storage capacity of approximately 18,000 acre-ft. The water is discharged from the reservoir via siphons that discharge into Buffalo Camp Bayou. Water is then diverted from buffalo camp bayou at the diversion works where the water is introduced into the freshwater canal. It takes approximately 2-4 hours for water to reach the diversion works when released from the reservoir. Brazoria pump station has the capacity to pump 210,000 GPM into the Brazoria Reservoir. P1 can pump 100,000 GPM and P2 can pump 110,000 GPM. Usually only 1 pump is run at a time. However, it is possible to run both pumps at the same time.

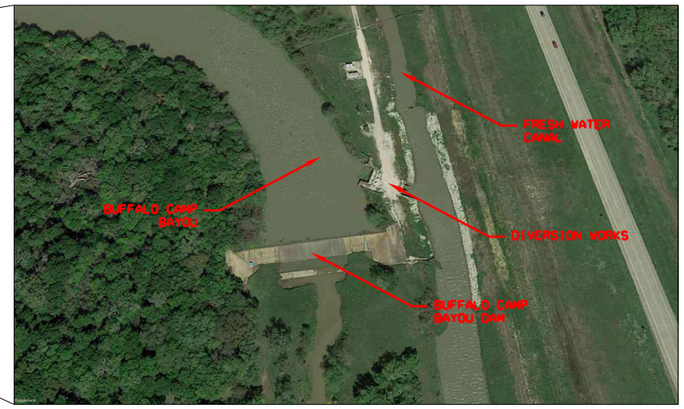
- **Diversion Works-** The diversion works consists of 3 gates that can be adjusted to flow water from Buffalo Camp Bayou to the Dow freshwater canal. It takes approximately 4 hours for water to reach Plant B from the Diversion works.
- **Fresh Water Canal -** A 15.5 mile (40' Ditch) man made canal which runs parallel to Brazos River from Oyster Creek to Plant B, and runs parallel to Barge Canal and ends at Plant A.
- **West End Lake-**Located west of Plant B, the West End Lake has approximately 235 acres surface area. The Lake holds approximately 2300 acre feet of water. There is a gated inlet structure on the north side of the lake and a gated outlet structure on the south side of the lake.
- **West End lake outlet structure-** The outlet gates at the West End Lake are operated remotely from the B-309 Control Room by the Water Distribution (WD) board operator. The purpose of the gates is to supply the raw river water users with water via the in-plant canal system. There are 5 gates, each with electric/manual operators located at the outlet structure. Each gate and associated piping can flow approximately 35,000 GPM. Instrumentation and controls are via a PLC with radio communications located at the outlet structure. The operator will be responsible for maintaining canal level and flow to the downstream users. Also, the board operator shall monitor the Lake Level to assure the target elevations of 9.5' (1929 NGVD with 79 adjustment) is maintained.

6.2 Operation Responsibilities

1. Reservoir Technician will be responsible for pumping water into the reservoirs and delivering raw river water to the plants via the pump stations, reservoirs, gates and canals that are part of the raw river water delivery system.
2. Measuring and recording all raw water pumped and delivered. This will be done via the daily report (Appendix M) that is filled by the reservoir technician.
3. Operating/Maintaining Brazoria, Harris and Harris Expansion Pump Stations and related facilities (switchgear, staff gages etc.).
4. Operating/Maintaining Brazoria, Harris and Harris Expansion reservoirs inlets and outfalls.
5. Operating/Maintaining Diversion Works gates and related appurtenances.
6. Operating/Maintaining Lake Jackson Pump Station and related appurtenances, (switchgear, staff gages etc.)
7. Operating/Maintaining the Gates at the inlet and outlet of the West End Lake and related appurtenances.
8. Operating/Maintaining the freshwater canal from its origin at the Lake Jackson Pump Station to its termination at Plant A.









REV. MARK	REVISION	BY	DATE

REV. MARK	REVISION	BY	DATE

DRAWING ISSUE RECORD

ISSUE NO.	REV	MATERIAL OR JOB SPEC	DATE ISSUED FOR: BID	FAB	CONST	REF
5						
4						
3						
2						
1						

DRAWING ISSUE RECORD

ISSUE NO.	REV	MATERIAL OR JOB SPEC	DATE ISSUED FOR: BID	FAB	CONST	REF
10						
9						
8						
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6						

DESIGNED	
DRAWN	
CHECKED	
APPROVED	
PROJ ENGR	
MFG. REP	

INDEXED | PLANT NUMBER

PROJECT NO.

SHEET

THE DOW CHEMICAL COMPANY

OVERALL SITE PLAN AERIAL

CHARGE NUMBER | SCALE | PICTURE 2

6.3 Operating out of *Brazoria* Reservoir

In normal flows in the Brazos river, normal meaning the salt content of the river at Brazoria intake is less than 300ppm and silt content less than 0.5%, we will be operating out of Brazoria Reservoir.	
Item	**Action**
1	One of the two pumps, P1 or P2 will be pumping out of the river and into the reservoir.
2	Brazoria Reservoir will be maintained at a level of 31.05 during summer months and 30.05 during winter months. These levels will be maintained as river flows allow.
3	Reservoir Technician will increase or decrease flow of water at the siphons as water is needed by the plant demand.
4	Plant demand will be determined by coordinating with board operator at B-309 control room. This will be done by telephone on all normally scheduled workdays. If plant demand changes drastically during off hours board operators will call Reservoir Technician to make necessary adjustments at the siphon to either cut flow back or increase flow.
5	Reservoir Technician will also make necessary adjustments to the flow at diversion works gates and at West End Lake outlet structure as necessary.
6	The West End Lake has an operational target of 9.5' and the plant canal level has an operational target level of 8.5'.
7	A minimal flow will be maintained from Harris and/or Harris Expansion Reservoirs and blended with the water from Brazoria Reservoir. Minimal flow from Harris and/or Harris Expansion Reservoirs needs to be approximately 10,000 GPM to match the capacity of smallest pump at Lake Jackson pump station. Any flow released from Harris and Harris Expansion Reservoirs will be picked up at Lake Jackson Pump Station and sent to Texas operations.

6.4 Operating out of *Harris* Reservoir

If the salt content at Brazoria Reservoir gets above 300ppm raw water delivery will be switched to Harris Reservoir.

Item	Action
1	A minimal flow will be maintained from Harris and/or Harris Expansion Reservoirs and blended with the water from Brazoria Reservoir. Minimal flow from Harris and/or Harris Expansion Reservoirs needs to be approximately 10,000 GPM to match the capacity of smallest pump at Lake Jackson pump station. Any flow released from Harris and Harris Expansion Reservoirs will be picked up at Lake Jackson Pump Station and sent to Texas operations.
2	One of the two pumps, P1 or P2 will be pumping out of the river and into the reservoir.
3	Harris Reservoir will be maintained at a level of 42.5 during summer months and 40.5 during winter months. These levels will be maintained as river flows allow.
4	Reservoir Technician will increase or decrease flow of water at the siphons as water is needed by the plant demand. Water takes about 40 hours to reach plant B from Harris Reservoir Siphons and quick adjustment to plant demands from Harris Reservoir is not practical.
5	Reservoir Technician will turn on pumps at Lake Jackson pump station as flow reaches at the intake of Lake Jackson Pump station. Lake Jackson Pump Station has limited variability for flow adjustments. Reservoir Technician will balance the flow from Harris to match the pump capacities at Lake Jackson pump station.
6	Plant demand will be determined by coordinating with board operator at B-309. This will be done by telephone on all normally scheduled workdays. If plant demand changes drastically during off hours board operators will call Reservoir Technician to make necessary adjustments at the reservoir siphons to either cut flow back or increase flow.
7	Reservoir Technician will also make necessary adjustments to flow at West End Lake outlet structure as necessary.
8	The West End Lake has an operational target of 9.5’ and the plant canal level has an operational target level of 8.5’.

6.5 Operating out of *Harris Expansion Reservoir*

Minimal flow is released from Harris Expansion to allow consistent freshwater flow in the Oyster Creek and the Reservoir.

During drought conditions with low stream flows on the Brazos River, Oyster Creek, and Buffalo Camp Bayou, the average daily demand for Texas Operations, can't be met by pumping from the river alone. Water is released from Dow's water storage reservoirs in a manner that maximizes the benefit of the storage and yields the highest probability to refill storage during a sustained drought. The following outlines a conceptual operating plan for the storage facilities after the proposed reservoir is constructed.

1. Water releases would first be made from the Harris Expansion reservoir. Water would be released exclusively from this source or used to augment flows from the existing Harris reservoir.
2. Once the Harris Expansion reservoir water supply was exhausted, releases would then be made from the existing Harris reservoir.
3. Finally, releases from the Brazoria Reservoir would be made. The release rates would first be set to augment the diminishing flow from the existing Harris reservoir as it empties and then at the full demand rate after Harris reservoirs are depleted. Releases from the Brazoria Reservoir would be reduced to some minimum rate, identified as required to meet critical demands.

If the salt content at Brazoria Reservoir gets above 300ppm raw water delivery will be switched to Harris Reservoir.

Item	Action
1	A minimal flow will be maintained from Harris and/or Harris Expansion Reservoirs and blended with the water from Brazoria Reservoir. Minimal flow from Harris and/or Harris Expansion Reservoirs needs to be approximately 10,000 GPM to match the capacity of smallest pump at Lake Jackson pump station. Any flow released from Harris and Harris Expansion Reservoirs will be picked up at Lake Jackson Pump Station and sent to Texas operations.
2	One of the two pumps, P1 or P2 will be pumping out of the river and into the reservoir. Reservoir Technician shall follow Pump rotation guidelines using Appendix D & H.
3	Harris Expansion Reservoir will be maintained at the levels as described in Table B. These levels will be maintained as river flows allow.

Item	Action
4	Reservoir Technician will increase or decrease flow of water by operating valves at the Baffle Drop Outlet as water is needed by the plant demand. Water takes about 40 hours to reach plant B from Harris Expansion Reservoir Outlet and quick adjustment to plant demands from Harris Expansion Reservoir is not practical.
5	Reservoir Technician will turn on pumps at Lake Jackson pump station as flow reaches the intake for Lake Jackson Pump station. Lake Jackson Pump Station has limited variability for flow adjustments. Reservoir Technician will balance the flow from Harris Expansion to match the available pump capacities at Lake Jackson pump station.
6	Plant demand will be determined by coordinating with board operator at B-309. This will be done by telephone on all normally scheduled workdays. If plant demand changes drastically during off hours board operators will call Reservoir Technician to make necessary adjustments at the reservoir outlet to either cut flow back or increase flow. Plant demand will be determined by coordinating with board operator at B-309. This will be done by telephone on all normally scheduled workdays. If plant demand changes drastically during off hours board operators will call Reservoir Technician to make necessary adjustments at the reservoir siphons to either cut flow back or increase flow.
7	Reservoir Technician will also make necessary adjustments to flow at West End Lake outlet structure as necessary. Reservoir Technician will also make necessary adjustments to flow at West End Lake outlet structure as necessary.
8	The West End Lake has an operational target of 9.5’ and the plant canal level has an operational target level of 8.5’. The West End Lake has an operational target of 9.5’ and the plant canal level has an operational target level of 8.5’.

6.6 Operating Outlet Gates at West End Lake The outlet gates at the West End Lake will be operated remotely from the B-309 Control Room by the WD board operator. The purpose of the gates is to supply the raw river water users with water via the in-plant canal system.

Item	Action
1	Determine flow needed to plant through gates at West End Lake.
2	Enter flow set point in West End Lake Control Page at B-309 Board (Computer).
3	Check level in canal (should be between 8.5' to 9.1)
4	Check level in lake (should between 9.5' to 10.5')
5	Check Lake level deviation to determine if lake is gaining or losing volume. *If lake is losing level and is below target level of 9.5' call the Reservoir Technician to add water to the lake.* *If lake is gaining level and is going above level of 10.5' call the Reservoir Technician to cut back on water to the lake.*
6	Check canal level deviation to determine if canal is gaining or losing volume. *If canal is losing volume adjust flow set point to higher value.* *If canal is gaining volume adjust flow set point to lower value.*

6.7 Salt Wedge Approaching Harris and/or Harris Expansion Intakes

Reservoir Technician shall take river water samples and run Chloride analysis while pumping at Brazoria, Harris and/or Harris Expansion pump stations every day. Based on the river water sample chloride analysis results, if the salt wedge is approaching the Harris Intake structure at Brazos River Mile 44, Reservoir Technician shall notify Operations Leader.

Item	Action
1	Operations Leader shall immediately contact Texas Operations Emergency Operations Planning Committee (EOPC) and initiate Section 10 Drought Contingency Plan.
2	Follow Section 10 Drought Contingency Plan.

6.8 Locations of Monitoring

There are several locations on the reservoir system that transmit data to the control room at B-309 via radio telemetry. The Radio's at the remote site transmit data from a PLC to a central PLC hub at the Angleton pipeline office, except the radio at the West End Lake outlet transmits to the radio tower at B-100. The data is then sent to the control room at B-309 where it is displayed using the software package and monitored 24 hours a day by the board operator at B-309 control room. Reservoir Technician has access to this data using remote connection to computer in his truck. The locations of the PLC's and radio transmitters are as follows:

- Brazoria Pump Station
- Brazoria Reservoir near siphons where water is discharged into Buffalo Camp Bayou
- Diversion Works
- Harris Reservoir Pump Station
- Harris Reservoir near siphons where water is discharged into Oyster Creek
- Harris Expansion Reservoir Pump Station
- Harris Expansion Reservoir near Baffle Drop Outlet where water is discharged into Oyster Creek
- Lake Jackson Pump Station
- Brazosport Water Authority intake pump station
- West End Lake Outlet Structure

6.9 Operations Strategy

Operation of the storage facilities can generally be categorized into the following:

1-Normal Operations: During normal, non-drought conditions, Dow's river water supply will continue to be operated in generally the same fashion as it has been for the past 60 years with the Harris and Brazoria reservoirs. The provision of additional storage will result in minor changes to operations. For example, the proposed reservoir will normally be filled and maintained at a full level until releases are required for maintenance, seasonal adjustments to operating pool level, or a drawdown in advance of a tropical storm landfall near the site. Given this normal mode of operation, the proposed river intake and pump station will only manually operated as necessary to fill the reservoir and maintain it in a full condition.

- During many normal rain events and when the reservoir is below the full pool elevation, no discharge will occur at WSEL 68 feet or less.
- At full pool elevation (68 feet WSEL), the reservoir will capture a rain event of 6 inches with an incidental maximum release rate of 4.2 cfs through the stepped spillway.
- The reservoir operation and the stepped spillway design allow accumulation of two feet (WSEL 70 ft) of rainfall before the discharge rate reaches 110.8 cfs. The two feet is marginally more than the 100 year rainfall event. The 110.8 cfs discharge rate resulting from the reservoir discharge at elevation 70 ft is estimated to be significantly below the pre-project discharge rate of approximately 1,000 cfs from the property in Oyster Creek for the 100-year 24 hours storm (rainfall depth of approximately 13.5 inches on the property).

2-Drought Condition Operations: During drought conditions with low stream flows on the Brazos River, Oyster Creek, and Buffalo Camp Bayou, the average daily demand for Texas Operations, can't be met by pumping from the river alone. Per Texas Operations Emergency Operations Planning Committee (EOPC) determinations, water is released from Dow's water storage reservoirs in a manner that maximizes the benefit of the storage and yields the highest probability to refill storage during a sustained drought. The following outlines a conceptual operating plan for the storage facilities.

- Water releases would first be made from the Harris Expansion reservoir. Water would be released exclusively from this source or used to augment flows from the existing Harris reservoir.
- Once the Harris Expansion reservoir water supply was exhausted, releases would then be made from the existing Harris reservoir.
- Finally, releases from the Brazoria Reservoir would be made. The release rates would first be set to augment the diminishing flow from the existing

Harris reservoir as it empties and then at the full demand rate after Harris reservoirs are depleted. Releases from the Brazoria Reservoir would be reduced to some minimum rate, identified as required to meet critical demands.

3-Emergency Release Conditions: Emergency release conditions would include drawdown in advance of a tropical storm (Hurricane) landfall near the site, any other extreme storm events (comparable to tropical storms) outside of Hurricane season or drawdown because of embankment instability. Emergency releases could also occur via the emergency spillway in a full reservoir condition.

The stage-storage-discharge relationship of the Harris Reservoir Expansion Project is provided in Table A to assist Operations in evaluating how the available storage volume will affect the rainfall runoff in terms of how captured rainfall might affect the Oyster Creek floodplain storage. Note that the reservoir pool elevation is variable based on the different scenarios reflecting seasonal Water Surface Elevation (WSEL) and targeted drawdown levels. In the response Table B is provided showing the seasonal drawdown levels and Hurricane levels. Figure A is included to provide a visual of the Preliminary Stepped Spillway design.

The Harris Reservoir Expansion and stepped spillway (Figure A) have been designed to capture rainfall on the reservoir and allow for controlled release from the stepped spillway. The design is specifically intended to reduce both the volume of discharge and the rate of discharge to the Oyster Creek Flood Plain relative to pre-project conditions.

- At full pool elevation (68 feet WSEL), the reservoir will capture a rain event of 6 inches with an incidental maximum release rate of 4.2 cfs through the stepped spillway.
- The typical maximum target drawdown for an expected Hurricane Landfall would be 1.7 feet below full pool (68 feet WSEL). This would allow approximately 19 inches of rain to be captured in the reservoir before reaching the stepped spillway 4 foot wide notched opening.
- The seasonal pool elevations will provide a variable amount of rainfall capture based on the target pool elevations in Table B.

Table A. Water Surface Elevations, Storage, and Stepped Spillway Discharge Rates (based on preliminary design data, May 2021)

			4' opening				12' opening				Total
Key Elev Description	**WSEL**	**Storage**	**C**	**L**	**H**	**Q(4)**	**C**	**L**	**H**	**Q(12)**	**Q**
	(ft)	**(Acre-ft)**		**(ft)**	**(ft)**	**(cfs)**		**(ft)**	**(ft)**	**(cfs)**	**(cfs)**
	65.3	46,205	Pre-Hurricane Target Drawdown Elevation August and October								
	65.8	47,061	Pre-Hurricane Target Drawdown Elevation Mid July and November								
	66.1	47,574	Pre-Hurricane Target Drawdown Elevation July								
	66.3	47,916	Pre-Hurricane Target Drawdown Elevation Mid-June and December								
	67.0	49,114	Seasonal Max Pool August to October								
	67.5	49,970	Seasonal Level November and July								
Spillway Notch Crest, Max Normal Pool (Dec to mid Jun)	68.0	50,825	2.74	4	0.0	0.0	2.74	12	0.0	0.0	0.0
	68.1	50,997	2.74	4	0.1	0.3	2.74	12	0.0	0.0	0.3
	68.2	51,168	2.80	4	0.2	1.0	2.74	12	0.0	0.0	1.0
	68.3	51,339	2.86	4	0.3	1.9	2.74	12	0.0	0.0	1.9
	68.4	51,510	2.92	4	0.4	3.0	2.74	12	0.0	0.0	3.0
Full Spillway Crest	68.5	51,681	3.00	4	0.5	4.2	2.74	12	0.0	0.0	4.2
	68.6	51,852	3.08	4	0.6	5.7	2.74	12	0.1	1.0	6.8
	68.7	52,023	3.19	4	0.7	7.5	2.80	12	0.2	3.0	10.5
	68.8	52,194	3.30	4	0.8	9.4	2.80	12	0.3	5.5	15.0
	68.9	52,666	3.31	4	0.9	11.3	2.92	12	0.4	8.9	20.2
	69.0	52,537	3.32	4	1.0	13.3	3.00	12	0.5	12.7	26.0
	69.1	52,708	3.32	4	1.1	15.3	3.08	12	0.6	17.2	32.5
	69.2	52,879	3.32	4	1.2	17.5	3.19	12	0.7	22.4	39.9
	69.3	53,050	3.32	4	1.3	19.7	3.30	12	0.8	28.3	48.0
	69.4	53,221	3.32	4	1.4	22.0	3.31	12	0.9	33.9	55.9
	69.5	53,392	3.32	4	1.5	24.4	3.32	12	1.0	39.8	64.2
	69.6	53,563	3.32	4	1.6	26.9	3.32	12	1.1	46.0	72.8
	69.7	54,735	3.32	4	1.7	29.4	3.32	12	1.2	52.4	81.8
	69.8	53,906	3.32	4	1.8	32.1	3.32	12	1.3	59.1	91.1
	69.9	54,077	3.32	4	1.9	34.8	3.32	12	1.4	66.0	100.8
	70.0	54,248	3.32	4	2.0	37.6	3.32	12	1.5	73.2	110.8
	70.5	55,104	3.32	4	2.5	52.5	3.32	12	2.0	112.7	165.2
	71.0	55,959	3.32	4	3.0	69.0	3.32	12	2.5	157.5	226.5
	71.5	56,815	3.32	4	3.5	87.0	3.32	12	3.0	207.0	294.0
	72.0	57,671	3.32	4	4.0	106.2	3.32	12	3.5	260.9	367.1
	72.5	58,526	3.32	4	4.5	126.8	3.32	12	4.0	318.7	445.5
Nominal Crest	72.7	58,869	3.32	4	4.2	135.3	3.32	12	4.0	342.9	478.2

Figure A: Preliminary Stepped Spillway Design

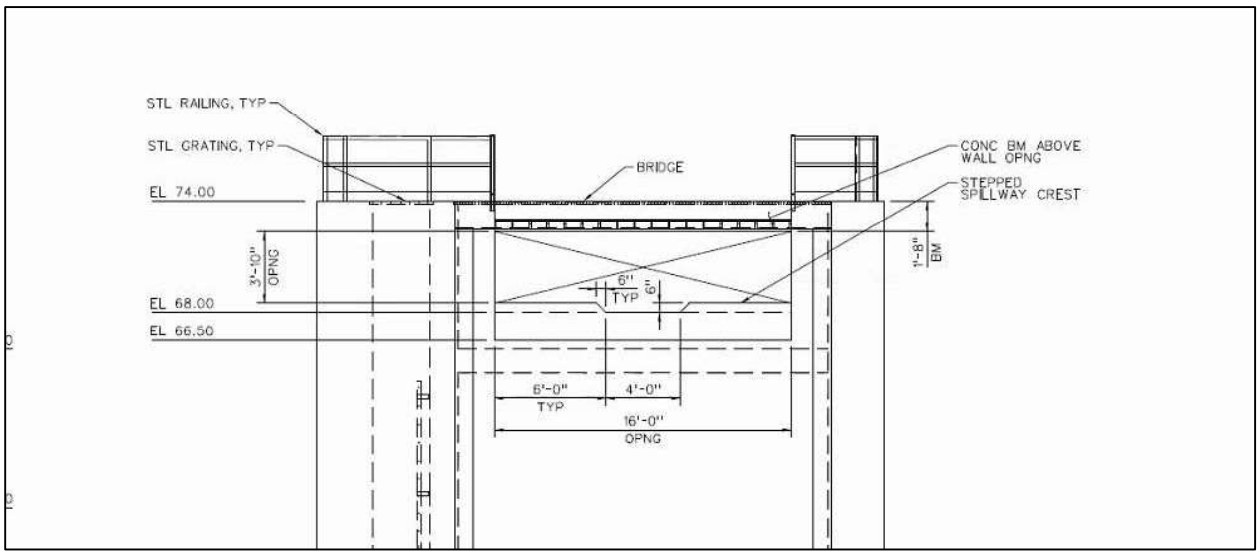


Table B. Season drawdown rule curve for maximum reservoir elevation

1	2	3	4
Date	**Seasonal Reservoir Maximum Pool Elevation (ft)**	**Required Reservoir Elevation 6-hr prior to Hurricane Landfall (ft)**	**Required 36 hour discharge flow to drop reservoir from Seasonal Elevation to Required Reservoir Elevation 6-hr prior to a Hurricane Landfall (discharge frequency anticipated less than once in five years)**
May 15	68.0	66.3	935 cfs
June 1	67.8	66.1	935 cfs
July 15	67.5	65.8	935 cfs
August 1	67.0	65.3	935 cfs
October 1	67.0	65.3	935 cfs
November 1	67.5	65.8	935 cfs
December 1	68.0	66.3	935 cfs

The operational goal of the reservoir is to maximize storage for water supply purposes while also managing the risk of extreme rain events and wind driven waves impacting the embankment. Rainfall impacts on discharges depend on the operational level in the reservoir, which varies by the season.

Two key points:

- During many normal rain events and when the reservoir is below the full pool elevation, no discharge will occur at WSEL 68 feet or less.
- The reservoir operation and the stepped spillway design allow accumulation of two feet (WSEL 70 ft) of rainfall before the discharge rate reaches 110.8 cfs. The two feet is marginally more than the 100 year rainfall event. The 110.8 cfs

discharge rate resulting from the reservoir discharge at elevation 70 ft is estimated to be significantly below the pre-project discharge rate of approximately 1,000 cfs from the property in Oyster Creek for the 100-year 24 hours storm (rainfall depth of approximately 13.5 inches on the property).

During non-hurricane season, the pool level will be operated to stay close to the maximum normal pool elevation. During hurricane season the pool elevation will be slowly lowered 1 foot from the maximum normal pool elevation. When hurricanes are expected, if the pool elevation is at target drawdown levels due to evaporation or water supply releases, no additional drawdown will occur. If the pool elevation is not at target drawdown, it will be lowered to reach the 1.7 feet below the seasonal maximum pool elevations. The seasonal elevations and hurricane drawdown elevations are shown in Table B.

On infrequent occasions (estimated to be less than once in every 5 years), a predicted hurricane occurring when the reservoir pool is above the target drawdown elevation (column 3 in Table B) may require a more rapid than normal drawdown of the reservoir pool using up to the discharge rate in column 4 of Table B.

Depending on the season and if a hurricane is expected, the targeted operational pool elevation could vary from the maximum normal pool elevation to 2.7 feet below this elevation. When the targeted operational level is below the maximum normal pool elevation, rainfall would first need to fill the available volume below the maximum normal pool elevation before water would start to engage the stepped spillway. When the operation level is at the maximum normal pool elevation, any rainfall would start to engage the stepped spillway.

During non-hurricane rainfall events, operations will continue to manage any controlled discharges to account for the rainfall, including any reduction in controlled discharges as needed. If the rain event is significant enough to result in any water passing over the stepped spillway, operations will seek to adjust controlled release to continue meeting water demand balancing with the water passing over the stepped spillway. In addition operations may adjust or stop intake pumping from the Brazos River, as needed, to manage the controlled discharges under the current circumstances.

During expected hurricane rainfall events, operations will drawdown the pool elevation 1.7 feet below the seasonal pool elevations in order to provide an added level of protection to the reservoir embankment against wind driven waves. The operations model anticipates that the drawdown will occur over a minimum of 36 hours and finish a minimum of 6 hours before hurricane landfall. It is intended that the drawdown release will be managed so it is completed in advance of the hurricane and prior to the occurrence of heavy hurricane rainfall. Practically, operations will be able to adjust the drawdown release rate and duration based on the actual behavior of the hurricane.

4-Controlled Outlet Discharge Rates:

In an Emergency condition, A controlled drawdown rate of 935cfs is achieved by slowly throttling up the discharge gates. Discharge is increased at the rate of not more than 200cfs per hour during drought or emergency conditions. This rate corresponds with existing calculated hydrograph of Oyster Creek.

Once desired draw down level is achieved, discharge rate is throttled down not more than of 150cfs per hour. Also, in drought conditions, discharge rate is throttled down not more than of 150cfs per hour.

Discharge canal is lined with concrete blocks to avoid any erosion potential. Oyster Creek should be monitored per Oyster Creek Monitoring and Adaptive Management Plan.

7.0 Implementation

The Reservoir Technician is responsible for distribution of this plan and any revisions to the appropriate parties. The Reservoir Technician is the point of contact if any involved parties have questions about the plan. The site training coordinator should schedule training about the plant for those associated with it, including how to use the O&M and how to identify problems and their severity.

The Reservoir Technician is responsible for revising this O&M, as required. The Reservoir Technician is responsible for conducting an annual review to determine if revisions are required. Documentation of the annual review should be maintained in this O&M in Tab 1. Revisions to the O&M must also be approved through Management of Change (MOC) process. The revision approval date, the signature, and title of the approving authority should be included in this O&M.

TAB 1

PLAN REVIEW AND UPDATE

This plan will be reviewed and updated annually

Review history The following information lists at least the last reviews to this document and all reviews that were done in the last 12 months.

Date	Reviewed By	Comments

Revision history The following information documents at least the last 3 changes to this document.

Date	Revised By	Changes

Appendix A: Inspection Check List

Date of Inspection:
Time:

DOW RESERVOIRS OPERATIONS CHECK LIST

Inspection Type: Weekly Emergency Assessment

Condition	Yes	No	Inspection Findings (If Yes, Complete Appendix B)	Action Required	Date Actions Taken
Are there any surface cracks?			If yes, describe extent of cracking:		
Is there any slumping, sloughing, or slides on the basin or the abutments?			If yes, describe extent of problem and location:		
Is there cloudy or dirty seepage; or seepage with increase in flow?			If yes, describe seepage:		
Is there any misalignment or settlement in the basin?			If yes, describe location and extent of misalignment or settling:		
Is there any erosion or riprap displacement?			If yes, describe location and extent of erosion or riprap displacement:		
Are there any animal burrows visible, especially those associated with beavers?			If yes, describe location and extent of animal burrows:		
Are there trees or brush that is overgrown?			I f yes, describe location and extent of overgrowth:		
Is there any undermining of the service spillway?			If yes, describe extent of undermining:		
Is there any mechanical or electrical malfunctions?			If yes, describe extent of malfunction or problems:		

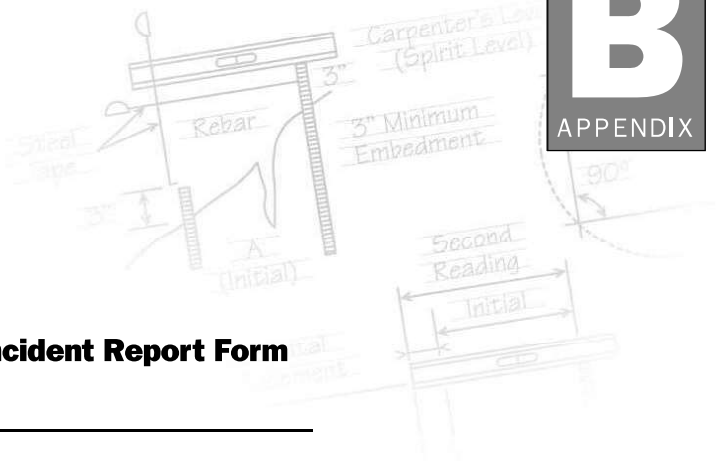
Any areas with "leaks, seepage", or other visible signs of an integrity breach should be reported immediately to the Operations Leader. If basin failure appears imminent, contact Operations Leader and Production Leader immediately.

Sketch/Additional Notes

ALL INSPECTION SHEETS SHALL BE SAVED IN WD APPROVED FOLDER.

Appendix B: Inspection Monitor Forms

Appendix B: Report Forms



Dam Incident Report Form

Date _____ Time _____

Name of Dam _____

Stream Name _____

Location _____

County _____

Observer _____

Observer Telephone No. _____

Nature of Problem _____

_____

Location of Problem Area *(looking downstream)* _____

_____

Extent of Problem Area _____

_____

Flow Quantity and Color _____

_____

Water Level in Reservoir _____

Was Situation Worsening? _____

Emergency Status _____

Current Weather Conditions _____

_____

Additional Comments _____

_____

_____

_____

_____

_____

Inspection Monitoring Form

Date _____ Time _____

Name of Dam _____

Inspector _____

Item Being Monitored _____

Extent of Area _____

Current Description _____

Change From Previous Inspections _____

Appendix C: Five Year Inspection Form

Texas Commission on Environmental Quality

Five Year Dam Inspection Form

Inspection Results—Dam Conditions

Dam Name: _____ Inventory No: _____

Name of Inspector/s: _____ ___

Name of Contact/s: _____ ____

Date of Inspection: _____ Start Time: _____ End Time: _____ Weather: _____

Crest level (at center) above water: _____

Service spillway level ❑ Above or ❑ Below water: _____

Emergency spillway level above water: _____

Ground Moisture Condition: ❑ Dry ❑ Damp ❑ Wet ❑ Snow ____ ❑ Other: _____

Crest of Embankment General Condition: ❑ Good ❑ Fair ❑ Poor Width: _____

Problems Noted: ❑ None ❑ Rutting ❑ Erosion ❑ Poor Drainage Height: _____

❑ Trees ❑ Depressions ❑ Bulges ❑ Livestock Damage ❑ Cracks Length: _____

❑ Misalignment of Crest ❑ Misalignment of Utility Poles ❑ Misalignment of Fences or Rails ❑ Sinkhole ❑ Burrows ❑ Breached ❑ Other: _____

Comments: _____

_____

_____

_____

Upstream Embankment General Condition: ❑ Good ❑ Fair ❑ Poor Slope: _____

Problems Noted: ❑ None ❑ Rip-Rap ❑ Erosion ❑ Too Steep ❑ Burrows ❑ Trees ❑ Cattails ❑ Depressions ❑ Bulges ❑ Livestock Damage ❑ Slides ❑ Concrete Decay ❑ Cracks ❑ Sinkhole

❑ Benching ❑ Misalignment of Rip-rap ❑ Open Joints in Concrete

Comments: _____

_____

_____

Downstream Embankment General Condition: ❑ Good ❑ Fair ❑ Poor Slope: _____

Problems Noted: ❑ None ❑ Sloughing ❑ Erosion ❑ Too Steep ❑ Burrows ❑ Trees ❑ Cattails

❑ Depressions ❑ Bulges ❑ Livestock Damage ❑ Slides ❑ Concrete Decay ❑ Cracks ❑ Sinkhole

❑ Other:_____

Comments:

_____

_____

_____

Seepage on Downstream Slope Amount: ❑ Major ❑ Moderate ❑ Minor ❑ None Found

Problems Noted: ❑ None ❑ Saturation Starts at _____ % up Embankment

❑ Presence of Sediment in Flow ❑ Cattails at Toe of Dam ❑ Surface Water at Toe of Dam

❑ Seepage Associated with Sloughing ❑ Continuous Flow ❑ Sporadic Flow

Comments: _____

_____

_____

Downstream Hazard Conditions ❑ Narrow Canyon ❑ Wide Canyon ❑ Lightly Sloping Prairie

❑ Pastureland ❑ Large Trees and Forest ❑ Brushy and Scrubby Forest ❑ No Homes

❑ Lightly Populated ❑ Moderately Populated ❑ Densely Populated ❑ Industrial ❑ Businesses

Estimated number of homes: _____

Comments: _____

_____

_____

Service Inlet Structure General Condition: ❑Good ❑ Fair ❑ Poor

Problems Noted: ❑ None ❑ Blockage ❑ Not Located ❑ Steel Corrosion ❑ Concrete Spalling

❑ Concrete Cracking ❑ Reinforcement Corrosion ❑ Missing Parts ❑ Timber Decay

❑ Leakage Below Water Level ❑ Inoperable Valve ❑ Other:_____

Comments: _____

_____

_____

Service Outlet Structure General Condition: ❑ Good ❑ Fair ❑ Poor

Problems Noted: ❑ None ❑ Blockage ❑ Not Located ❑ Corrosion of Conduit

❑ Presence of Sediment in Flow ❑ Inaccessible ❑ Concrete Cracking ❑ Concrete Spalling

❑ Reinforcement Corrosion ❑ Misalignment of Walls/Slabs ❑ Open Joints

Comments: _____

_____

_____

Service Spillway Condition: ❑ Good ❑ Fair ❑ Poor Depth: _____

Width: _____

Problems Noted: ❑ None ❑ Blockage ❑ Not Located ❑ Trees ❑ Burrows ❑ Back-Cutting Erosion

❑ Inaccessible ❑ Livestock Damage ❑ Concrete Cracking ❑ Concrete Spalling

❑ Reinforcement Corrosion ❑ Damaged Water-stops ❑ Open Joints ❑ Sinkholes

❑ Holes in Spillway Chute ❑ Seepage ❑ Misalignment of Walls/Slabs ❑ Damaged Gates

❑ Nonfunctional Gates ❑ Lubrication of Gates ❑ Testing of Gates

Comments: _____

_____

_____

Emergency Spillway Condition: ❑ Good ❑ Fair ❑ Poor Depth: _____

Width: _____

Problems Noted: ❑ None ❑ Blockage ❑ Not Located ❑ Trees ❑ Burrows ❑ Back-Cutting Erosion

❑ Inaccessible ❑ Livestock Damage ❑ Concrete Cracking ❑ Concrete Spalling

❑ Reinforcement Corrosion ❑ Damaged Water-stops ❑ Open Joints ❑ Sinkholes

❑ Holes in Spillway Chute ❑ Seepage ❑ Misalignment of Walls/Slabs ❑ Damaged Gates

❑ Nonfunctional Gates ❑ Lubrication of Gates ❑ Testing of Gates

Comments: _____

_____

_____

Other Items ❑ Major road along crest of dam ❑ Private road or driveway along crest of dam

❑ Vehicle bridge along crest of dam ❑ Culverts built into crest of dam

❑ Pipeline immediately downstream from dam - Type of pipeline: _____

❑ Water supply line in crest of dam ❑ Other: _____

Comments: _____

_____

_____

Repair Items Ranked by Priority

Item 1: _____

Item 2: _____

Item 3: _____

Item 4: _____

Security Issues ❑ Vehicle Accessible ❑ Vehicle Gates ❑ Vehicle Fences and Railing

❑ Pedestrian Accessible ❑ Pedestrian Gates and Fences ❑ Obscured from Surveillance ❑ Locks

❑ Breaches in Fence ❑ Evidence of Parties ❑ Graffiti ❑ Security System

Comments: _____

_____

_____

Operational Procedures ❑ SOP Available Location Kept: _____

❑ Logbook Location of Logbook: _____

❑ Major Events Noted ❑ Staff Training

Topics of Training: _____

❑ Manual Gate Operations ❑ Powered Gate Operations ❑ Automated Gate Operations

Comments: _____

_____

_____

Communications ❑ Directory Available ❑ 24-Hour Coverage ❑ Telephone Available at Dam

❑ Cell Phone Coverage—Provider: _____

Comments: _____

_____

_____

Emergency Action Plan ❑ Available ❑ Filed with TCEQ ❑ Change in Downstream Hazard

Frequency of Update: _____ Date of Last Revision: _____

Date of Last Exercise: _____

Comments: _____

_____

_____

Instrumentation ❑ Present ❑ Adequately Maintained ❑ Inadequately Maintained ❑ Operational

❑ Data Collected ❑ Data Analyzed ❑ Adequately Protected

Comments: _____

_____

_____

Early Warning System ❑ Present ❑ Adequately Maintained ❑ Inadequately Maintained ❑ Operational

Frequency of Maintenance: _____

Date of Last Exercise: _____

Comments: _____

_____

_____

Reservoir Drawdown Capability Method of Drawdown: _____

Maximum Drawdown: _____ c.f.s. Frequency of Testing: _____

Comments: _____

_____

_____

Backup Power ❑ Present ❑ Adequately Maintained ❑ Inadequately Maintained ❑ Operational

Frequency of Maintenance: _____

Date of Last Exercise: _____

Comments: _____

_____

Appendix D: Pump Swap Rotation Logbook

Harris Expansion Pump Swap Rotation Log Book

Pumps	Month		Month		Month		Month	
	On/ Off	Date/ Initial	On/ Off	Date/ Initial	On/ Off	Date/ Initial	On/ Off	Date/ Initial
	Can be swapped on days or nights any day of specified swap month.							
P-1								
P-2								
P-1								
P-2								
P-1								
P-2								
P-1								
P-2								
P-1								
P-2								
P-1								
P-2								
P-1								
P-2								
P-1								
P-2								
P-1								
P-2								
P-1								
P-2								
P-1								
P-2								

Instructions for Use:
Pumps can be swapped anytime during the swap month noted in the sheet unless specified otherwise. Once the pump has been swapped, please note in the sheet which pump is currently running. If a pump cannot be swapped due to any reason, please write a notification in log book to ensure the pump can be available for the next swap cycle.

Appendix E: Security Policy

[See Water Distribution Network Folder]

Appendix F: SPCC Check List

Weekly Inspection of Oil Storage Tanks, Transformers and Diked Areas

Harris Expansion Reservoir Weekly SPCC Checklist

1. Inspect the outside of each Transformer and each tank, along with its diked or curbed area, for:

   A. Signs of deterioration or corrosion
   B. Evidence of a leak
   C. An Accumulation of oil
   D. Ensure Dike Valve is Closed – Diesel Tank

2. Inspect dike/containment for:

   A. No restrictions to flow or extraneous materials in the contained areas that would inhibit flow or containment (trench is free of objects and debris; dike and trench is not accumulating dirt, sludge, etc.)
   B. No factors that would inhibit valves, detectors, or other control components from functioning properly (dike material and seals are intact; surface integrity assured; Dike or sump level indicators are functional; Dike sump pump / eductor is working properly)
   C. No damages to the material of construction of the diked area (cracks or alterations in a way that the volume has changed)
   D. Inspect temporary containment "pop-up", if applicable, and make sure it is set-up properly to collect rainwater

3. Enter a P, for Pass, or an F, for Fail, in the box. Complete MTL task if no deficiencies are found.

4. If an area fails, write the action taken to correct the situation in the space below. Leaks that might cause a spill and/or the accumulation of oil must be corrected promptly.

   Enter the Work Order No. (W.O.) in section if a work order is needed.

   If deficiencies are found, mark compliance task as RI (Resolution Initiated) until gap is closed. Document date on checklist when gap is closed.

5. Signature and date are required on form.

6. Place weekly form in the Weekly SPCC Checklists binder at BM-6 for the current year. Previous years will be kept at the B-3501 Main Library

Weekly Inspection of Oil Storage Tanks, Transformers and Diked Areas

CHECK LIST

Equipment	Pass Or Fail	Work Order No.	Date W.O. Closed out
Transformers			
T-1 TRANSF SEAL COMPT.			
T-2 TRANSF CASE			
TR-1 TRANSF CASE			
TR-3 TRANSF CASE			
T-1 CONTAINMENT			
T-2 CONTAINMENT			

Corrective Actions: (Enter Work Order if one is used and date issue was corrected.)

Reservoir Technician (signature) _____

Date _____

Appendix G: TCEQ Suspicious Dam Incident Report Form

Texas Commission on Environmental Quality

REPORTING SUSPICIOUS DAM INCIDENTS

The Department of Homeland Security (DHS) and the Texas Commission on Environmental Quality (TCEQ) encourage recipients of this document to report information concerning suspicious or criminal activity to the local FBI Joint Terrorism Task Force, the National Operations Center (NOC), and the TCEQ Dam Safety Program.

The FBI: regional phone numbers can be found at http://www.fbi.gov/contact/fo/fo.htm
The NOC: 202-282-8101 or HSOC.Common@dhs.gov.
The TCEQ: 1-888-777-3186 or wsamuels@tceq.state.tx.us.

For information affecting the private sector and critical infrastructure, contact the National Infrastructure Coordinating Center (NICC), a sub-element of the NOC.

The NICC: telephone: 202-282-9201; fax: 703-487-3750; or e-mail: NICC@dhs.gov.

When available, each report should include the date, time, location, type of activity (category of incident), number of people and type of equipment used for the activity, the name of the submitting company or organization, and a designated point of contact.

Suspicious Incident Categories

CATEGORY	DESCRIPTION
ELICITING INFORMATION	Questioning facility personnel about a facility; this includes individuals probing employees in person on- or off-site, over the phone, or on the Internet about particular structures, functions, and personnel procedures at the facility.
BREACH	Unauthorized personnel entering a restricted area.
ATTEMPTED INTRUSION	Unauthorized personnel attempting to enter a restricted area.
PHOTOGRAPHY	Taking still or moving pictures of a facility.
OBSERVATION	Showing unusual interest in a facility; for example, observing it through binoculars, taking notes, drawing maps, or making drawings of facility structures.
THEFT	Stealing something associated with a facility.
SABOTAGE/ TAMPERING/ VANDALISM	Damaging, manipulating, or defacing part of a facility with malicious intent.
CYBER ATTACK	Compromising, or attempting to compromise, a facility's IT infrastructure.
EXPRESSED THREAT	Making a spoken or written threat to damage or compromise a facility.
FLYOVER	Flying an aircraft over a facility; this comprises any type of flying vehicle, including an unmanned aerial vehicle loitering over a site.
WEAPONS DISCOVERY	Discovery of small arms or explosives at or near a facility.
OTHER	Incidents not fitting any of the above categories.

Collecting, Reporting, and Analyzing Suspicious Incidents

DHS and TCEQ recognize the increased vigilance of industry and government partners, and encourage partners to continually report suspicious activity and incidents.

Effective information collection when a suspicious incident occurs enables faster and more thorough investigative follow-up. DHS and TCEQ recognize that it is not always possible to gather detailed information, but collecting the following types of information will facilitate the investigative and analytic process:

Date and time of incident _____
Number of individuals involved _____
Description of the incident, with the name of the dam involved _____
_____
Name and address of the dam _____

Suspicious persons:
- Names, aliases, including variation in spelling _____
- Gender _____
- Physical description _____
- Social Security Number and any passport and visa information _____
- Reason for being in the area or conducting the suspicious activity _____
_____
- Place of employment _____
- Copy of picture IDs
- History of incidents of this kind involving this individual, especially at this facility _____
_____

Vehicles:
- Color, make, model, and year _____
- License plate and state _____
- Distinguishing marks, stickers, and embellishments on the vehicle _____
_____
- Any history involving the same vehicle at this location or facility _____
_____

Aircraft:
- Color scheme, make, model, year, and tail number _____
_____

Boats:
- Boat registration ID, color, and identifying information _____
_____

Suspect's surveillance equipment:
- Make and model of binoculars, camera, or recording equipment _____
_____
- Subject and number of pictures taken _____
- Copy of pictures, if available

Description of any other suspicious individuals in the vicinity _____
_____
Contact information of the reporting individual, witnesses, and organization or facility _____
_____
Elements of local law enforcement or other Federal, State, or local agencies that have been notified:
- Responsibility for follow-up actions _____
- Results of follow-up actions _____
- Points of contact for further information _____
_____

Appendix H: Pump Swapping Guidelines

THE DOW CHEMICAL COMPANY

[redacted]

[redacted]

PUMP SWAPPING GUIDELINES

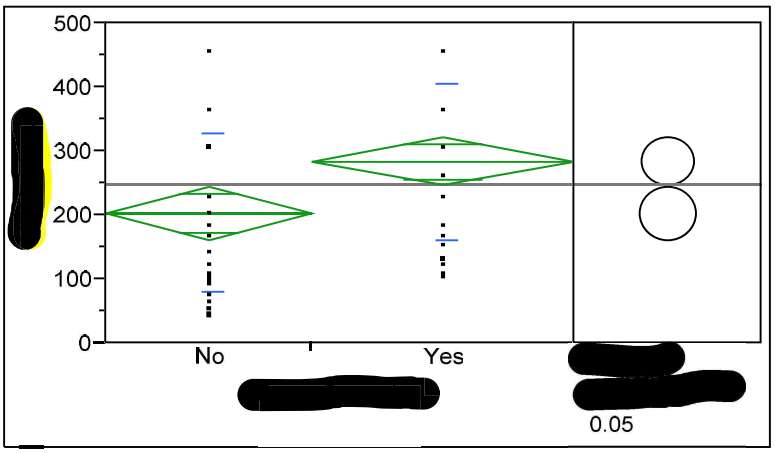
1. Introduction

Part of defining the optimum maintenance strategy for a centrifugal pump system, is to define the strategy for managing installed spares. Important failure modes for standby pumps are Failure to perform on demand, and Failure to deliver required flow at the required head. These modes can only be tested fully by running the spare pump periodically in the process. A statistical analysis of a sample of single stage overhung A&B pump sets indicates that periodic swapping of pumps results in higher population MTBR. This analysis and a discussion on standby pump testing intervals are included in this document.
Based on the above the recommendation in this guideline is to periodically test/swap pumps.
There are however products and processes where periodic swapping is not possible, i.e. where the product cannot be left in the pump at standstill or where swapping is too disruptive to process stability. For those cases recommended PPM practices are given.

2. Justification for periodic testing of the standby pump.

[redacted]

3. Statistical analysis of a pump sample.



4. Test duration and determination of the testing interval.

[redacted]

Testing interval.

[redacted]

[redacted]

5. PPM for permanent idle pumps:

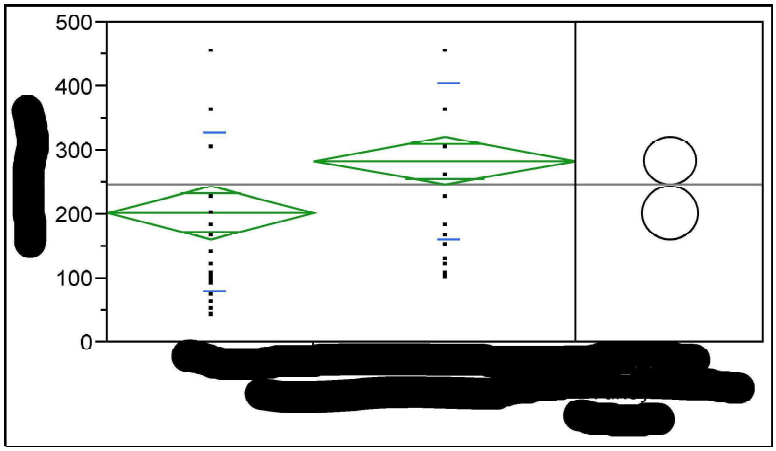
[redacted]

[redacted]

[redacted]

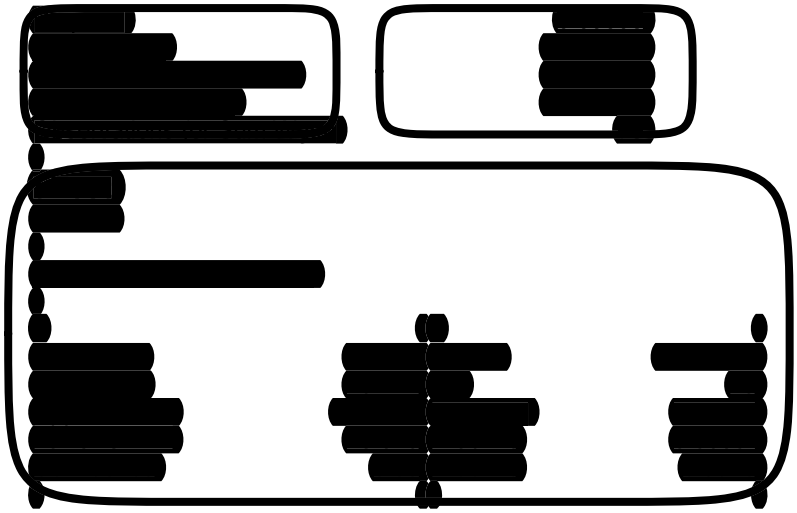
Appendix A. Pump swapping [redacted] report

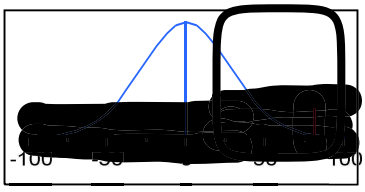
Oneway Analysis of [redacted]



Oneway [redacted]

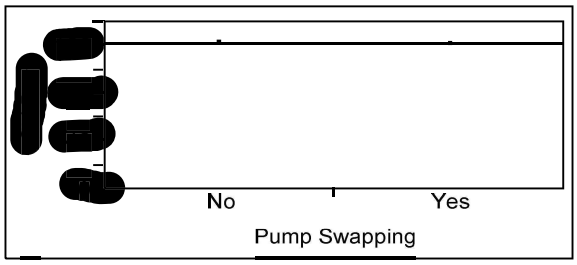
[redacted]





[redacted]

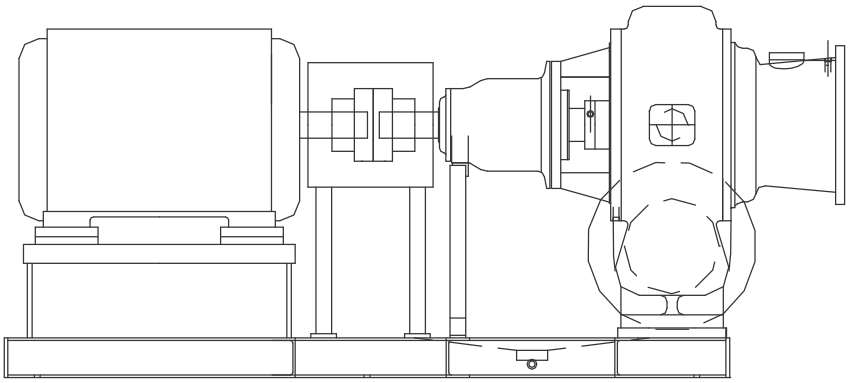
[redacted]


No
Yes
Pump Swapping

Appendix I: Pump Operations & Maintenance

FLOWSERVE®

Pump Division



Type: MN
(Horizontal close-coupled)

CENTRIFUGAL PUMPS

USER INSTRUCTIONS:
INSTALLATION, OPERATION, MAINTENANCE

PCN = 71569189 11–04 (E) **(Incorporating MN.IM)**

⚠ ***These instructions should be read prior to installing operating, using and maintaining this equipment.***

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1 INTRODUCTION AND SAFETY

1.1 General

These instructions must always be kept close to the product's operating location or directly with the product.

Flowserve's products are designed, developed, and manufactured with state-of-the-art technologies in modern facilities. The unit is produced with great care and commitment to continuous quality control, utilizing sophisticated quality techniques, and safety requirements.

Flowserve is committed to continuous quality improvement and being at service for any further information about the product in its installation and operation or about its support products, repair and diagnostic services.

These instructions are intended to facilitate familiarization with the product and its permitted use. Operating the product in compliance with these instructions is important to help ensure reliability in service and avoid risks. The instructions may not take into account local regulations; ensure such regulations are observed by all, including those installing the product. Always coordinate repair activity with operations personnel, and follow all plant safety requirements and applicable safety and health laws and regulations.

These instructions should be read prior to installing, operating, using and maintaining the equipment in any region worldwide. The equipment must not be put into service until all the conditions relating to safety noted in the instructions, have been met.

1.2 CE marking and approvals

It is a legal requirement that machinery and equipment put into service within certain regions of the world shall conform with the applicable CE Marking Directives covering Machinery and, where applicable, Low Voltage Equipment, Electromagnetic Compatibility (EMC), Pressure Equipment Directive (PED) and Equipment for Potentially Explosive Atmospheres (ATEX).

Where applicable the Directives and any additional Approvals cover important safety aspects relating to machinery and equipment and the satisfactory provision of technical documents and safety instructions. Where applicable this document incorporates information relevant to these Directives and Approvals. To confirm the Approvals applying and if the product is CE marked, check the serial number plate markings and the Certification, see section 9, *Certification*.

1.3 Disclaimer

Information in these User Instructions is believed to be reliable. In spite of all the efforts of Flowserve Pump Division to provide sound and all necessary information the content of this manual may appear insufficient and is not guaranteed by Flowserve as to its completeness or accuracy.

Flowserve manufactures products to exacting International Quality Management System Standards as certified and audited by external Quality Assurance organizations. Genuine parts and accessories have been designed, tested, and incorporated into the products to help ensure their continued product quality and performance in use. As Flowserve cannot test parts and accessories sourced from other vendors the incorrect incorporation of such parts and accessories may adversely affect the performance and safety features of the products. The failure to properly select, install, or use authorized Flowserve parts and accessories is considered to be misuse. Damage or failure caused by misuse is not covered by Flowserve's warranty. In addition, any modification of Flowserve products or removal of original components may impair the safety of these products in their use.

1.4 Copyright

All rights reserved. No part of these instructions may be reproduced, stored in a retrieval system, or transmitted in any form or by any means without prior permission of Flowserve Pump Division.

1.5 Duty conditions

This product has been selected to meet the specifications of your purchaser order. The acknowledgement of these conditions has been sent separately to the Purchaser. A copy should be kept with these instructions.

The product must not be operated beyond the parameters specified for the application. If there is any doubt as to the suitability of the product for the application intended, contact Flowserve for advice, quoting the serial number.

If the conditions of service on your purchase order are going to be changed (for example liquid pumped, temperature or duty) it is required that the user seeks Flowserve's written agreement before start up.

1.6 Safety

1.6.1 Summary of safety markings

These User Instructions contain specific safety markings where non-observance of an instruction would cause hazards. The specific safety markings are:

DANGER This symbol indicates electrical safety instructions where non-compliance will involve a high risk to personal safety or the loss of life.

This symbol indicates safety instructions where non-compliance would affect personal safety and could result in loss of life.

This symbol indicates "hazardous and toxic fluid" safety instructions where non-compliance would affect personal safety and could result in loss of life.

CAUTION This symbol indicates safety instructions where non-compliance will involve some risk to safe operation and personal safety and would damage the equipment or property.

This symbol indicates explosive atmosphere zone marking according to ATEX. It is used in safety instructions where non-compliance in the hazardous area would cause the risk of an explosion.

Note: This sign is not a safety symbol but indicates an important instruction in the assembly process.

1.6.2 Personnel qualification and training

All personnel involved in the operation, installation, inspection, and maintenance of the unit must be qualified to carry out the work involved. If the personnel in question do not already possess the necessary knowledge and skill, appropriate training and instruction must be provided.

If required the operator may commission the manufacturer/supplier to provide applicable training.

Always coordinate repair activity with operations and health and safety personnel, and follow all plant safety requirements and applicable safety and health laws and regulations.

1.6.3 Safety action

This is a summary of conditions and actions to prevent injury to personnel and damage to the environment and to equipment. For products used in potentially explosive atmospheres section 1.6.4 also applies.

DANGER NEVER DO MAINTENANCE WORK WHEN THE UNIT IS CONNECTED TO POWER

GUARDS MUST NOT BE REMOVED WHILE THE PUMP IS OPERATIONAL

DRAIN THE PUMP AND ISOLATE PIPEWORK BEFORE DISMANTLING THE PUMP
The appropriate safety precautions should be taken where the pumped liquids are hazardous.

FLUORO-ELASTOMERS (When fitted.)
When a pump has experienced temperatures over 250 ºC (482 ºF), partial decomposition of fluoro-elastomers (example: Viton) will occur. In this condition these are extremely dangerous and skin contact must be avoided.

HANDLING COMPONENTS
Many precision parts have sharp corners and the wearing of appropriate safety gloves and equipment is required when handling these components. To lift heavy pieces above 25 kg (55 lb) use a crane appropriate for the mass and in accordance with current local regulations.

THERMAL SHOCK
Rapid changes in the temperature of the liquid within the pump can cause thermal shock, which can result in damage or breakage of components and should be avoided.

APPLYING HEAT TO REMOVE IMPELLER
There may be occasions when the impeller has either been shrunk fit onto the pump shaft or has become difficult to remove due to products that are corrosive in nature.

If you elect to use heat to remove the impeller, it must be applied with a great care and before applying heat ensure any residual hazardous liquid trapped between the impeller and pump shaft is thoroughly drained out through the impeller keyway to prevent an explosion or emission of toxic vapor.

Impeller design vary and so are the heat, applying location and the duration of heat application. Contact your nearest Flowserve service center for help

HOT (and cold) PARTS
If hot or freezing components or auxiliary heating supplies can present a danger to operators and persons entering the immediate area action must be taken to avoid accidental contact. If complete protection is not possible, the machine access must be limited to maintenance staff only, with clear visual warnings and indicators to those entering the immediate area.

Note: Bearing housings must not be insulated and drive motors and bearings may be hot.

If the temperature is greater than 68 °C (175 °F) or below 5 °C (20 °F) in a restricted zone, or exceeds local regulations, action as above shall be taken.

HAZARDOUS LIQUIDS
When the pump is handling hazardous liquids care must be taken to avoid exposure to the liquid by appropriate siting of the pump, limiting personnel access and by operator training. If the liquid is flammable and/or explosive, strict safety procedures must be applied.

Gland packing must not be used when pumping hazardous liquids.

CAUTION PREVENT EXCESSIVE EXTERNAL PIPE LOAD
Do not use pump as a support for piping. Do not mount expansion joints, unless allowed by Flowserve in writing, so that their force, due to internal pressure, acts on the pump flange.

CAUTION ENSURE CORRECT LUBRICATION
(See section 5, *Commissioning, startup, operation, and shutdown*.)

CAUTION START THE PUMP WITH OUTLET VALVE PARTLY OPENED (Unless otherwise instructed at a specific point in the User Instructions.)

This is recommended to minimize the risk of overloading and damaging the pump motor at full or zero flow. Pumps may be started with the valve further open only on installations where this situation cannot occur. The pump outlet control valve may need to be adjusted to comply with the duty following the run-up process. (See section 5, *Commissioning startup, operation, and shutdown*).

CAUTION NEVER RUN THE PUMP DRY

CAUTION INLET VALVES TO BE FULLY OPEN WHEN PUMP IS RUNNING
Running the pump at zero flow or below the recommended minimum flow continuously will cause damage to the seal.

CAUTION DO NOT RUN THE PUMP AT ABNORMALLY HIGH OR LOW FLOW RATES
Operating at a flow rate higher than normal or at a flow rate with no backpressure on the pump may overload the motor and cause cavitation. Low flow rates may cause a reduction in pump/bearing life, overheating of the pump, instability, and cavitation / vibration.

1.6.4 Products used in potentially explosive atmospheres

Measures are required to:

- Avoid excess temperature
- Prevent build up of explosive mixtures
- Prevent the generation of sparks
- Prevent leakages
- Maintain the pump to avoid hazard

The following instructions for pumps and pump units when installed in potentially explosive atmospheres must be followed to help ensure explosion protection. Both electrical and non-electrical equipment must meet the requirements of European Directive 94/9/EC.

1.6.4.1 Scope of compliance

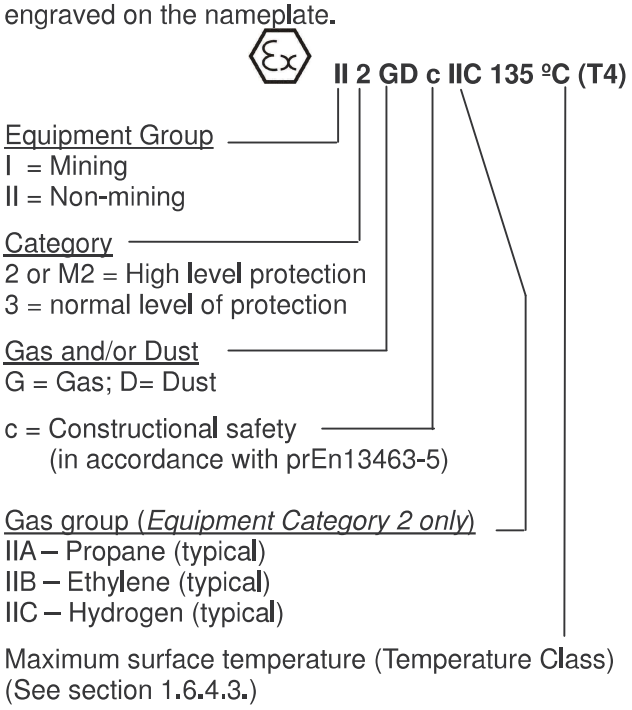
Use equipment only in the zone for which it is appropriate. Always check that the driver, drive coupling assembly, seal and pump equipment are suitably rated and/or certified for the classification of the specific atmosphere in which they are to be installed.

Where Flowserve has supplied only the bare shaft pump, the Ex rating applies only to the pump. The party responsible for assembling the pump set shall select the coupling, driver, and any additional equipment, with the necessary CE Certificate/ Declaration of Conformity establishing it is suitable for the area in which it is to be installed.

The output from a variable frequency drive (VFD) can cause additional heating affects in the motor and the ATEX Certification for the motor must state that it is covers the situation where electrical supply is from the VFD. This particular requirement still applies even if the VFD is in a safe area.

1.6.4.2 Marking

An example of ATEX equipment marking is shown below. The actual classification of the pump will be engraved on the nameplate.



1.6.4.3 Avoiding excessive surface temperatures

ENSURE THE EQUIPMENT TEMPERATURE CLASS IS SUITABLE FOR THE HAZARD ZONE

Pumps have a temperature class as stated in the ATEX Ex rating on the nameplate. These are based on a maximum ambient of 40 °C (104 °F); refer to Flowserve for higher ambient temperatures.

The surface temperature on the pump is influenced by the temperature of the liquid handled. The maximum permissible liquid temperature depends on the temperature class and must not exceed the values in the table that follows.

The temperature rise at the seals and bearings and due to the minimum permitted flow rate is taken into account in the temperatures stated.

Temperature class to prEN 13464-5	Maximum surface temperature permitted	Temperature limit of liquid handled (* depending on material and construction variant - check which is lower)
T6	85 °C (185 °F)	Consult Flowserve
T5	100 °C (212 °F)	Consult Flowserve
T4	135 °C (275 °F)	115 °C (239 °F) *
T3	200 °C (392 °F)	180 °C (356 °F) *
T2	300 °C (572 °F)	275 °C (527 °F) *
T1	450 °C (842 °F)	400 °C (752 °F) *

The responsibility for compliance with the specified maximum liquid temperature is with the plant operator.

Note: Temperature classification "Tx" is used when the liquid temperature varies and the pump could be installed in different hazarous atmospheres. In this case the user is responsible for ensuring that the pump surface temperature does not exceed that permitted in the particular hazardous atmosphere.

If an explosive atmosphere exists during the installation, do not attempt to check the direction of rotation by starting the pump unfilled. Even a short run time may give a high temperature resulting from contact between rotating and stationary components.

Where there is any risk of the pump being run against a closed valve generating high liquid and casing external surface temperatures it is recommended that users fit an external surface temperature protection device.

Avoid mechanical, hydraulic or electrical overload by using motor overload trips, temperature monitor or a power monitor and make routine vibration measurements.

In dirty or dusty environments, regular checks must be made and dirt removed from areas around close clearances, bearing housings and motors.

1.6.4.4 Preventing the build up of explosive mixtures

ENSURE THE PUMP IS PROPERLY FILLED AND VENTED AND DOES NOT RUN DRY

Ensure the pump and relevant suction and discharge pipeline system is totally filled with liquid at all times during the pump operation, so that an explosive atmosphere is prevented.

In addition it is essential to make sure that seal chambers, auxiliary shaft seal systems and any heating and cooling systems are properly filled.

If the operation of the system cannot avoid this condition the fitting of an appropriate dry run protection device is recommended (eg liquid detection or a power monitor).

To avoid potential hazards from fugitive emissions of vapor or gas to atmosphere the surrounding area must be well ventilated.

1.6.4.5 Preventing sparks

 To prevent a potential hazard from mechanical contact, the coupling guard must be non-sparking and anti-static for Category 2.

To avoid the potential hazard from random induced current generating a spark, the earth contact on the baseplate must be used.

Avoid electrostatic charge: do not rub non-metallic surfaces with a dry cloth; ensure cloth is damp.

The coupling must be selected to comply with 94/9/EC and correct alignment must be maintained.

1.6.4.6 Preventing leakage

 The pump must only be used to handle liquids for which it has been approved to have the correct corrosion resistance.

Avoid entrapment of liquid in the pump and associated piping due to closing of suction and discharge valves, which could cause dangerous excessive pressures to occur if there is heat input to the liquid. This can occur if the pump is stationary or running.

Bursting of liquid containing parts due to freezing must be avoided by draining or protecting the pump and ancillary systems.

Where there is the potential hazard of a loss of a seal barrier fluid or external flush, the fluid must be monitored.

If leakage of liquid to atmosphere can result in a hazard, the installation of a liquid detection device is recommended.

1.6.4.7 Maintenance to avoid the hazard

 CORRECT MAINTENANCE IS REQUIRED TO AVOID POTENTIAL HAZARDS WHICH GIVE A RISK OF EXPLOSION

The responsibility for compliance with maintenance instructions is with the plant operator.

To avoid potential explosion hazards during maintenance, the tools, cleaning, and painting materials used must not give rise to sparking or adversely affect the ambient conditions.
Where there is a risk from such tools or materials, maintenance must be conducted in a safe area.

It is recommended that a maintenance plan and schedule is adopted to include the following. (See section 6, *Maintenance).*

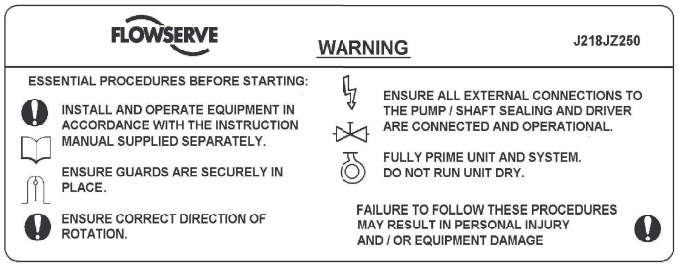
a) Any auxillary systems installed must be monitored, to ensure they function correctly.
b) Gland packings must be adjusted correctly to give visible leakage and concentric alignment of the gland follower to prevent excessive temperature of the packing or the follower.
c) Check for any leaks from gaskets and seals. The correct functioning of the shaft seal must be checked regularly.
d) Chck bearing lubricant level,and verify if the hours run show a lubricant change is required.
e) Check the duty condition is in the safe operating range for the pump.
f) Check vibration, noise level and surface temperarture at the bearings to confirm satisfactory operation.
g) Check that dirt and dust are removed from areas around close clearances, bearing housings and motors.
h) Check coupling alignment and re-align if necessary.

1.7 Name plates and warning labels

1.7.1 Nameplate

For details of nameplate, see the *Declaration of Conformity.*

1.7.2 Warning labels





Oil lubricated units only:



1.8 Noise level

Whenever pump noise level exceeds 85 dBA, attention must be given to the prevailing Health and Safety Legislation, to limit the exposure of plant operating personnel to the noise. Typical safety level requires limiting sound level to 90 dBA, for 8 hours of exposure. Thereafter, the allowable dBA value increases 5 dBA for each halving of exposure time. The usual approach is to control exposure time to the noise or to enclose the machine to reduce emitted sound.

You may have already specified a limiting noise level when the equipment was ordered, however if no noise requirements were defined then machines above a certain power level will exceed 85 dBA. In such situations, consideration must be given to the fitting of an acoustic enclosure to meet local regulations.

1.8.1 Typical sound levels for MN pumps

Pump noise level is dependent on a number of factors such as: the type of motor fitted, the operating capacity, pipe work design and acoustics of the building. Typical sound pressure levels measured in dB, and are A-weighted.

Motor Frame Size. NEMA	RPM	Motor Only Sound Pressure (dBA)	Pump only Sound Pressure (dBA)	Combination of pump and motor Sound pressure (dBA)
180	1800	60.0	65	70
	1200 & slower	55.0	55	63
210	1800	60.0	65	69
	1200 & slower	55.0	56	63
250	1800	70.0	77	77
	1200 & slower	60.0	68	69
280	1800	70.0	77	77
	1200 & slower	60.0	68	69
320	1800	65.0	77	77
	1200 & slower	65.0	69	69
360	1800	65.0	77	78
	1200 & slower	65.0	68	69
400	1800	70.0	77	78
	1200 & slower	65.0	68	69
440	1800	70.0	77	78
	1200 & slower	65	68	69

Sound pressure values indicated for the motor are extracted from typical motor manufacturer's data at no load conditions and are not guaranteed. They may vary depending on the type of motor, enclosure used, and the manufacturer. The sound pressure values for the pump are estimated levels in free field measured 1 meter from the nearest major pump surface and at a height of 1.5 meters above the floor. using speed, flow rate, motor horsepower, number of impeller vanes, and other variables. Therefore values indicated are for reference only and could exceed the estimated values by as much as 8~10 dBA depending upon factors such as installed conditions, building acoustics, foundation, piping, operating conditions, surrounding machinery. It is highly recommended to take actual field measurement of sound pressure values, apply enclosures and safety measures mandated by the local authorities and prevailing safety regulations. For all other pump and motor frame size combinations, the sound levels have to measured and safety measures have to be adopted.


For units driven by equipment other than electric motors or units contained within enclosures, see the accompanying information sheets and manuals.

1.9 Specific machine performance

For performance parameters see section 1.5, *Duty conditions*. When the contract requirement specifies these to be incorporated into User Instructions these are included here. In cases where performance data has been supplied separately to the purchaser these should be obtained and retained with these User Instructions, if required.

2 TRANSPORT AND STORAGE

2.1 Consignment receipt and unpacking

Immediately after receipt of the equipment it must be checked against the delivery and shipping documents for its completeness and that there has been no damage in transportation.

Any shortage and or damage must be reported immediately to Flowserve Pump Division and received in writing within one month of receipt of the equipment. Later claims cannot be accepted.

Check any crate, boxes, and wrappings for any accessories or spare parts that may be packed separately with the equipment or attached to the sidewalls of the box or equipment.

Each product has a unique serial number. Check that this number corresponds with that advised and always quote this number in correspondence as well as when ordering spare parts or further accessories.

2.2 Handling

Boxes, crates, pallets, or cartons may be unloaded using forklift vehicles or slings dependent on their size and construction.

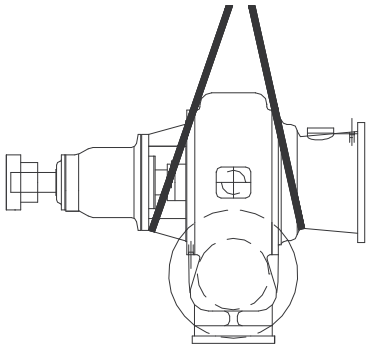
2.3 Lifting

CAUTION To avoid distortion, the pump unit should be lifted as shown in sections 2.3.1 & 2.3.3. It is strongly recommended to attempt lifting with appropriate tools and equipments only. It is strongly recommended to employ experts or approved weight-handling methods to avoid injury or loss of life.

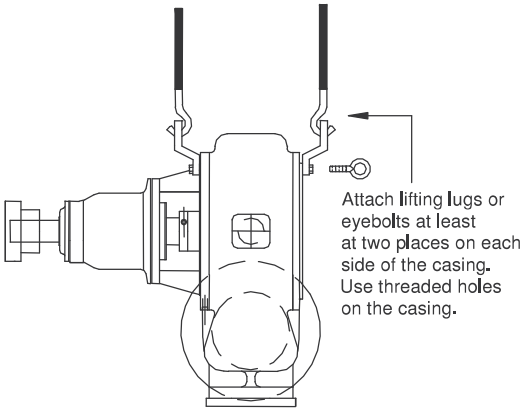
A crane must be used for all pump sets in excess of 25 kg (55 lb). Fully trained personnel must carry out lifting, in accordance with local regulations.

2.3.1 Pump only - lifting methods

a) Small pumps with the suction nozzle attached are easily lifted by straps or slings looped around the gland housing (prevent straps/slings from sliding).



b) Eyebolt lifting method



2.3.2 Driver only - lifting method

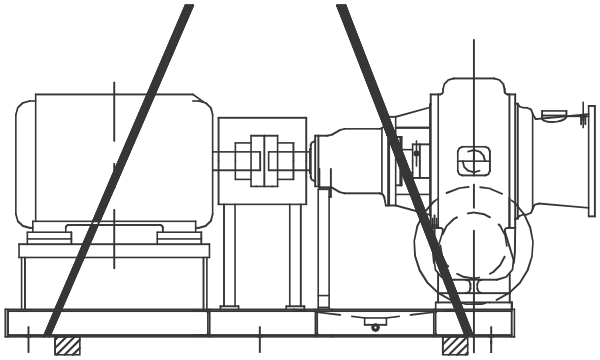
Use driver lifting lugs/ or follow instructions in driver manufacturer instruction manual.

2.3.3 Pump + driver + base plate lifting method

Use hooks to the lifting lugs (if provided to the base plate) or use strap as shown in the figure around the bolted wooden support. Depending on the pump size and weight of the driver, the driver may be supplied separately and it is the responsibility of the end user to make sure that the right lifting method is adopted for the safety reasons.

Use lifting lugs (if provided) or strap the base plate as shown. It is the responsibility of the end user to use proper lifting arrangement considering the weight and size limitations of the equipment. Contact your nearest Flowserve Service Center for unloading and installation tips.

If you are not sure about pump/driver weights, contact Flowserve.



2.4 Storage

CAUTION Store the pump in a clean and dry location away from vibration. Leave piping connection covers in place to keep dirt and other foreign material out of pump casing. Turn pump at intervals to prevent brinelling of the bearings and the seal faces (if fitted) from sticking.

2.4.1 Inspection before storage

a) Inspect the preservative coating/painted surfaces on the various parts. Touch up the areas, If necessary.
b) Inspect all covers over pump openings and piping connections. If found damaged, remove the covers and inspect interiors of the opening for any deposits of foreign materials or water.
c) If necessary, clean and preserve the interior parts as noted above to restore the parts to the "as shipped" condition. Replace covers and fasten securely.

2.4.2 Short term storage (less than 6 months)

When it is necessary to store a pump for a short period of time, place it in a dry location and protect it thoroughly from moisture.

When protective flanges are bolted to the suction and discharge nozzles at the factory, they should not be removed. Protect the bearings and the shaft against moisture, dirt, or other foreign matter. To prevent rusting in or seizing, lubricate the unit; see section 5.2, *Pump Lubricants*. Rotate the pump shaft a minimum of 5 revolutions every two weeks to keep the bearings coated with lubricant and to minimize the effects of brinelling.

CAUTION Oil lubricated anti-friction bearings are factory lubricated to prevent rusting for a short period of time only. Immediately upon receiving equipment, fill the oil reservoir to the proper level with the proper lubricant.

2.4.3 Long term storage (6 months and over)

Note: More thorough precautions are required, if the pump is scheduled to be stored for an extended period of time. Contact Flowserve before long-term storage is attempted for specific storage requirements and warranty information.

The following is a general procedure and could vary depending on the pump design or specific application.

CAUTION The storage area must be clean & dry location not subject to rapid changes in the temperature, light or humidity, and relatively free of ground transmitted vibration due to heavy construction and/or machinery.

A temperature range of 5 to 50 °C (40 to 120 °F) with humidity control is recommended.

a) Drain fluid from the pump, rotate the pump rotor once in the proper direction and blow the liquid end dry with air.
b) Coat the interior surfaces of the liquid end with rust inhibitor by brushing, spraying or fogging. Rotate the pump shaft one turn in the proper direction while coating.
c) Remove the packing and seal cage from the stuffing box to prevent corrosion due to condensation. Coat the interior machined surfaces of stuffing box with a rust inhibitor. This step may be omitted if the pumps are stored prior to initial use.
d) For grease lubricated bearing frames, fill the cavity between the bearing covers and bearings with a good grade of NGLI No. 2 lithium base grease to prevent contamination of the bearings. Ensure that the bearings are thoroughly packed with grease. Lubrication quality and quantity must be checked every six months and replaced or replenished as necessary. For oil lubricated bearing frames, upon receipt of the equipment fill the bearing frame with a good quality R&O oil capable of providing rust protection to the parts. Check the oil bi-monthly for signs of water. See section 5.2, *Pump Lubricants.*
e) Coat all threaded openings with rust inhibitor and plug. Coat machined surfaces of exposed flanges with rust inhibitor and then cover with fiber board or wood flange covers. Desiccant bags should be secured to the covers prior to putting them in place and must not contact metal surfaces.
f) Coat exposed, unpainted, and machined surfaces with a rust inhibitor.
g) Cover openings in the stuffing box head between the casing and bearing frame with plastic, taped in place, to prevent entrance of contaminants into the stuffing box and line bearing area.
h) Cover the entire pump with a clear plastic sheet for protection from dust, dirt moisture, etc. and to allow for visual inspection. The cover should be open near the top to allow for ventilation.

i) Rotate the pump shaft a minimum of 5 revolutions every two weeks to keep the bearings coated with lubricant and to minimize the effects of brinelling.

j) Refer to the vendors instruction manuals for extended storage procedure for motors, controls, coupling, etc.

k) Prior to installation or start up, a Flowserve representative should be hired to inspect all equipment to determine, if any damage or deterioration of parts has occurred and that the equipment is in "as shipped" condition.

2.5 Recycling and end of product life

At the end of the service life of the product or its parts, the relevant materials and parts should be recycled or disposed of using an environmentally acceptable method and local regulations. If the product contains substances that are harmful to the environment, these should be removed and disposed of in accordance with current regulations. This also includes the liquids and or gases that may be used in the "seal system" or other utilities.

Make sure that hazardous substances are disposed of safely and that the correct personal protective equipment is used. The safety specifications must be in accordance with the current regulations at all times.

3 DESCRIPTION

The MN type pump is a single stage, volute type dry pit, horizontal centrifugal pump designed for handling sewage, storm water, dry dock and industrial waste applications with end suction side discharge mix flow non-clog design.

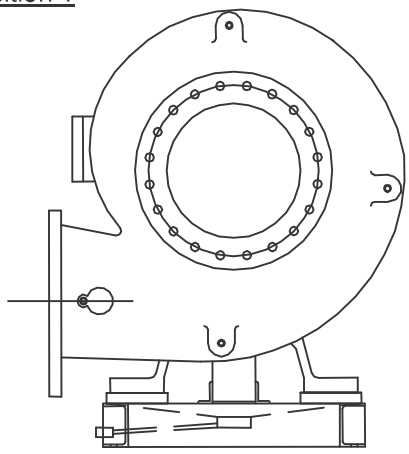
It should be noted that unscreened raw sewage may introduce some chances of clogging and therefore clogging may be totally avoided if appropriate level of screening is applied.

The information contained in this book covers horizontal close coupled pumps only where the pump and driver are installed on a common base plate.

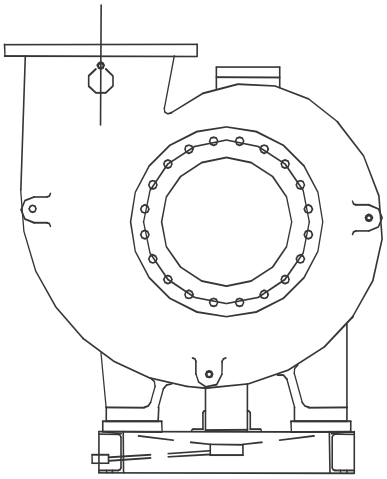
3.1 Configurations

The type MN pumps are installed in any of the following three nozzle positions.

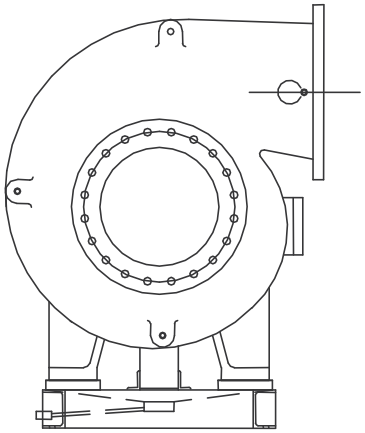
Nozzle position 1



Nozzle position 2



Nozzle position 3



3.2 Nomenclature

The pump size is engraved on the nameplate typically as below:

24- MN- 47

Nominal discharge branch size (in inches only)

Type: Horizontal close coupled

Nominal impeller diameter (in inches only)

Note: Measurement shown above for discharge branch size and impeller diameter are always provided in inches.

The typical nomenclature above is the general guide to the MN configuration description. Identify the actual pump size and serial number from the pump nameplate. Check that this agrees with the applicable certification provided. The driver will have separate name plate attached to it.

3.3 Design of major parts

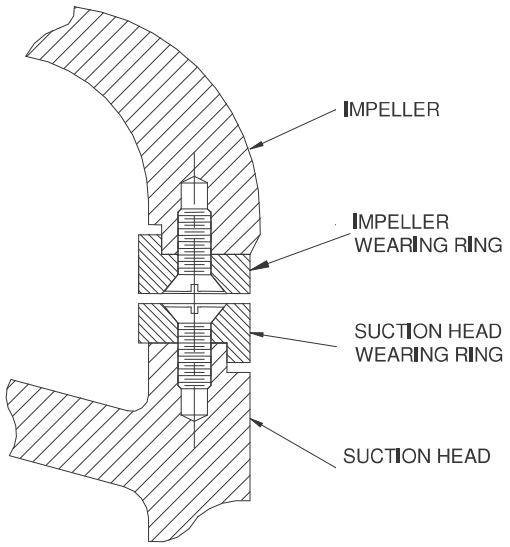
3.3.1 Pump casing and stuffing box head

The pump casing with its integrally cast discharge nozzle is of the volute type. It is machined to provide a rabbet fit for the stuffing box head and suction head. The heads are removable and are bolted to and centered in the casing. The casing and suction head are each provided with one hand hole for inspection and cleaning of the pump without dismantling. The pump has its main casing gasket axial to the shaft allowing maintenance to the rotating element by separating the impeller assembly from the casing. Suction and discharge branches remain undisturbed.

3.3.2 Impeller

The impeller hub is keyed to the shaft and held in position by an impeller nut which is set screwed to the impeller to prevent its backing off. A pair of replaceable wearing rings (optional) between the rotating impeller and the stationary suction head are provided for impeller wear resistance.

3.3.2.1 Impeller and wearing ring arrangement



3.3.3 Shaft and shaft sleeve

The pump shaft is sized to transmit the rated loads encountered with liberal safety factors, and is accurately machined over its full length. Generous fillets are used to minimize stress concentrations. It is protected from wear at the stuffing box by a removable shaft sleeve.

3.3.4 Pump bearings

MN pumps are equipped with anti-friction bearings of the tapered roller type. The line and thrust bearings are arranged in opposed mounting and can be furnished with either grease or oil lubrication. Bearings are grease lubricated as standard.

3.3.5 Bearing housing

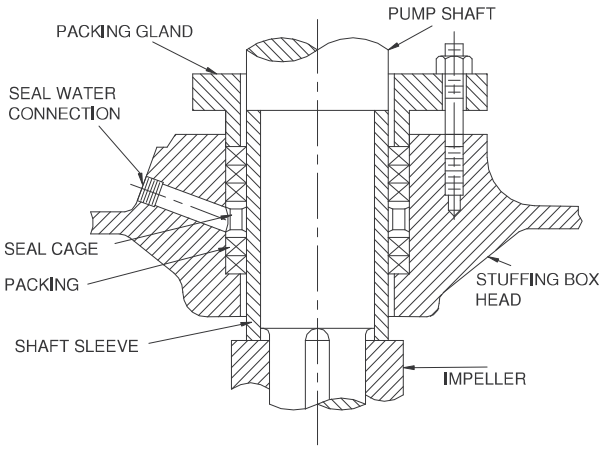
Bearings are mounted in a removable cast iron bearing frame. The frame casting offers rigid support and location to the bearings and two grease nipples enable grease-lubricated bearings to be replenished between major service intervals.

3.3.6 Stuffing box housing

The stuffing box housing cast integrally with the back head and has designed to accommodate number of sealing options. For applications requiring mechanical seals refer to the mechanical seal manufacturer's User Instructions.

Packing within the pump stuffing box seals the pump against leakage along the shaft at the point where it passes through the stuffing box. It should be packed with rings of braided, non-asbestos packing and a seal cage as shown in detail under this section. It is equipped with a removable split packing gland.

Always place two rings of packing below the seal cage and the remaining rings above the seal cage. The number of packing rings used is listed in table 6.1.8.1.



Typical gland arrangement

CAUTION The stuffing box is not packed when the pump is shipped.

A water supply of approximately 0.113 to 0.227 m^3/h (0.5 to 1.0 gpm) is to be introduced to the seal water connection to provide for packing lubrication and sealing. A steady "trickle" of water from the stuffing box will indicate proper adjustment. The sealing water supply pressure should be 0.35 to 0.69 bar (5 to 10 psi) above the pump discharge pressure. When grease sealing is used, a similar grease pressure should be maintained. A slight leakage of liquid from the stuffing box is to be expected and the gland **MUST NOT** be tightened to the point of stopping the leakage.

3.3.7 Shaft seal

The mechanical seal(s) attached to the pump shaft, seals the pumped liquid from the environment. Gland packing may be fitted as an option. See section 6.1.9 for mechanical seal maintenance information.

3.3.8 Driver

The driver is normally an electric motor. Different drive configurations may be fitted such as internal combustion engines, turbines, hydraulic motors etc driving via couplings, belts, gearboxes, drive shafts etc. Fully flexible couplings are normally used for connecting pump and drive shafts. For operating instructions, refer to the coupling manufacturer's User Instructions.

3.3.9 Couplings

Fully flexible couplings are normally used for connecting pump and drive shafts. Many variations of make and models are available. These couplings provide compensation for angular and parallel misalignment.

For coupling installation, operating and maintenance refer to the coupling manufacturer's User Instructions.

3.3.10 Accessories

Accessories may be fitted when specified by the customer.

3.4 Performance and operating limits

This product has been selected to meet the specifications of your purchase order. See section 1.5.

The following data is included as additional information to help with your installation. It is typical, and factors such as temperature, materials, and seal type may influence this data. If required, a definitive statement for your particular application can be obtained from Flowserve.

3.4.1 Operating limits

Pumped liquid temperature limits*	5 ºC (40 ºF) to +80 ºC (176 ºF)
Maximum ambient temperature*	5 ºC (40 ºF) to +40 ºC (104 ºF)
Maximum pump speed	refer to the nameplate

*Subject to written agreement from Flowserve. Special designs and materials may be available for pumps operating above and below these specified limits. Contact Flowserve for upgrade options available for your specific application.

3.4.2 Pump and impeller data

Details such as impeller diameter, wearing ring diameter are normally provided along with the test curves. If not provided with the pump documentation, please contact Flowserve.

4 INSTALLATION

Ex Equipment operated in hazardous locations must comply with the relevant explosion protection regulations. See section 1.6.4, *Products used in potentially explosive atmospheres.*

Inspection prior to installation: Six months prior to the scheduled installation date, a Flowserve Pump Division representative is to be employed to conduct an inspection of the equipment and the facility. If any deterioration of equipment is noticed, the Flowserve Pump Division representative may require a partial or complete dismantling of the equipment including restoration and replacement of some components.

4.1 Location

The pump should be placed so as to allow room for access, ventilation, maintenance and inspection with ample headroom for lifting and should be as close as practicable to the supply of liquid to be pumped.

4.1.1 General installation check-list

The following checks should be made before starting actual installation.

a) Make sure that the motor nameplate ratings and the power supply system match correctly.
b) Check the sump depth and suction pipe length match up.
c) Check the liquid level in the sump.
d) Check the installation equipment to be sure that it will safely handle the pump weight and size.
e) Check all pump connections (bolts, nuts etc) for any shipping and handling related problems.
f) Check for any evidence of lubricant leakage at the bearings.
g) Check that the shaft rotates freely.

4.1.2 Cleaning prior to installation

Remove the rust inhibitor, flange protectors, plastic covers, desiccant, and inspect the inside of the pump. Repack the stuffing box and ensure that the stuffing box drain is clear. Flush the bearings using a hot, light oil at 82° to 93°C (180° to 200° F) while the shaft is slowly rotated. Re-lubricate the bearings as explained in Section 5.0

4.1.3 Manufacturer's service

It is recommended that the services of Flowserve Company Service Representative be employed for installing and starting the pump as proper installation is vital for designed functioning, performance and reliability of the equipment.

4.1.4 Site preparation

Care should be taken to prevent an out of service pump from freezing during cold weather. Draining the pump is recommended when there is any possibility of freezing.

CAUTION Observe extreme caution when priming, venting and draining hazardous liquids.

Wear protective clothing in the presence of hazardous, caustic, volatile, flammable and hot liquids. Do not breathe toxic vapors. Do not swallow. Do not allow sparking, flames or hot surfaces in the vicinity of the equipment.

4.1.5 General tools required for installation

a) Mobile crane capable of hoisting and lowering the pump and/or motor.
b) Sets of chains, tongs and cable slings for attaching it to the pump and motor lifting eyes.
c) General purpose hand tools, pipe wrenches, end wrenches, socket set, screwdrivers, Allen wrenches, wire brush, scraper and fine emery cloth.
d) Thread sealing compound designed for stainless steel and light machinery oil.

4.2 Part assemblies

Motors may be supplied separately for some of the larger models of MN pumps. It is the responsibility of the installer to ensure that the motor is assembled to the pump and lined up as detailed in section 4.5. It is also the responsibility of the installer to take note of the pump and driver weights for proper handling before assembly is attempted.

4.3 Foundation

CAUTION There are many methods of installing pump units to their foundations. The correct method depends on the size of the pump unit, its location and limitations on its noise/vibrations. Non-compliance with the provision of correct foundation and installation may lead to failure of the pump and, as such, would be outside the terms of the warranty.

The foundation may consist of material that will afford permanent, rigid support to the discharge head and will absorb expected stresses that may be encountered in service.

Concrete foundations should have anchor bolts installed in sleeves that are twice the diameter of the bolt to allow alignment and has holes in the mounting plate as illustrated in the detail below.

The foundation should be of sufficient strength to absorb vibration (i.e., at least five times the weight of the pump unit) and to form a permanent, rigid support for the baseplate. This is important in maintaining the alignment of a close-coupled unit. A concrete foundation on a solid base should be satisfactory.

4.3.1 Pump and structural natural frequency

Pump manufacturers can calculate or determine the natural frequency of the pump assembly, including the driver. However, in a field installation, the vibrating structure comprises, in addition to the pump assembly, the foundation, the mounting, the piping, and supports. The natural frequency of the vibrating structure is determined by the stiffness of the total structure and by its equivalent mass. The natural frequency of the structure may therefore differ significantly from the natural frequency of the pump.

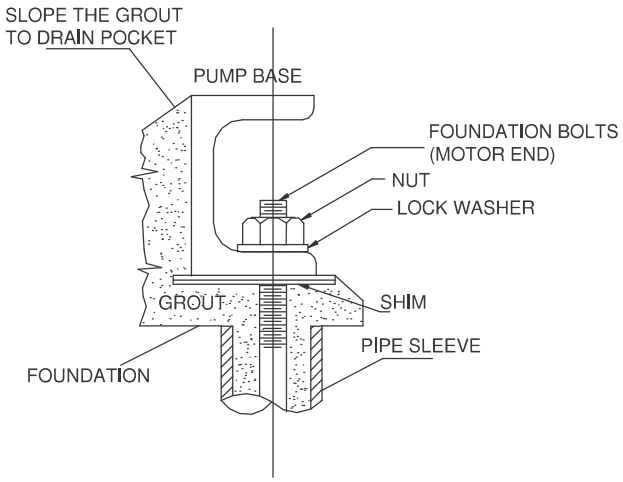
In the absence of any specific information, the pump manufacturer will assume that the piping is installed rigidly and anchored close to the pump connections.

It will also be assumed that the hold down bolts are securely embedded in a concrete foundation of infinite mass and rigidity.

The system designer must give proper consideration and must ensure that the natural frequency of the vibrating structure, as defined above, does not fall within the pump operating speed range. That person also must be aware of the much lower stiffness of fabricated system structures, relative to concrete, and the problems associated with calculating stiffness of unconventional and composite structures.

4.3.2 Typical foundation bolt arrangement

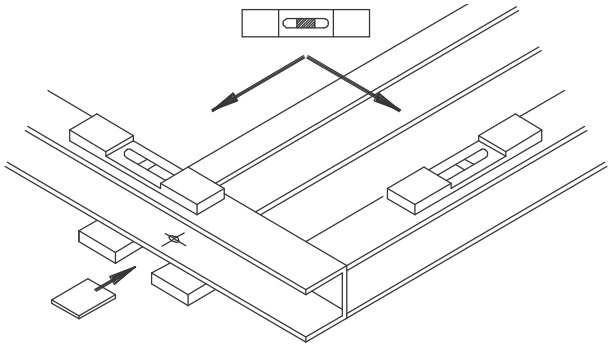
Foundation bolts of the specified size should be embedded in concrete and located according to the Elevation drawing. Each bolt should be surrounded by a pipe sleeve at least two times the diameter of the bolt. The sleeve should be held rigidly yet allow the bolts to be moved to conform to the holes in the baseplate as shown in the detail under this section.



4.3.3 Baseplate installation

a) The baseplate should be mounted onto a firm foundation, either an appropriate thickness of quality concrete or sturdy steel framework. (It should NOT be distorted or pulled down onto the surface of the foundation, but should be supported to maintain the original alignment).

b) Install the baseplate onto packing pieces evenly spaced and adjacent to foundation bolts as shown in the detail below.



c) Level with shims between baseplate and sturdy baseplate support pieces.

d) The pump and driver have been aligned before shipment however the alignment of pump and motor half coupling must be checked. If this is incorrect, it indicates that the baseplate has become twisted and should be corrected by re-shimming.

4.3.4 Baseplate leveling.

a) Prior to grouting an initial alignment check shall be performed to verify that coupling spacing and final alignment can achieved without modifying the hold down bolts.

b) As a minimum, baseplate level shall be set with a master level or a precision machinist level. Level should checked before beginning the plate leveling process by checking level repeatability when reversing 180 degrees. All base plate level measurements are taken on the equipment-mounting surface.
c) The equipment baseplate mounting surface are to be leveled longitudinally and transversely to within 200 µm/m (0.002 in./ft) for API-610 pumps and to within 400 µm/m (0.005 in./ft) for general purpose & other pumps.
d) Baseplate level is achieved by adjusting the jack screws and then snugging the anchor bolt nut to hold the base plate in place.

CAUTION If leveling nuts are used on the foundation bolts to level the base, they must be backed off as far as possible prior to grouting the base in place. Always shim near the foundation bolts, back off the leveling nuts, and tighten the foundation bolts. To do otherwise will significantly lower the structural natural frequency and result in separation of the base from the grout.

4.4 Grouting

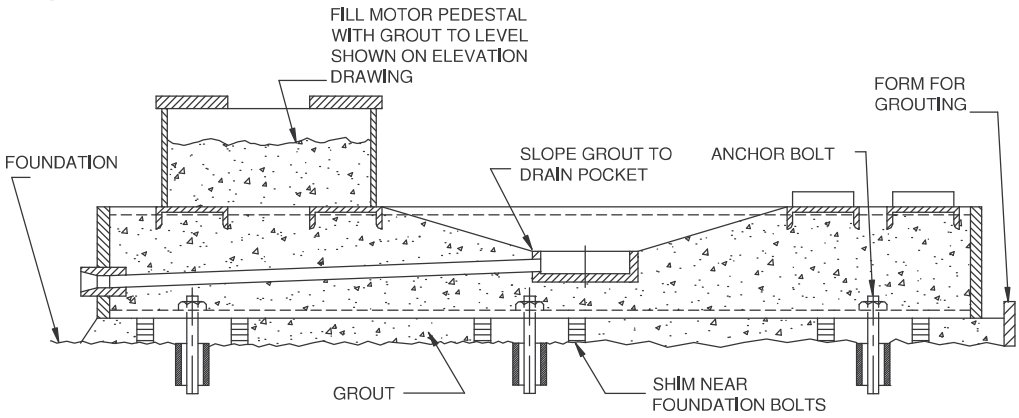
CAUTION The pump and motor must be aligned on the base prior to grouting the base in place (see alignment). Improper grouting will negate the factory pre-alignment. Grouting provides solid contact between the equipment and foundation that prevents lateral movement of the equipment and may also help in dampening resonant vibrations.

The purpose of grouting is to prevent lateral shifting of the equipment supports and not to take up irregularities in the foundation. Only non-shrinking grout should be used.

4.4.1 Recommended procedure for grouting:

a) Build a wooden form around the outside of the baseplate to contain the grout. In some cases the form is placed tightly against the lower edge of the base and in other cases it is placed a slight distance from the edge of the baseplate.
b) Saturate the top of the rough concrete foundation with water, if required before grouting. Add grout until the entire area within the baseplate is filled, including the motor pedestal and the space between the foundation bolt and pipe sleeve. A stiff wire should be used to work the grout and release any air pockets.
c) The drain pocket should be plugged before grouting. Grout in the drain pocket area should be poured to the drain pocket level and sloped to the pocket (see 4.4.1.1). The motor pedestal should be led to the level shown on the elevation drawing.
d) The grout is poured and cured slowly to prevent cracking. The grout is set for a minimum of about 48 hours. The grout should be allowed to cure at least 72 hours before it is dynamically loaded.
e) If desired, the grout surface in the drain pocket area may be treated or painted to resist oil and grease.
f) Drainage will flow through the grout encased pipe from the drain pocket to the pipe coupling on the baseplate. The drainage can be picked up at this point and directed to a convenient disposal area.

4.4.1.1 Grouting method



4.5 Initial alignment

CAUTION The equipment is shipped from the factory with the couplings pre-mounted. If they are to be removed, do so by applying heat and using a puller. Remount the couplings by heating them evenly in an oven to approximately 135 °C (275 °F). This is required as the coupling flanges are designed for a specific interference fit. Upon removal from the oven, position the hubs on the shafts as required.

DO NOT hammer on the flanges in an attempt to remove them from the shaft. To do so will permanently damage the bearings in the pump and/or the motor.

Accurate alignment of pump and drive shafts is essential for successful operation. Misalignment values as near to zero tolerance as possible are required for trouble free operation and long equipment life.

DANGER It is a must to lock out electrical supply to the pump and its accessories to prevent accidents during alignment,

A flexible coupling is used to compensate for slight changes in alignment that occur during normal operation. It is not used to correct for initial misalignment in excess of the values herein.

Although most couplings can withstand greater misalignment, such can cause excessive vibration and premature equipment failure.

4.5.1 Thermal expansion

CAUTION The pump and motor will normally have to be aligned at ambient temperature and should be corrected to allow for thermal expansion at operating temperature. For pump installations involving high liquid temperatures, the unit should be run at the actual operating temperature, shut down and the alignment checked immediately.

4.5.2 Preparation before alignment

To ensure proper alignment the following items are very important.

a) All machined mating surfaces (such as the mating flanges of pump and motor) must be clean and free of burrs and nicks.
b) Exterior strain must not be transmitted to the pump. The most common cause of trouble in this respect is forcing the piping to mate with the pump. It is recommended that flexible connectors be installed in the piping adjacent to the pump.
c) All threads should be checked for damage and repaired if necessary. Lubricate all screwed connections with a suitable thread lubricant (an anti-galling compound).

4.5.3 Alignment Procedure

DANGER Ensure pump and driver are isolated electrically and the half couplings are disconnected.

CAUTION The alignment MUST be checked. Although the pump will have been aligned at the factory it is most likely that this alignment will have been disturbed during transportation or handling. If necessary, align the motor to the pump, not the pump to the motor.

Note: Alignment is achieved by adding or removing shims under the motor feet and also moving the motor horizontally as required. In some cases where the alignment cannot be achieved, it will be necessary to move the pump before recommencing the above procedure.

a) Mount the pump and driver on the baseplate and align to the pre-drilled hold-down holes. Partially install the hold down screws and the bearing frame support screws by engaging several threads.
b) Use wedges and shims between the baseplate and foundation to level the pump and driver support pads. Ensure that the suction and discharge flanges are level, plumb, and at the proper elevation. Tighten down the anchor bolts and then recheck for level and proper orientation.
c) Check the gap between the driver and driven shafts against the dimensions shown on the installation drawing; a 1.5 mm (0.06 in.) variation is normally acceptable. For any necessary adjustment, move the driver rather than the pump.

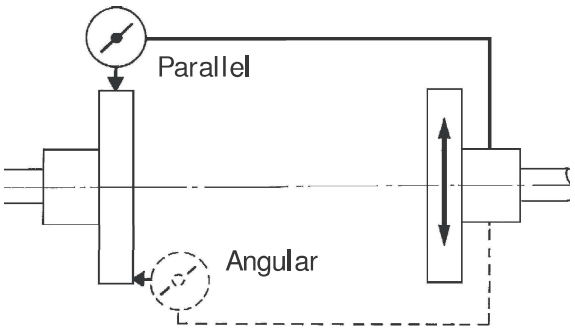
CAUTION The driver and pump were factory pre-aligned and the baseplate mounting holes were drilled and tapped based on that alignment. Failure to level the base or shifting the equipment from their natural hole centers may result in alignment difficulty that is not covered under the warranty.

d) Check parallel alignment of the coupling halves using a dial indicator. The dial indicator should be mounted on the driven half-coupling with the probe resting on the outer diameter of the driver coupling.

Rotate the pump shaft and take readings at 90° intervals to check parallel alignment.

Check angular alignment of the coupling halves with a dial indicator. The dial indicator should be mounted on the driven half flange with the probe resting on the driver half coupling flange. Rotate both the driven and driver shafts together and take readings at 90° intervals. The difference between maximum and minimum dimensions is the angular misalignment.

For couplings with narrow flanges use a dial indicator as shown here to check both parallel and angular misalignment.



e) Move and shim the driver until the shafts are accurately aligned.
f) Bolt both the pump and driver, including the pump bearing frame support, securely to the base and recheck the alignment per Step (d).
g) Grout the base plate to the foundation; see section 4.4 *Grouting.*
h) Drill, ream, and dowel the driver feet and pump feet to the base.
i) Re-check alignment as in Step (d) and connect the coupling halves and install the coupling guard.

4.5.4 Alignment criteria

The following maximum Total Indicator Reading (TIR) is recommended:
Parallel Misalignment: 0.050 mm (0.002 in.)
Total Angular Misalignment: 0.025 mm (0.001 in.) per 25 mm (1.0 in.) of coupling hub radius.

When checking parallel alignment, the TIR shown is twice the value of the actual shaft displacement.

Align in the vertical plane first, then horizontally by moving motor. When performing final alignment, check for soft-foot under the driver.

An indicator placed on the coupling should not indicate more than 0.05 mm (0.002 in.) in the vertical direction, when any driver foot fastener is loosened.

While the pump is capable of operating with the maximum misalignment shown above, maximum pump reliability is obtained by near perfect alignment of 0.05 to 0.10 mm (0.002 to 0.004 in.) TIR parallel and 0.05 mm (0.002 in.) per 100 mm (4 in.) of coupling flange diameter as TIR angular misalignment. This covers the full series of couplings available.

Note: Pumps with thick flanged non-spacer couplings can be aligned by using a straight-edge across the outside diameters of the coupling hubs and measuring the gap between the machined faces using feeler gauges, measuring wedge or calipers.

When the electric motor has sleeve bearings it is necessary to ensure that the motor is aligned to run on its magnetic centerline.

Refer to the motor User Instructions for details.

A button (screwed into one of the shaft ends) is normally fitted between the motor and pump shaft ends to fix the axial position.

CAUTION If the motor does not run in its magnetic centre the resultant additional axial force may overload the pump thrust bearing.

Complete piping and see sections 4.8, *Final shaft alignment check* up to and including section 5.0, *Commissioning, startup, operation and shutdown* before connecting driver and checking actual rotation.

4.6 Piping

CAUTION Protective covers are fitted to the pipe connections to prevent foreign bodies entering during transportation and installation. Ensure that these covers are removed from the pump before connecting pipes.

4.6.1 Pipework velocities

In order to minimize friction losses and hydraulic noise in the pipework it is good practice to choose pipework that is one or two sizes larger than the pump suction and discharge. Typically main pipework velocities should not exceed 2 m/s (6 ft/sec) suction and 3 m/s (9 ft/sec) on the discharge.

Take into account the available NPSH that must be higher than the required NPSH of the pump.

CAUTION Never use the pump as a support for piping.

4.6.1.1 Piping strains

Pipe strains are a common cause of misalignment, hot bearings, worn couplings, and vibrations.

Satisfactory operation cannot be maintained when the piping imposes a force on the pump. Misaligned piping flanges can spring and pull a pump out of position when their bolts are drawn up.

Flanges must have flat faces and be brought squarely together before the bolts are tightened.

To avoid breaking the flanges when tightening the bolting, mating pipe flanges should also have flat faces and full face gaskets should be used.

Suction and discharge pipes, and associated equipment, should be supported and anchored near, but independent of the pump so that no strain will be transmitted to the pump casing.

Note: Pipe couplings that are not axially rigid are sometimes used in the discharge and/or suction piping to avoid transmitting any piping strains caused by system pressure, thermal expansion, or pipe misalignment. Such pipe couplings allow transmittal to the pump, a force equal to the area of the expansion joint times the pressure in the piping.

These forces can have a significant magnitude and it is impractical to design the pump casing, base plate, support, etc., to withstand them.

Consequently, when pipe couplings lack axial rigidity, a suitable pipe anchor must be installed. Alternately, adequate restraining devices should be used and properly adjusted to prevent these forces from being transmitted to the pump. Maximum forces and moments allowed on the pump flanges vary with the pump size and type.

To minimize these forces and moments that may, if excessive, cause misalignment, hot bearings, worn couplings, vibration and the possible failure of the pump casing, the following points should be strictly followed:

- Prevent excessive external pipe load
- Never draw piping into place by applying force to pump flange connections
- Do not mount expansion joints so that their force, due to internal pressure, acts on the pump flange

CAUTION Ensure piping and fittings are flushed before use.

Ensure piping for hazardous liquids is arranged to allow pump flushing before removal of the pump.

4.6.2 Suction piping

Experience has shown that the major source of trouble in centrifugal pump installations, other than misalignment, is traceable to a faulty suction line. The utmost attention must be given to this portion of the installation to ensure that the pump receives hydraulically stable flow. The suction piping should be direct as possible and its length held to a minimum. If a long suction line is required, increase the pipe size to reduce friction losses. Then gradually reduce the pipe size in steps before entering the pump. The piping should be run without having high spots and should have a continual rise toward the pump. This prevents formation of air pockets.

Clean out all debris from the suction line and wet well prior to operating the pumps. Care should be exercised to keep the suction piping air tight and sealed against leakage

Note: Isolation valve in suction line is strongly recommended to facilitate future servicing needs. An isolation valve is recommended in the suction line, if a positive head exists.

4.6.2.1 Suction piping guidelines

a) The inlet pipe should be one or two sizes larger than the pump inlet bore and pipe bends should be as large a radius as possible.
b) Pipework reducers should have a maximum total angle of divergence of 15 degrees.
c) On suction lift the piping should be inclined up towards the pump inlet with eccentric reducers incorporated to prevent air locks.
d) On positive suction, the inlet piping must have a constant fall towards the pump.
e) Flow should enter the pump suction with uniform flow, to minimize noise and wear. This is particularly important on large or high-speed pumps that should have a minimum of four diameters of straight pipe on the pump suction between the elbow and inlet flange.
f) Inlet strainers, when used, should have a net 'free area' of at least three times the inlet pipe area.
g) Do not install elbows at an angle other than perpendicular to the shaft axis. Elbows parallel to the shaft axis will cause uneven flow.
h) Except in unusual circumstances strainers are not recommended in inlet piping. If considerable foreign matter is expected a screen installed at the entrance to the wet well is preferable.
i) Fitting an isolation valve will allow easier maintenance.
j) Never throttle pump on suction side and never place a valve directly on the pump inlet nozzle.

4.6.3 Discharge piping

A check valve and a gate valve are normally installed in the discharge line. The check valve is normally placed between the pump and the gate valve to protect the pump from any excessive back pressure and reverse rotation that may be caused by water running back through the pump casing during a driver or power failure. Any reverse flow through the pump or excessive back pressure should be kept to its absolute minimum. The check valve will also prevent suspended solids from accumulating in the casing and will increase wearing ring life.

- Pipework reducers should have a maximum total angle of divergence of 9 degrees
- Fitting an isolation valve will allow easier maintenance
- A compound pressure gauge should be connected to the suction and a pressure gauge to the discharge side of each pump. Mount the gauges at a convenient location as they are necessary for any adequate check on the pump performance

4.6.4 Auxiliary piping

4.6.4.1 Drains

Pipe pump casing drains and gland leakage to a convenient disposal point.

4.6.4.2 Pumps fitted with gland packing

When suction pressure is below ambient pressure, it is necessary to feed the gland packing with liquid to provide lubrication and prevent the ingress of air. This is normally achieved with a supply from the pump discharge volute to the stuffing box.

If the pumped liquid is dirty and cannot be used for sealing, a separate clean compatible liquid supply to the gland at 1 bar (15 psi) above the suction pressure is recommended.

4.6.4.3 Pumps fitted with mechanical seals

Single seals requiring re-circulation will normally be provided with the auxiliary piping from pump casing already fitted.

Special seals may require different auxiliary piping to that described above. Consult seal User Instructions and/or Flowserve, if unsure of correct method or arrangement.

For pumping hot liquids, to avoid seal damage, it is recommended that any external flush/cooling supply be continued after stopping the pump.

4.6.5 Final checks

Check the tightness of all bolts in the suction and discharge pipework. Check also the tightness of all foundation bolts.

4.7 Electrical connections

DANGER Electrical connections must be made by a qualified Electrician in accordance with relevant local national and international regulations.

It is important to be aware of the EUROPEAN DIRECTIVE on potentially explosive areas where compliance with IEC60079-14 is an additional requirement for making electrical connections.

It is important to be aware of the EUROPEAN DIRECTIVE on electromagnetic compatibility when wiring up and installing equipment on site. Attention must be paid to ensure that the techniques used during wiring/installation do not increase electromagnetic emissions or decrease the electromagnetic immunity of the equipment, wiring or

any connected devices. If in any doubt contact Flowserve for advice.

DANGER The motor must be wired up in accordance with the motor manufacturer's instructions (normally supplied within the terminal box) including any temperature, earth leakage, current and other protective devices as appropriate. The identification nameplate should be checked to ensure the power supply is appropriate.

A device to provide emergency stopping must be fitted. If not supplied pre-wired to the pump unit, the controller/starter electrical details will also be supplied within the controller/starter. For electrical details on pump sets with controllers see the separate wiring diagram.

CAUTION See section 5.4, *Direction of rotation* before connecting the motor to the electrical supply.

4.8 Final shaft alignment check

After connecting piping to the pump, rotate the shaft several times by hand to ensure there is no binding and all parts are free.

CAUTION Recheck the coupling alignment, as described in section 4.5, to ensure no pipe strain. If pipe strain exists, correct piping.

4.9 Protection systems

Ex The following protection systems are recommended particularly if the pump is installed in a potentially explosive area or is handling a hazardous liquid. If in doubt consult Flowserve.

If there is any possibility of the system allowing the pump to run against a closed valve or below minimum continuous safe flow a protection device should be installed to ensure the temperature of the liquid does not rise to an unsafe level.

If there are any circumstances in which the system can allow the pump to run dry, or start up empty, a power monitor should be fitted to stop the pump or prevent it from being started.

This is particularly relevant if the pump is handling a flammable liquid.

If leakage of product from the pump or its associated sealing system can cause a hazard it is recommended that an appropriate leakage detection system is installed.

To prevent excessive surface temperatures at bearings it is recommended that temperature or vibration monitoring is conducted on a regular basis.

5 COMMISSIONING, STARTUP, OPERATION AND SHUTDOWN

CAUTION These operations must be carried out by fully qualified personnel.

Note: To ensure safety, keep the power supply turned off to the motor and pump accessories during commissioning.

5.1 Pre-commissioning procedure

The gland is to be filled with grease and flush supply to be in place. Flush piping to be checked for leaks. Mechanical seals to be checked for leaks, flush flow and pressure. In addition, follow the list below.

a) Pump bearings must be filled with the recommended lubricant to avoid running dry and to guarantee acceptable performance of the pump.
b) Check all vent connections for complete filling of the pump.
c) Check the direction of rotation of the pump (Coupling spacer dismantled).
d) The pump rotor and the shaft seal must be in correct axial position.
e) Check the readiness of all auxiliary systems (seal sys. lubrication sys.,) for start up.
f) All pipe work, including the internal and the auxiliary pipe work, must be connected correctly and must be absolutely tight. Check the tightness of all connections of the auxiliary pipe work. The suction valve must be open, the discharge valve shall be closed or partially open as required.
g) Turn the pump by hand, if required with the help of a lever, to check the free rotation of the rotor. The rotor must turn uniformly and noiselessly. Some resistance may be felt due to the friction in the bearings and seals.
h) Check the readiness of the driver for start up.

Refer to driver User instructions before energizing the motor.

5.2 Pump lubricants

Determine the mode of lubrication of the pump set, e.g. grease, oil, and product lubrication.

CAUTION For oil lubricated pumps, fill the bearing housing with correct grade of oil to the correct level, check sight glass.

Oil quantities are provided in section 5.2.5.2. Grease lubricated pumps and electric motors are supplied pre-greased. See section 5.2.6.2 for approximate grease filling quantities information. Other drivers and gearboxes, if appropriate, should be lubricated in accordance with their User Instructions.

5.2.1 Bearings-oil lubricated

MN pumps can be furnished with oil lubricated bearings at the customers request. However, although the oil and grease lubricated bearing frames are physically interchangeable in whole, individual parts may or may not be interchangeable. Check with the nearest Flowserve Sales Representative to determine inter-changeability of the parts.

Oil circulation and lubrication is achieved by the bearing rollers pumping oil through the bearings towards the covers. During operation, a level drop of up to 6 mm (0.25 in.) can occur due to this bearing pumping action. If oil is added during operation, do not adjust to the static oil level as this over-oiling may cause the bearing end cover seals to leak.

CAUTION Before starting the pump, check the bearing frame oil level and add oil to the bearing frame as necessary. Refer to the table in sec 5.2.5.2 for the correct bearing frame oil level. Assuming that the oil level in the bearing frame is properly maintained and contamination is minimal.

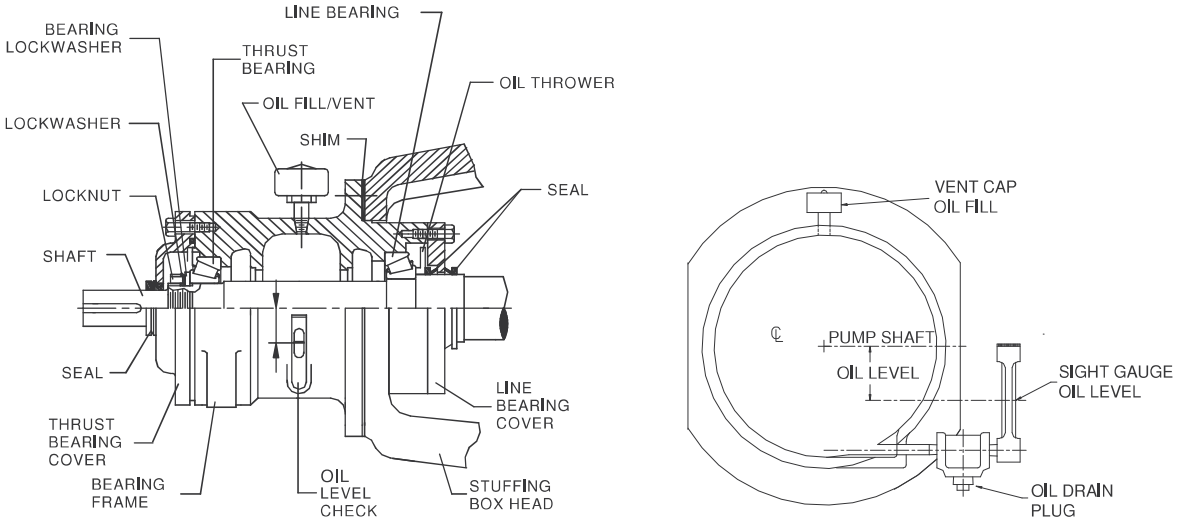
CAUTION Oil lubricated anti-friction bearings are factory lubricated to prevent rusting for a short period of time only. Immediately upon receiving equipment, fill the oil reservoir to the proper level with the proper lubricant. If the units are to be stored longer than six months, fill the bearing frame cavity with a good quality R&O oil capable of providing rust protection to the parts. See section 2.4.3 for details on *Long Term Storage*.

5.2.2 Filling the oil reservoir

Pumps with oil lubricated bearings are equipped with an externally mounted oil level sight gauge and vent cap as shown in figure. Introduce oil into the bearing frame by removing the vent and fill the bearing housing to the level as given in Table 5.2.5.2. The oil level measured from the centerline of the shaft. See detail in section 5.2.2.1 below. After filling with oil, mark the correct static oil level on the sight glass, and maintain this level to within ±3 mm (±0.125 in.).

5.2.2.1 Bearing housing showing oil fill/vent and oil level checker (typical)

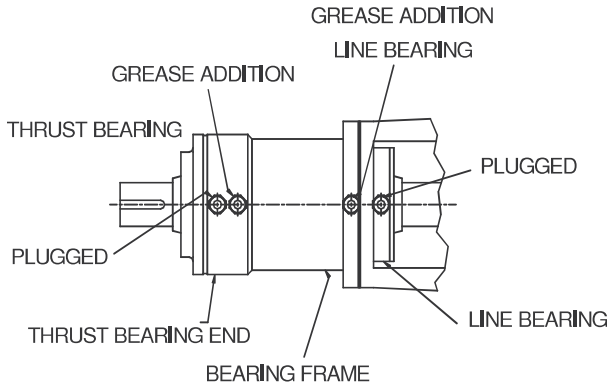
Note: This is a STATIC oil level and the oil level will drop during operation; verify that the vent plug is properly installed so that a false level is not realized.



5.2.3 Bearings–grease lubricated

MN pumps are normally furnished with grease lubricated bearings. Grease fittings are provided on the line and thrust bearing ends of the bearing housing; see detail below. Before starting the pump, check the bearing frame cavities for grease and add grease as necessary. For suggested frequency and grease quantity for re-lubrication, refer to section 5.2.6.2

Proper grease lubrication is very important. Anti-friction bearings can be over-greased as well as under-greased. After start up, remove the grease fittings or pipe plug closest to the cover and allow the excess grease to flow out.



Grease fitting locations

CAUTION The grease flowing out of the bearing frame may be hot and under pressure. Bearings may run slightly hot immediately after adding new grease. Monitor the bearing temperatures until they return to normal. Any marked increase in the temperature of the bearings after return to normal operation may indicate the presence of dirt in the bearing, insufficient cleaning, improper re-assembly, or a faulty/damaged bearing. In this case the pump should be immediately stopped and the cause of the trouble investigated.

5.2.4 Bearing operating temperatures

The maximum operating temperatures for anti-friction bearings will differ from unit to unit. In general, bearing frames using Timken bearings can run 40 °C (100 °F) or higher above ambient. This should be no cause for alarm. However, continuously rising temperatures, or an abrupt temperature rise, are indicative of possible trouble.

These symptoms require immediate stopping of the pump and a thorough investigation to determine the cause of the trouble.

5.2.5 Selection of oil lubricants

The bearings are to be lubricated with a premium quality paraffinic based turbine or R&O lubricating oil. The oil should have an ISO 68 Grade, an approximate Viscosity Index (VI) of 100, a pour point of -30 °C (-22 °F), and a Timken OK load rating of 16kg (35 lbs) minimum. The oil should shed water and contain oxidation, rust, and foam inhibitors. The following oils are acceptable. Others oils meeting the above requirements may also be used.

5.2.5.1 Recommended oil lubricants

AMOCO	Amokon 68 / American Industrial Oil 68
CHEVRON	Turbine Oil GST 68 / Machine Oil R&O 68
EXXON	Terrestic 68
SHELL	Turbo T 68
TEXACO	Regal R&O 68
BP	Turbinol Select-68

5.2.5.2 Recommended oil fill quantities

See 5.2.2.1 for details

Fr. No	Line Bearing, Timken Cup # Cone #	Thrust Bearing, Timken Cup # Cone #	Initial Fill Vol. m^3 (fl·oz.)	Oil Level mm (in.) ±3 mm (±0.125 in.)
6A	HM218210 HM218248	9220 92853	0.0019 (64)	58 (2.3)
7H	JHM522610 JHM522649	98788 98400	0.0049 (166)	75 (2.9)
8H	95925 95500	HH926710 HH926749	0.0076 (257)	91 (3.6)
8HA	82931 82576	HH926710 HH926749	0.0076 (257)	91 (3.6)
9H	H239610 H239640	H936310 H936349	0.0110 (385)	124 (4.9)
9HA	93125 93825	H936310 H936349	0.0110 (385)	124 (4.9)

5.2.6 Recommended grease lubricants

The bearings are to be lubricated with a premium quality Lithium based NGLI # 2 grease suitable for anti-friction bearings use. The grease should have a viscosity range of 150 to 220 cSt (mm^2/sec) at 40 °C (100 °F) and Timken load rating of 16 kg (35 lb.) minimum. The grease should contain rust and oxidation inhibitors and extreme pressure additives.

See table 5.2.6.1 for grease types that are acceptable. Equivalents may also be used.

5.2.6.1 Recommended grease lubricants

AMOCO	Amolith EP2
CHEVRON	Duralith EP2
EXXON	Lidok EP2
MOBIL	Mobilux EP2
SHELL	Alvania EP2
TEXACO	Multifak EP2
BP	Energrease LS EP 2

5.2.6.2 Recommended grease fill quantities

Frame No.	Line bearing, Timken Cup # Cone #	Thrust bearing, Timken Cup # Cone #	Initial fill grams (oz)				Suggested re-lubrication grams (oz)		
			Line Bearing		Thrust Bearing		Frequency of lubrication		
			Conn.[1]	Cover [2]	Conn.[1]	Cover [2]	Hours	Line Brg	Thr. Brg
4T	JLM506849 JLM506810	M804048 M804010	43 (1.5)	9 (0.3)	28 (1.0)	23 (0.8)	300	9 (0.3)	9 (0.3)
5T	29685 29620	72225C 72487	56 (2.0)	14 (0.5)	56 (2.0)	56 (2.0)	300	11 (0.4)	11 (0.4)
6	6536 6580	6536 6580	369 (13.0)	114 (4.0)	369 (13.0)	225 (8.0)	300	28 (1.0)	28 (1.0)
6A	HM218210 HM218248	9220 **9285** [3]	56 (2.0)	42 (1.5)	85 (3.0)	127 (4.5)	300	14 (0.5)	14 (0.5)
7L	JM822010 JM822049	9321 9386H	595 (21.0)	85 (3.0)	370 (13.0)	255 (9.0)	300	28 (1.0)	28 (1.0)
7H	JHM522610 JHM522649	98788 98400	480 (17.0)	225 (8.0)	565 (20.0)	650 (23.0)	300	28 (1.0)	28 (1.0)
8L	74850 74500	HM926710 HM926740	990 (35.0)	200 (7.0)	680 (24.0)	310 (11.0)	500	42 (1.5)	42 (1.5)
8H	95925 95500	HH926710 HH926749	880 (31.0)	425 (15.0)	1135 (40.0)	1135 (40.0)	500	56 (2.0)	56 (2.0)
8HA	82931 82576	HH926710 HH926749	880 (31.0)	625 (22.0)	1135 (40.0)	1135 (40.0)	500	56 (2.0)	56 (2.0)
9H	H239610 H239640	H936310 H936349	1560 (55.0)	625 (22.0)	1845 (65.0)	1700 (60.0)	500	70 (2.5)	70 (2.5)
9HA	93125 93825	H936310 H936349	1560 (55.0)	480 (17.0)	1845 (65.0)	1700 (60.0)	500	70 (2.5)	70 (2.5)

Superscripts 1, 2, and 3 shown in table and their meaning.

1 This value indicates the amount of grease to be added to the bearing through the grease connection. For horizontal units, the space between the bearing and the grease retainer will be 2/3 full.

2 This value indicates the amount of grease required for packing the space between each bearing and its respective cover. The space between bearings and their respective covers should be 1/3 full.

3 This bearing must comply with Timken Co. inspection code 20481.

5.2.7 Oil and grease change schedule

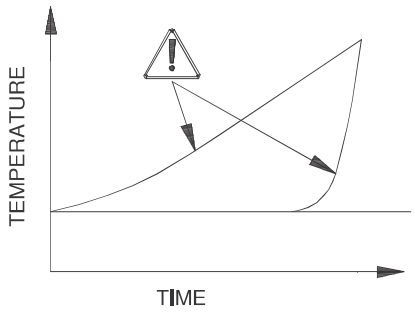
5.2.7.1 Oil lubricated bearings

Flowserve recommends an oil change interval of approximately 8000 hours or 12 months, whichever occurs first. For pumps on hot service or in severely damp or corrosive atmosphere, the oil will require changing more frequently. Lubricant and bearing temperature analysis can be useful in optimizing lubricant change intervals.

The lubricating oil should be a high quality mineral oil having foam inhibitors. Synthetic oils may also be used if checks show that the rubber oil seals will not be adversely affected.

The bearing temperature may be allowed to rise to 50 ºC (122 ºF) above the ambient, but should not exceed 82 ºC (180 ºF).

CAUTION A continuously rising temperature, or an abrupt rise is an indication of potential failure.



5.2.7.2 Grease lubricated bearings

See section 5.2.6.2 for frequency of lubrication in hours. The characteristics of the installation and severity of service will determine the frequency of lubrication.

Lubricant and bearing temperature analysis can be useful in optimizing lubricant change intervals.

The bearing temperature may be allowed to rise to 55 ºC (131 ºF) above ambient but should not exceed 95 °C (203 °F). For most operating conditions a quality grease having a lithium soap base and NLGI consistency of No 2 is recommended. The drop point should exceed 175 ºC (350 ºF).
See table 5.2.6.1 for recommended grease lubricants.

CAUTION Never mix greases containing different bases, thickeners or additives.

5.3 Impeller clearance

(See section 6.1.6)

5.4 Direction of rotation

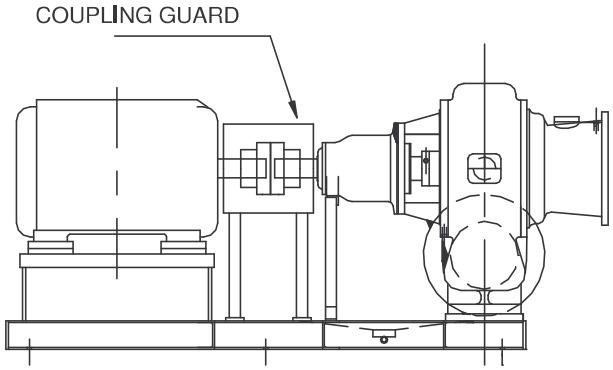
CAUTION Ensure the pump is given the same rotation as the pump direction arrow cast on the pump casing/driver.

To avoid dry running, the pump must either be filled with liquid or have the flexible coupling disconnected before driver is switched on.

CAUTION If maintenance work has been carried out to the site's electricity supply, the direction of rotation should be re-checked as above, in case the supply phasing has been altered.

5.5 Guarding

In most cases guarding is supplied fitted to the pump set. If this has been removed or disturbed ensure that all the protective guards around the pump coupling and exposed parts of the shaft are securely fixed.



5.6 Priming and auxiliary supplies

CAUTION Ensure all electrical, hydraulic, pneumatic, sealant and lubrication systems (as applicable) are connected and operational.

CAUTION Ensure the inlet pipe and pump casing are completely full of liquid before starting continuous duty operation.

CAUTION Do not run the pump dry!

CAUTION Observe extreme caution when priming, venting and draining hazardous liquids. Wear protective clothing in the presence of hazardous, caustic, volatile, inflammable or hot liquids. Do not breath the toxic vapors. Do not allow sparking, flames or hot surfaces in the vicinity of the equipment.

Priming a centrifugal pump means removing the air, gas or vapor from the pump casing and suction piping. Internal pump parts depend on liquid for lubrication and may seize if the casing is not completely filled with liquid prior to starting. Priming a pump can be accomplished by any of the following methods, depending on the installation.

5.6.1 Positive suction head (pressure)

With a positive suction head on the pump, priming is accomplished in the following manner:

a) Open all suction valves to allow liquid to enter the suction piping and pump casing.
b) Open the vent valve located on the highest point on the casing (or discharge piping) to release all entrapped air.
c) When liquid appears as a steady stream (no air bubbles) the pump is primed and may be started.

5.6.2 Negative suction head (vacuum)

Priming by Ejector or Exhauster

When steam, high pressure water or compressed air is available, the pump may be primed by attaching an ejector to the highest point for venting the pump casing.
Proceed as follows:
a) Open the suction valve.
b) Start the ejector to exhaust the air from the pump and suction line.
c) When the ejector waste pipe exhausts liquid continuously, the pump is primed and may be started.

To ensure that the prime is not lost, allow the ejector to operate until the pump is started and is up to operating speed. A continuous stream of liquid will indicate that the prime is being held.

5.6.3 Priming by vacuum pump

Priming may be accomplished by the use of a wet type vacuum pump. The procedure is the same as priming by ejector.

5.6.4 Suction pressure above atmospheric pressure

Horizontal pumps: open vent connection on top of the pump to allow the trapped air to escape. Let liquid run out until free from air bubbles.

5.6.5 Suction lift

Fill suction pipe and casing with liquid at a pressure of 1 to 2 bar (14.5 to 29 psi) from an external source. Vent as described in Sections 5.6.1 thru 5.6.4.

5.7 Starting the pump

5.7.1 Preliminary to starting

CAUTION Read this instruction book thoroughly before starting the unit. Make sure the following items are checked before starting:

a) Pack the stuffing box and leave the gland nuts loose.
b) Verify alignment has been accomplished as indicated in Section 4.5.
c) Lubricate the driver, as required, per the drive manufacturer's instructions.
d) Check the direction of rotation of the driver. The arrow on the pump casing will show the correct rotation.
e) Lubricate the couplings, as required per the coupling manufacturer's instructions.
f) Check pump bearing lubrication as indicated in Section 5.
g) The pump must be filled with liquid (primed). If a priming device is used, it must be operated before the pump is started.
h) Packing:
   - For packed boxes, the gland nuts must be loose
   - Fill the packing grease reservoir if using a grease packed box, or if the unit is equipped with an independent flush to the stuffing box, turn on the flush liquid and verify that the proper pressure and flow are being supplied
i) If the wearing rings are provided with a flushing provision, turn on the flush liquid.

5.7.2 Pump startup

The procedure for starting the unit will vary somewhat with each installation, however the following steps generally apply.

CAUTION Ensure flushing and/or cooling/ heating liquid supplies are turned ON before starting the pump.

a) Turn the pump over by hand to verify that the pump rotor turns freely. If it is bound, do not operate the pump until the cause of the trouble is located.
b) Make sure the suction valve is open.
c) CLOSE the outlet valve.
d) Prime the pump.
e) Ensure all vent connections are closed before starting.
f) Check the motor connections.
g) Start the driver per the manufacturer's instruction.
h) Open the discharge valve slowly as pressure is built up on the discharge side of the pump. If the valve does not open within three minutes, shutdown the unit and determine the cause.
i) CAUTION If NO pressure, or LOW pressure, STOP the pump. Refer to section 7, *Faults; causes and remedies*, for fault diagnosis.
j) Adjust the gland nuts on the packing;
k) When in service, monitor oil level, bearing temperature, suction, discharge, and stuffing box pressure, stuffing box operation, noise, and vibration for several hours.

5.7.3 Normal vibration levels, alarm and trip

For guidance and general data, the subject pump types with rigid supports are classified based on power ratings as provided within the International Standards and recommended maximum levels below are based on those standards.

CAUTION Alarm and trip values for installed pumps should be based on the actual measurements (N) taken on the pump in a fully commissioned (new) condition. Measuring vibration at regular intervals and recording will help to track any deterioration in pump or operating conditions.

Motor rating kW (hp)	Vibration velocity-unfiltered	mm/sec (in./sec) r.m.s
0.75-to 7.5 (1-10)	N	6.6 (0.22)
7.5 to 75 (10-100)	N	6.6 (0.22)-8.0(0.32)
75-298 (100-400)	N	8.0 (0.32)-8.6(0.34)
298-750 (400-1000)	N	8.6 (0.34)

Alarm = N X 1.25. TRIP = N X 2.0

5.7.4 Motor start/stop frequency

Even though motors are normally suitable for at least two consecutive starts, it is recommended to restart only after coasting to rest between starts (minimum of 15 minutes gap is recommended) with the motor initially at ambient temperature. If more frequent starting is necessary, refer to driver manufacturer's User Instructions.

CAUTION The number of motor start and stops in any given time affects motor life.

If the motor is expected to experience multi starts in any given time, please refer to the driver's user instructions before the pump is put into operation.

5.8 Running or operation

5.8.1 Venting the pump

Vent the pump to enable all trapped air to escape taking due care with hot or hazardous liquids.

Under normal operating conditions, after the pump has been fully primed and vented, it should be unnecessary to re-vent the pump. See related information in Section 5.6.

5.8.2 Pumps fitted with packed gland

If the pump has a packed gland there must be some leakage from the gland. Gland nuts should initially be finger-tight only. Leakage should take place soon after the stuffing box is pressurized.

Ex The gland must be adjusted evenly to give visible leakage and concentric alignment of the gland ring to avoid excess temperature. If no leakage takes place the packing will begin to overheat. If overheating takes place the pump should be stopped and allowed to cool before being re-started. When the pump is re-started, check to ensure leakage is taking place at the packed gland.

If hot liquids are being pumped it may be necessary to slacken the gland nuts to achieve leakage.

The pump should be run for 30 minutes with steady leakage and the gland nuts tightened by 10 degrees at a time until leakage is reduced to an acceptable level. As a thumb rule, a minimum of 30 drops/minute for every inch of sleeve diameter will keep the gland in safe zone. Seating of the packing may take another 30 minutes.

Care must be taken when adjusting the gland on an operating pump. Safety gloves are essential. Loose clothing must not be worn to avoid being caught up by the pump shaft. Shaft guards must be replaced after the gland adjustment is complete.

CAUTION Never run gland packing dry, even for a short time.

5.8.3 Pumps fitted with mechanical seal

Mechanical seals require no adjustment. Any slight initial leakage will stop when the seal is run in.

Before pumping dirty liquids it is advisable, if possible, to run in the pump mechanical seal using clean liquid to safeguard the seal face.

CAUTION External flush or quench should be started before the pump is run and allowed to flow for a period after the pump has stopped.

CAUTION Never run a mechanical seal dry, even for a short time.

5.8.4 Pump and motor bearings temperature

Ex If the pumps are working in a potentially explosive atmosphere, temperature or vibration monitoring at the bearings is recommended.

If bearing temperatures are to be monitored it is essential that a benchmark temperature is recorded at the commissioning stage and after the bearing temperature has stabilized.

- Record the bearing temperature (t) and the ambient temperature (ta)
- Estimate the likely maximum ambient temperature (tb)
- Set the alarm at (t+tb-ta+5) °C [(t+tb-ta+10) °F] and the trip at 100 °C (212 °F) for oil lubrication and 105 °C (220 °F) for grease lubrication

It is important, particularly with grease lubrication, to keep a check on bearing temperatures. After start up the temperature rise should be gradual, reaching a maximum after approximately 1.5 to 2 hours. This temperature rise should then remain constant or marginally reduce with time.

5.8.5 Reduced Capacity operation

Generally, Flowserve non-clog pumps are designed for continuous operation above 65% of the peak efficiency capacity at maximum RPM and impeller diameter. They are suitable for occasional or intermittent operation at capacities outside these limits, however, pump operation may be noisy and component life may be reduced.

These limitations are placed because the impellers have wide discharges and at other capacities high magnitudes of radial reactions are encountered and flow re-circulation may occur. This is an inherent design characteristic for a pump of this type.
In many cases, particularly in sewage pumping applications, reduced capacities are met by a reduction in pump speed and no throttling is used. Under these circumstances, these part capacity applications are not nearly so critical because of lower pump speed and relatively lower pump operating heads. Refer application requirements with pump operation at other capacities to your nearest Flowserve representative.

5.8.6 Suction lift

Sometimes the suction conditions imposed upon a centrifugal pump are extremely unfavorable and lead to a complete breakdown of the pump operation. The suction lift must be kept within the suction limitations for which the pump was sold. If the original operating conditions must be changed for any reason, consult your nearest Flowserve Sales Representative.

Care should also be exercised to keep the suction piping air tight and sealed against leakage.

5.9 Stopping and shutdown

a) CAUTION Close the outlet valve, but ensure that the pump runs in this condition for no more than a few seconds.
b) Shut down the driver according to driver manufacturer's instruction.
c) For pumps operating under positive suction head, after stopping the pump, continue injecting water into the stuffing box to avoid the entrance of contaminants into the stuffing box sealing area, if required
d) CAUTION Do not tighten the gland to stop liquid leaking out or air leaking into the stuffing box
e) If wearing rings are provided with a flushing provision, turn off liquid to the rings several minutes after the pump is stopped.

5.10 Hydraulic, mechanical and electrical duty

This product has been supplied to meet the performance specifications of your purchase order, however it is understood that during the life of the product these may change. The following notes may help the user decide how to evaluate the implications of any change. If in doubt contact your nearest Flowserve office.

5.10.1 Specific gravity (SG)

Pump capacity and total head in meters (feet) do not change with SG, however pressure displayed on a pressure gauge is directly proportional to SG. Power absorbed is also directly proportional to SG. It is therefore important to check that any change in SG will not overload the pump driver or over-pressurize the pump.

5.10.2 Viscosity

For a given flow rate the total head reduces with increased viscosity and increases with reduced viscosity. Also for a given flow rate the power absorbed increases with increased viscosity, and reduces with reduced viscosity. It is important that checks are made with your nearest Flowserve office, if changes in viscosity are planned.

5.10.3 Pump speed

Changing pump speed effects flow, total head, and power absorbed, $NPSH_R$, noise and vibration. Flow varies in direct proportion to pump speed, head varies as speed ratio squared and power varies as speed ratio cubed. The new duty, however, will also be dependent on the system curve. If increasing the speed, it is important therefore to ensure the maximum pump working pressure is not exceeded, the driver is not overloaded, $NPSH_A > NPSH_R$, and that noise and vibration are within local requirements and regulations.

5.10.4 Net positive suction head ($NPSH_A$)

NPSH available ($NPSH_A$) is a measure of the head available in the pumped liquid, above its vapor pressure, at the pump suction branch.

NPSH required ($NPSH_R$) is a measure of the head required in the pumped liquid, above its vapor pressure, to prevent the pump from cavitating. It is important that $NPSH_A > NPSH_R$. The margin between $NPSH_A > NPSH_R$ should be as large as possible.

If any change in $NPSH_A$ is proposed, ensure these margins are not significantly eroded. Refer to the pump performance curve to determine exact requirements particularly if flow has changed. If in doubt please consult your nearest Flowserve office for advice and details of the minimum allowable margin for your application.

5.10.5 Pumped flow

Flow must not fall outside the minimum and maximum continuous safe flow shown on the pump performance curve and or data sheet.

6 MAINTENANCE

It is the plant operator's responsibility to ensure that all maintenance, inspection and assembly work is carried out by authorized and qualified personnel who have adequately familiarized themselves with the subject matter by studying this manual in detail.

Any work on the machine must be performed when it is at a standstill. It is imperative that the procedure for shutting down the machine is followed, as described in section 5.9.

On completion of work all guards and safety devices must be re-installed and made operative again.

Before restarting the machine, the relevant instructions listed in section 5, *Commissioning, start up, operation and shut down* must be observed.

CAUTION Oil and grease leaks may make the ground slippery. Machine maintenance must always begin and finish by cleaning the ground and the exterior of the machine.

If platforms, stairs and guard rails are required for maintenance, they must be placed for easy access to areas where maintenance and inspection are to be carried out.

The positioning of these accessories must not limit access or hinder the lifting of the part to be serviced.

When air or compressed inert gas is used in the maintenance process, the operator and anyone in the vicinity must be careful and have the appropriate protection.

- Do not spray air or compressed inert gas on skin.
- Do not direct an air or gas jet towards other people.
- Never use air or compressed inert gas to clean clothes.

Before working on the pump, take measures to prevent an uncontrolled start. Put a warning board on the starting device with the words: ***"Machine under repair: do not start".***

With electric drive equipment, lock the main switch open and withdraw any fuses. Put a warning board on the fuse box or main switch with the words: ***"Machine under repair: do not connect".***

Never clean equipment with inflammable solvents or carbon tetrachloride. Protect yourself against toxic fumes when using cleaning agents.

6.1 Maintenance schedule

It is recommended that a maintenance plan and schedule is adopted, in line with these User Instructions. It should include the following:

a) Any auxiliary systems installed must be monitored, if necessary, to ensure they function correctly.
b) Gland packings must be adjusted correctly to give visible leakage and concentric alignment of the gland follower to prevent excessive temperature of the packing or follower.
c) Check for any leaks from gaskets and seals. The correct functioning of the shaft seal must be checked regularly.
d) Check bearing lubricant level, and if the hours run show a lubricant change is required.
e) Check that the duty condition is in the safe operating range for the pump.
f) Check vibration, noise level and surface temperature at the bearings to confirm satisfactory operation.
g) Check that dirt and dust is removed from areas around close clearances, bearing housings and motors.
h) Check coupling alignment and re-align if necessary.

Our specialist service personnel can help with preventative maintenance records and provide condition monitoring for temperature and vibration to identify the onset of potential problems.

If any problems are found the following sequence of actions should take place:

a) Refer to section 7, *Faults; causes and remedies*, for fault diagnosis.
b) Ensure equipment complies with the recommendations in this manual.
c) Contact Flowserve, if problem persists.

CAUTION Variation from the initial performance is probably an indication of changing system conditions, wear or impending breakdown of the unit.

6.1.1 Routine inspection (daily/weekly)

CAUTION Hourly and daily observations should be made of the pump operation to avert trouble. Whether or not you consider a log of these inspections, the operator must be alert for irregularities in the operation of the pumps. Operator should immediately report any trouble symptoms that are detected. Stuffing box operation and bearing temperatures should be checked periodically. An abrupt change in bearing temperatures is much more indicative of trouble than a consistently high temperature. A change in the sound of a running pump is also a warning of possible trouble.

CAUTION The following checks should be made and the appropriate action taken to remedy any deviations.

a) Check operating behavior. Ensure noise, vibration and bearing temperatures are normal.
b) Check that there are no abnormal fluid or lubricant leaks (static and dynamic seals) and that any sealant systems (if fitted) are full and operating normally.
c) Check that shaft seal leaks are within acceptable limits.
d) Check the level and condition of oil lubricant. On grease lubricated pumps, check running hours since last recharge of grease or complete grease change.
e) Check any auxiliary supplies e.g. heating/cooling, if fitted, are functioning correctly.

Refer to the associated equipment user instructions for inspection requirements.

6.1.2 Periodic inspection (semi-annual)
Check the stuffing box for free movement of the gland. Clean and oil the gland studs and nuts. Closely observe the stuffing box for excessive leakage which cannot be reduced by gland adjustment, and replace the packing as necessary. Check the pump running records for hourly usage to determine if the bearings should be inspected and re-lubricated. The maximum recommended time between cleaning and lubrication change is one year, regardless of usage. The severity of the environment and conditions of service may dictate shorter frequency.

a) CAUTION Check foundation bolts for security of attachment and corrosion.
b) Check pump running records for hourly usage to determine if bearing lubricant requires changing.
c) The coupling should be checked for correct alignment and worn driving elements.

Refer to the manuals of any associated equipment for periodic checks needed.

6.1.3 Complete overhauls
Frequency of a complete overhaul depends upon the hours of pump operation, the severity of the conditions of service, the materials used in the pump construction, and the care the pump receives in operation.

Do not open the pump for inspection unless there is definite evidence that the capacity has fallen off excessively or unless there is indication of trouble inside the pump or in the bearings.

6.1.4 Complete cleaning during a major overhaul
If the bearings need cleaning, or if an overhaul period offers the opportunity, the lubricant cavities and bearings should be cleaned.

After the pump has been dismantled, use a brush and wash out the housing with hot oil, 95 to 115 °C (200 to 240 °F), or non-toxic solvent. Flush the housing with a light mineral oil to prevent rust and to remove all traces of solvent.

Using a brush dipped in hot oil, 80 to 95 °C (180 to 200 °F), remove any solid particles while gently spinning the bearing. If badly oxidized grease is present and refuses to come off with the above procedure, the bearings should be immersed in a hot non-toxic solvent and allowed to soak. Brush and spin the bearings until the oxidized grease is removed.

Difficult spots can sometimes be removed with a mixture of alcohol and light mineral solvent. Flush the bearings with clean, light oil to remove any contaminated oil.

6.1.5 Maintenance of casings
The casing waterways must be kept clean and clear. Whenever a unit has been dismantled, clean the waterways of the casing. These pumps have two casing gaskets that may be damaged when the pump is opened. One gasket is between the stuffing box head and the casing, and the other is between the suction head and the casing.

New casing gaskets must be the same thickness and material as the original to achieve the same compressed thickness. Gaskets originally installed were Aramid fiber with SBR rubber. When installing a new gasket proceed as follows:

a) Clean the flanges. Dirt and scale provide leakage paths.
b) Lubricate the fastener threads and mounting face. Threads should be well formed and free running.
c) Trim the gasket edges squarely and neatly and coat the gasket with a suitable release agent.
d) Place the gasket on the flat surface of the flange and assemble the flange joints and run up all the fasteners finger tight. Develop final torque using "Recommended Torques for Threaded Fasteners" at the end of this section, in about three equal steps by cross-tightening evenly.

6.1.6 Maintenance of wearing rings
Generally, the rings should be renewed or overhauled when the pump performance has decreased appreciably due to excessive wearing ring clearance. The original nominal design running clearance was 0.51 to 0.76 mm (0.020 to 0.030 in.) axially.

Note: Pumps equipped with mechanical seals may require rotor removal and resetting of the seal after adjusting the wearing ring gap. Refer to mechanical seal manufacturer's User Instructions.

6.1.6.1 Measuring wearing ring gap

There are two methods for checking wearing ring clearance on pumps equipped with axial wearing ring construction. The simplest is to remove the suction head hand hole cover and check with a feeler gauge around the gap perimeter. The second method follows but is difficult to perform on horizontal pumps:

Note: The bearing frame support bolts must be loosened to allow movement of the bearing frame during adjustment. Be sure to re-tighten the bolts when the wearing ring gap adjustment is completed.

a) Disconnect pump-coupling halves if required.
b) Back off the bearing frame retaining screws between the bearing frame and the stuffing box approximately 1.5 mm (0.06 in.). Do Not Remove.
c) Tighten the two exterior jacking bolts to break the shim joint, then remove all shims.
d) Back off the two jacking bolts until they are even with the bottom of the bearing frame flange. Tighten the bearing frame retaining screws until the impeller wearing ring seats against the casing wearing ring. Ensure that the gap between the bearing frame and stuffing box flange is even all the way around the perimeter.
e) Measure the gap between the bearing frame flange and the stuffing box head flange. Add the desired amount of wearing ring gap to the measurement. This is the required amount of shims to be added between the bearing frame and the stuffing box head

6.1.6.2 Adjusting wearing ring gap

After the actual ring gap has been determined, adjust the shim pack as required to obtain the desired ring gap. If the desired ring gap cannot be obtained because of having reached the limit of axial adjustment, one or both of the wearing surfaces will have to be restored or replaced.

a) Loosen the bearing frame retaining screws and then tighten the two jacking bolts to allow the placement of the proper shim pack.
b) After the shims are in place, back off the two jacking bolts until they are even with the bottom of the bearing frame flange.
c) Tighten the four bearing frame retaining screws. Ensure that the gap between the bearing frame and stuffing box flange is even all the way around the perimeter.
d) Rotate the pump shaft by hand to check for free rotation. Recheck the gap and repeat steps (a) thru (b) as necessary.
e) Recheck the coupling alignment and then replace the coupling bolts.

Shim stock identification

Light Brown	=	0.76 mm (.030 in.)
Yellow.	=	0.51 mm (.020 in.)
Brown	=	0.25 mm (.010 in.)
Blue	=	0.12 mm (.005 in.)

Each shim set consists of two halves, permitting easy removal. Each half must be the same thickness.

6.1.6.3 Removal of wearing rings

The impeller and suction head wearing rings are held in place by screws locked in place using Loctite 271 or equivalent. They may require heating to 200 °C (400 °F) to allow removal.

6.1.6.4 Mounting of wearing rings

Clean the screw threads and taps. Clean the ring and the area where the ring is to be mounted. Mount the ring and secure it using screws with Loctite 271 or equivalent applied to the threads.

Note: New tapped holes may be required to facilitate installation of a new wearing ring. Use the wearing ring as a template.

6.1.7 Maintenance of shaft and shaft sleeve

When the pump is dismantled, examine the shaft carefully. Its condition should be checked at the impeller hub fit, under the shaft sleeve (if sleeve is removed), at the bearings, and under the coupling flange (if flange is removed). The shaft may become damaged by rusting or pitting due to leakage along the shaft at the impeller or shaft sleeve, excessive exposure to moisture, or mishandling.

Anti-friction bearings improperly fitted to the pump shaft may result in the bearing cone rotating on the shaft, thus causing undue damage. Check the shaft keyways for distortion. Excessive thermal stresses or corrosion may loosen the impeller on the shaft and damage the keyway. Replace a shaft that is bent or distorted. If wear on the shaft is slight, it may be possible to rebuild it by metal spraying or plating and re-grinding. This repair should be carried out by trained and competent personnel.

After a shaft has been repaired, check it for possible runout, maximum 0.051 mm (0.002 in.) T.I.R. Recheck the runout after the bearing frame is completely assembled.

When the sleeve has become worn appreciably, it becomes difficult to adjust the packing to prevent leakage and it should be replaced. Excessively grooved and scored sleeves will tear new packing as soon as it is inserted into the stuffing box.

Any sleeve grooved more than 3.0 mm (0.12 in.) deep should immediately be replaced to avoid damage to other components.

Note: The shaft sleeve was mounted on the shaft using Loctite RC/680 or equivalent and may require heating to approximately 230 °C (450 °F) for removal.

6.1.7.1 Shaft sleeve removal

Uniformly heat the shaft sleeve to 230 °C (450 °F) and remove the sleeve while the part is hot. If this does not work, uniformly heat the sleeve to 260 °C (500 °F) and douse with cold water. This will crack the sleeve and allow mechanical removal of the sleeve. If heating is not practicable, it will be necessary to cut the sleeve off.

6.1.7.2 Mounting of shaft sleeve

Clean the shaft and shaft sleeve thoroughly and remove any oil or grease from the mating surfaces with a non-toxic solvent. Allow the solvent to dry and apply Loctite type RC/680 or equivalent to the sleeve inside diameter and shaft O.D. Install the sleeve by continuously rotating it to ensure a full and even coating of the mating surfaces. Avoid holding the sleeve in one position until the sleeve keyway is in line with the shaft keyway. Immediately install the key. This prevents "freezing" of the shaft sleeve to the shaft. Apply adequate force to the shaft sleeve face to ensure proper seating of the sleeve against the shaft shoulder. This can be done by mounting the impeller on the shaft and tightening the impeller nut. Remove excess Loctite from the parting lines. Loctite sealant will be fully cured in six hours.

6.1.8 Maintenance of packing

Pumps equipped with mechanical seals may have altered stuffing box dimensions. Refer to the seal manufacturer's installation drawing for actual box dimensions.

Use a good grade of non-asbestos packing with a high temperature surface lubricant for packing the stuffing box. Do not under any circumstances use flax packing as rapid wear of the shaft sleeve may result. The procedure for repacking the stuffing box follows:

a) Remove the split gland.
b) Remove the old packing and seal cage halves and clean the stuffing box.
c) Make sure the packing to be used is of the correct type and size. Measure the stuffing box to determine the proper length of packing. Packing should be cut slightly shorter than measured to prevent butting of the ends and buckling.
d) Insert each ring of packing separately, pushing it as far as possible into the stuffing box and seating it firmly. Stagger the rings so that successive joints are 90 ° to 180 ° angles apart.
e) After installing two packing rings, insert the seal cage. It is important to make sure the seal cage is located directly under the seal water connection and that the installation of successive rings does not displace it.
f) Continue adding more rings of packing. When the required number of packing rings have been added, install the gland and tighten the gland nuts by hand, then back off the nuts until the gland is loose. In tightening the gland, the nuts must be brought up uniformly so that the gland is not cocked and so that the packing is subjected to a uniform pressure.
g) New packing has to be "run in". It is a good practice to start the pump with the stuffing box gland quite loose. After the pump has been running for approximately 10 to 15 minutes, gradually tighten the stuffing box gland nuts until leakage is reduced to a steady supply or trickle. Packing that is too tight in the box will cause undue friction and create heat that will glaze the packing and possibly score the shaft sleeve. Packing must remain soft and pliable.

Note: It may be impossible to add the last ring of packing to the stuffing box and still insert the gland. When this occasion arises, omit the last ring of packing and adjust the gland. Continue to tighten the gland as required, allowing for proper leakage, until the packing has seated itself well enough to allow the final ring to be inserted. Approximately 0.113 to 0.227 m^3/h (0.5 to 1.0 gpm) at 0.34 to 0.69 bar (5 to 10 psi) above the maximum pump discharge pressure is recommended for sealing water. When grease sealing is used, a similar grease pressure should be maintained.

6.1.8.1 Stuffing Box Data

All dimensions in mm (In.)

Bearing Frame	O.D. Sleeve (1)	I.D. Box (2)	Depth of Box	Packing Size	No. Rings	Seal Cage Width	Gland Stud Size	Gland studs quantity	Bolt Circle Diameter	Distance to First Obstruction
4T	54.0 (2.13)	73.0 (2.87)	71.9 (2.83)	9.7 (0.38)	5	19.1 (0.75)	1/2-13NC	2	130.1 (5.12)	69.9 (2.75)
5T	70.0 (2.75)	95.3 (3.75)	95.3 (3.75)	12.7 (0.50)	5	25.4 (1.00)	5/8-11NC	2	154.9 (6.10)	85.9 (3.38)
6A	89.0 (3.50)	114.3 (4.50)	95.3 (3.75)	12.7 (0.50)	5	25.4 (1.00)	5/8-11NC	2	175.0 (6.89)	84.3 (3.32)
7L	114.0 (4.50)	139.7 (5.50)	95.3 (3.75)	12.7 (0.50)	5	25.4 (1.00)	3/4-10NC	2	190.5 (7.50)	88.9 (3.50)
7H (except 16 MN-19)	114.0 (4.50)	139.7 (5.50)	95.3 (3.75)	12.7 (0.50)	5	25.4 (1.00)	3/4-10NC	2	190.5 (7.50)	88.9 (3.50)
7H (16 MN-19)	127.0 (5.00)	158.7 (6.25)	117.3 (4.62)	15.8 (0.62)	5	31.8 (1.25)	3/4-10NC	2	215.9 (8.15)	90.4 (3.56)
8L	127.0 (5.00)	158.7 (6.25)	117.3 (4.62)	15.8 (0.62)	5	31.8 (1.25)	3/4-10NC	2	215.9 (8.15)	104.7 (4.12)
8H	127.0 (5.00)	158.7 (6.25)	117.3 (4.62)	15.8 (0.62)	5	31.8 (1.25)	3/4-10NC	2	215.9 (8.15)	104.7 (4.12)
8HA	149.3 (5.88)	187.5 (7.38)	142.7 (5.62)	19.1 (0.75)	5	38.1 (1.50)	7/8-9NC	2	264.2 (10.40)	127.0 (5.00)
9H	179.5 (7.07)	217.5 (8.56)	142.8 (5.62)	19.1 (0.75)	5	38.1 (1.50)	7/8-9NC	2	298.2 (11.74)	127.0 (5.00)
9HA	209.3 (8.24)	248.0 (9.76)	142.8 (5.62)	19.1 (0.75)	5	38.1 (1.50)	7/8-9NC	2	336.0 (13.23)	131.6 (5.18)

(1) O.D. Sleeve tolerance is +0.00 mm/-0.13 mm (+0.000 in. /-0.005 in.) for all frames except 4T and 5T that are + 0.00 mm/-0.05 in. (+0.000 mm/-0.002 in.)

(2) I.D. Box tolerance is +0.00 mm/-0.13 mm (+0.000 in. /-0 .005 in.) for all frames except 4T and 5T which are + 0.05 mm/-0.00 mm (+0.002 in./-0.000 in.)

6.1.9 Maintenance of mechanical seal

The following instruction, if adhered to, will help to ensure a long trouble free service life for the mechanical seal.

Most seals can be installed in a standard stuffing box, therefore in an emergency, packing with the addition of a seal cage and packing gland may be utilized. Compare your seal installation drawing to the stuffing box data provided in section 6.1.8.1.

6.1.9.1 General instructions

a) Be sure to read all seal instructions before installing the seal.
b) A mechanical seal is a precision product. To ensure satisfactory operation, exercise extreme care to avoid scratching or marring the lapped seal faces.

⚠ CAUTION Rotary to stationary seal faces are lapped to within millionths of an inch in flatness. It is therefore important to avoid grasping the rotary seal and compressing it against the spring, which due to uneven loading, may cause excessive seal face distortion and leakage upon installation.

6.1.9.2 Preparing the pump

a) After assembling the bearing frame, shaft sleeve and stuffing box, check the concentricity between the bore of stuffing box and shaft sleeve. The concentricity should not exceed the Seal Manufacture's tolerances. Also check the sleeve diameter and stuffing box bore dimensions to see that they agree with those shown on seal installation drawing.
b) Check that the face of the stuffing box is square with the shaft sleeve to within the Seal Manufacture's tolerances. This surface must be smooth and flat to ensure good sealing between the mechanical seal gland and stuffing box face.
c) Mount the rotating assembly in the pump and adjust the wearing ring gap. Remove the rotating assembly from the pump and scribe a line on the shaft sleeve to mark the location of the stuffing box face in relation to the shaft sleeve. Remove the stuffing box head.

Note: The wearing gap must be set before the mechanical seal is mounted since setting the gap relocates the shaft sleeve in relation to the stuffing box head by as much as 6.35 mm (0.25 in.). If the wearing gap is reset, then the mechanical seal must be remounted.

Check that the sleeve is free of pits, burrs or sharp edges to prevent cutting or improper sealing of the rotating "O" rings. The sleeve surface must be highly polished to the dimensions and tolerances indicated on the seal installation drawing

6.1.9.3 Installing the seal

Refer to the manufacturer's instructions for seal installation.

6.1.9.4 Before starting the unit

Check and make certain that the gland flushing line (and return line if a double seal) is clean, open and free of any obstruction that may interfere with circulation of clear flushing liquid for the seal.

Before start up bleed all air from the seal cavity. This is necessary to ensure a clean liquid environment for effective seal operation

6.1.10 Re-lubrication

Lubricant and bearing temperature analysis can be useful in optimizing lubricant change intervals. In general the following is recommended.

6.1.10.1 Oil lubrication

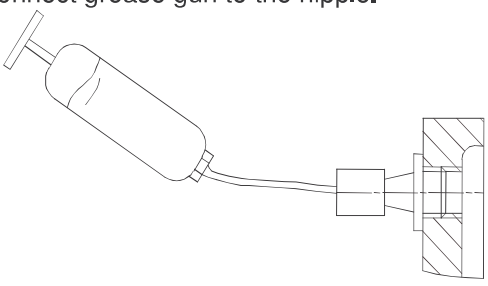
CAUTION Maintaining the correct oil level is very important. If a sight glass has been fitted then regular checks should be made to ensure the level is maintained at the center of the glass window.

Refer to section 5. for methods of oil fill, oil grade recommendations and for the schedule and temperature limits.

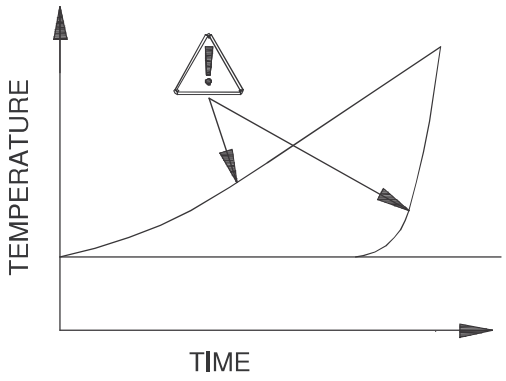
6.1.10.2 Grease lubrication

CAUTION See section 5.2.6.1 for recommended grease types. Re-grease via grease nipples. See section 5.2.3

a) It is important not to under or over grease the bearings as this will lead to over heating and premature failure. Grease lubricated bearing housings have grease nipples fitted in the bearing covers.
b) Connect grease gun to the nipple.



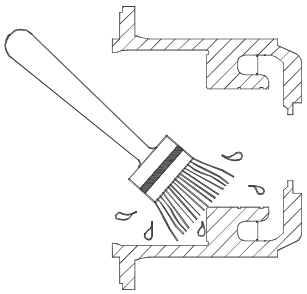
c) Press grease into the bearing housing until the first signs of it appear in the gap between the housing and shaft, then stop greasing.
d) The maximum allowable operating temperatures for anti-friction bearings will vary from unit to unit, depending on ambient and fluid temperature. The rise above ambient should not normally exceed 55 °C (131 °F) or a combined maximum of 95 °C (204 °F).
e) A continuously rising temperature or an abrupt temperature rise indicates a problem. If these symptoms occur, stop the pump immediately and investigate the cause.



6.1.10.3 Cleaning of bearing housing

CAUTION if Kerosene is used to clean the bearings make sure that the required safety measures are to be in place while handling this liquid fuel for cleaning (See Fuel supplier/ manufacturer's Material Safety Data Sheets for provided flash and flame temperatures).

a) Remove the bearing housing from the rotor assembly.
b) Brush the bearing housing with hot oil 94 to 115 °C (200 ° to 240 °F) or other non-toxic solvent.
c) Clean and flush out the housing with a light mineral oil.



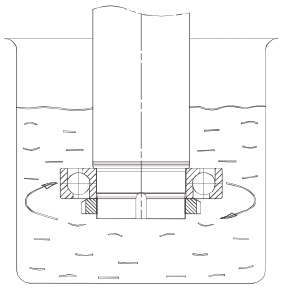
Note: Do not use waste oil to clean the housing.

6.1.10.4 To clean the bearings

a) Wipe off as much grease as possible with a clean lint-free cloth.
b) Brush bearings with hot oil or non-toxic solvent 80 to 95 °C (180 to 200 °F) while gently spinning the outer bearing ring.
c) Spin each roller to ensure that it is clean.

6.1.10.5 To remove badly oxidized grease

a) Support the rotor in a vertical position and immerse the bearing in hot oil 80 to 90 °C (175 to 195 °F) or a mixture of alcohol and light mineral solvent.
b) Dry and re-flush the bearing with clean light oil.
c) It is important not to under or over grease the bearings as this will lead to over heating and premature failure. It is recommended that the bearings be filled with grease using a suitable spatula. In addition the housings should be no more than half filled.



6.1.11 Mechanical seals

No adjustment is possible. When leakage reaches an unacceptable level the seal will need replacement.

6.1.12 Gland packing

The stuffing box split gland can be completely removed for re-packing or to enable the addition of extra rings of packing.

The stuffing box is normally supplied with a lantern ring to enable a clean or pressurized flush to the center of the packing. If not required, this can be replaced by an extra 2 rings of packing.

There must always be a small leakage, normally a minimum of 30~60 drops per minute is required depending upon the sleeve diameter.

6.2 Spare parts

6.2.1 Ordering of spares

Flowserve keep records of all pumps that have been supplied. When ordering spares the following information should be quoted:

a) Pump serial number.
b) Pump size.
c) Part name – *Refer to section 8.*
d) Part number – *Refer to Section 8.*
e) Number of parts required-Quantity.

The pump size and serial number are shown on the pump nameplate.

Note: To ensure continued satisfactory operation, replacement parts to the original design specification should be obtained from Flowserve. Any change to the original design specification (modification or use of a non-standard part) will invalidate the pump's safety certification.

6.2.2 Service parts

The severity of the condition of service, the extent to which repairs can be carried out in the field, and the number of units installed will determine, to a great extent, the minimum number of service parts that should be carried in stock at the installation site. It is suggested, as insurance against delays, that service parts be purchased at the time the pump order is placed or as soon after receiving the pump as possible.

A suggested spare parts list (priced if desired) can be furnished upon request.

6.2.3 Returning parts

All material returned to the factory must have a returned material (RM) tag attached. Consult the nearest Flowserve sales office or OEM factory for shipping instructions and "RM" tags. Unnecessary delays are avoided when parts or equipment are returned to the proper factory using the correct procedure.

a) When contacting the sales office or factory for return authorization, list the material to be returned and the reasons for returning it.
b) On receipt of the "RM" tags, be sure to check the part name, the part number, the quantity of parts involved, and the serial number of the equipment.
c) The "RM" tag must accompany the material shipped. Enclose it in the shipping container or attach it to the part being returned.

d) In cases where more than one part or box is returned, individually print or stencil your name, the part name, and the "RM" tag number on each part or box. Then attach the "RM" tag to one of the parts or boxes. This will facilitate quick identification.

Articles being returned should be carefully packed to prevent damage from handling or from exposure to the weather.

6.2.4 Storage of spares

Spares should be stored in a clean dry area away from vibration. Inspection and re-treatment of metallic surfaces (if necessary) with preservative is recommended at every six-months.

6.3 Suggested spares and consumable items

For start up purposes:
1 - complete set of gland packing
1 - shaft sleeve
1 - set of gaskets and seal kit
(optional: 2 - mechanical seal kits)

For 2 years operation:
1 - set of bearings (line and thrust)
2 - sets of gland packing
2 - shaft sleeves
2 - sets of gaskets and seal kits
2 - lantern rings
2 - casing wear rings
(optional: 2 - mechanical seal kits
2 - impeller wear rings)

For 4 years operation:
1 - set of bearings (line and thrust)
2 - sets of gland packing
2 - shaft sleeves
2 - sets of gaskets and seals
2 - lantern rings
2 - casing wear rings
1 - impeller
(Optional: 2 - mechanical seal kits
2 - impeller wear rings)

6.4 Tools required

No special tools are required to maintain these pumps. In general, most tools are readily available in standard tool kits, and dependent on pump size:

- Open ended spanners (wrenches)
- Socket spanners (wrenches)
- Allen keys
- Range of screwdrivers
- Soft mallet

More specialized equipment:

- Bearing induction heater/Oven
- Dial test indicator
- C-spanner (wrench) - for removing shaft nut. (If difficulties in sourcing are encountered, consult Flowserve).

6.5 Fastener torques

The following table is provided as a guide for the proper assembly of Grade (SAE) 2 fasteners.

Torques are for lubricated threads. Lubricate the fastener and tapped hole threads and the underside of the bolt heads and nuts before assembly.

Note: DO NOT lubricate threads that require the application of Loctite thread locking compound.

Bolt Size mm (in.)	**Torque Nm (lb-ft)**
M 6 (1/4)	8 (6)
M 8 (5/16)	16 (12)
M 10 (3/8)	28.5 (21)
M 12 (7/16)	47.5 (35)
M 14 (1/2)	70 (50)
M 16 (5/8)	135 (100)
M 20 (3/4)	235 (175)
M 24 (7/8)	205 (150)
M 27 (1)	305 (225)
M 30 (1-1/8)	435 (320)
M 33** (1-1/4)	610 (450)
M 36 (1-3/8)	800 (590)
M 39** (1-1/2)	1070 (790)

**Non-preferred size

Note: For assembly of a joint always finger tighten all nuts or bolts first. Then cross-tighten evenly in about three equal steps to develop final torque values.

6.6 Renewal clearances

As wear takes place between the impeller and casing ring the overall efficiency of the pump set will decrease. To maintain optimum efficiency it is recommended that rings are replaced and the impeller refurbished. The clearance dimensions depends on pump size. Contact Flowserve representative for service advise.

6.7 Disassembly

Refer to section 1.6, *Safety*, before dismantling the pump.

CAUTION Before dismantling the pump for overhaul, ensure genuine Flowserve replacement parts are available.

Refer to sectional drawings for part numbers and identification.

6.7.1 Preliminary to dismantling

a) Isolate motor and lock off electrical supply in accordance with local regulations.
b) Isolate suction and discharge valves.
c) Remove coupling guards and disconnect the coupling halves.
d) Drain pump casing. Remove any auxiliary piping if applicable.
e) For convenience at re-assembly, lay out all parts in the order in which they are removed.
f) Protect all machined faces against metal-to-metal contact and corrosion.
g) Proceed as follows referencing the pump Sectional Drawing provided in Section 8.

6.7.2 Pump dismantling procedure

a) Disconnect the coupling halves and the bearing frame support [53]. Unbolt and rotate the motor to allow removal of the pump rotor assembly [2+11+99+6 assemblies].
b) Unbolt the stuffing box head [11] from the casing [1].
c) Draw out the rotating assembly complete with the stuffing box head[11],bearing housing [99], impeller [9], shaft [6] and all attached parts and sub assemblies. Exercise care in slinging and handling the unit.
d) Remove the impeller nut set screw and the impeller nut [24]. The setscrew was mounted using Loctite 271 or equivalent and may require heating to 200 °C (400 °F) for removal. A standard square bar will fit the square hole provided in the impeller nut.
e) Pull the impeller [2] and the impeller key. Leave the impeller-wearing ring as is on the impeller.
f) Remove the packing gland [17]. If the pump is equipped with a mechanical seal unbolt the seal from the gland.
g) Unbolt and remove the bearing frame [99] from stuffing box head [11]. The packing [13] and seal cage halves [29] may be removed at this time. Remove the mechanical seal if so equipped.
h) Remove the shaft sleeve [14] only if necessary; see Maintenance of Shaft and Shaft Sleeve.
i) Remove pump coupling half. Do not hammer to remove.
j) Remove the upper and lower outside seal rings [40, 40A].
k) Remove the upper and lower bearing housing covers [35, 37] with their respective seals. If a bent shaft is suspected, the shaft should be checked for runout at this time. The maximum permissible runout is 0.050 mm (0.002 in.) TIR at the bearing, coupling, sleeve, and impeller turns.
l) Disengage the thrust bearing lock washer tab from its locknut [22]. Unscrew the thrust-bearing locknut [22] and remove the lock washer [22A] and bearing washer [22B].
m) Remove the shaft [6] toward the impeller end. The thrust bearing will be pushed off of the shaft by this movement.
n) Carefully examine all individual parts, important joints, and all wearing surfaces as the pump and rotor are dismantled. As a general rule, regardless of the performance of the unit, bearings and parts appreciably worn should be renewed if it is not intended to examine the pump again until the next overhaul period.

6.7.3 Bearing installation and removal

Anti-friction bearing cones (inner race) are usually pressed or shrunk onto the shaft. The cups (outer races) are usually pressed or shrunk into the bearing housing. When mounting bearings it is important that the proper fit is maintained.

When a pulling device is used to remove bearings from the shaft, the pulling jaws or fingers should be located on the bearing cone. When other parts do not interfere, the bearing cone may be supported by a split ring and the shaft pressed out using an arbor press. The bearing cups can similarly be pulled out of the housing.

There are two methods for mounting a bearing on the pump shaft:

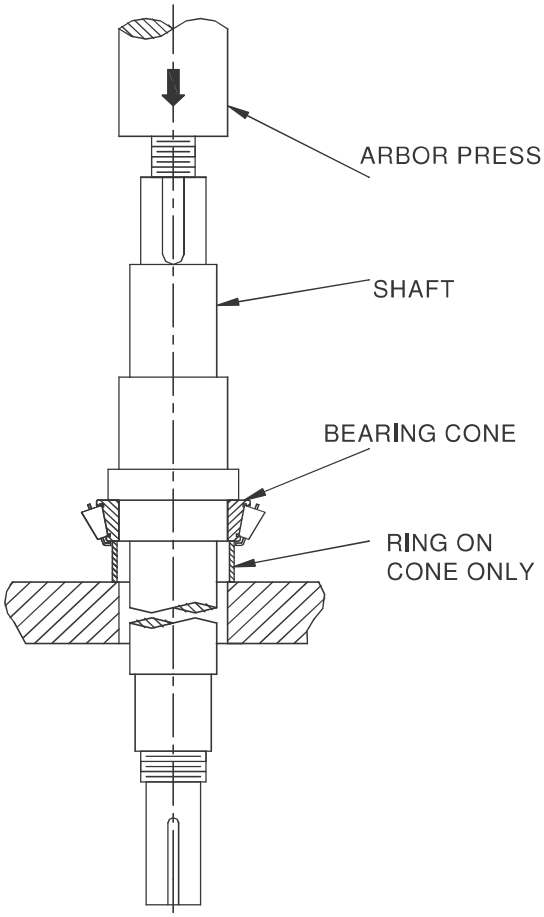
a) Heating the bearing to expand the cone and shrinking it on the shaft.
b) Pressing the bearing onto the shaft.

The method (a) is preferred over the method (b).

Heat the bearing in an oil bath or electric oven to a uniform temperature of 120 °C (250 °F). When heated, quickly mount it on the shaft. If the alternate method is used, apply force by means of an arbor press; see detail below.

Use a tubular sleeve, ring, or small blocks of equal thickness to apply the force to the cone (inner race). In forcing a bearing onto a shaft, be careful that the cone is never cocked.

Check the position of the bearing on the shaft with a feeler gauge to ensure it is pressing firmly against the shaft shoulder.



6.7.4 Bearing end play adjustment

The initial endplay will usually be 0.13 to 0.38 mm. (0.005 to 0.015 in.). Adjust to the recommended endplay (as provided in Section 6.7.5) by tightening the thrust bearing nut as necessary and repeating the procedure below to check the endplay. If the endplay becomes less than the recommended endplay, the thrust-bearing nut must be loosened and the thrust-bearing cone backed off by pressing if necessary (due to likelihood of being an interference fit). **DO NOT** exceed the static rating of the thrust bearing if pressing is necessary.

The entire rotating element (bearing frame, stuffing box head, and impeller) should be assembled before the bearing endplay is set. The assembly weight is necessary to properly set the bearing endplay.

a) Mount a dial indicator on the thrust end of the housing with its arm resting on top of the pump shaft.
b) With the bearing assembly supported vertically on the impeller, oscillate the frame to allow the line bearing rollers to fully seat. If this is not done false readings will be obtained. Record the dial indicator reading.
c) Now lift the bearing frame and oscillate the shaft to allow the thrust bearing rollers to fully seat. Record the dial indicator reading.
d) The bearing endplay is the difference in readings in items (b) and (c) above. Repeat (b) and (c) above to assure measurement consistency.
e) Once the endplay is set, bend over the closest lock washer tab into one of the thrust bearing locknut slots. This will secure the bearing locknut in place.

6.7.5 Bearing end play

Bearing Frame	Recommended end play mm (in.)	End play adjustment mm (in.)		Thrust bearing static load rating kg (lb.)
		with full tang movement	with 1/4 Tang movement	
4T	0.03 – 0.10 (0.002 - 0.004)	0.08 (0.0033)	0.02 (0.0008)	2250 (4970)
5T	0.03 – 0.10 (0.002 - 0.004)	0.08 (0.0033)	0.02 (0.0008)	5580 (12300)
6	0.03 – 0.10 (0.002 - 0.004)	0.07 (0.0028)	0.02 (0.0008)	6220 (13700)
6A	0.03 – 0.10 (0.002 - 0.004)	0.07 (0.0028)	0.02 (0.0008)	8850 (19500)
7L	0.03 – 0.10 (0.002 - 0.004)	0.11 (0.0044)	0.03 (0.0011)	6560 (14470)
7H	0.03 – 0.10 (0.002 - 0.004)	0.11 (0.0044)	0.03 (0.0011)	7200 (15880)
8L	0.03 – 0.10 (0.002 - 0.004)	0.11 (0.0044)	0.03 (0.0011)	10240 (22580)
8H 8HA	0.03 – 0.10 (0.002 - 0.004)	0.11 (0.0044)	0.03 (0.0011)	15950 (35170)
9H 9HA	0.08 - 0.16 (0.003 - 0.005)	0.17 (0.0066)	0.04 (0.0016)	23550 (51920)

6.8 Examination of parts

CAUTION Used parts must be inspected before assembly to ensure the pump will subsequently run properly. In particular, fault diagnosis is essential to enhance pump and plant reliability.

6.8.1 Casing, seal housing and impeller

a) Inspect for excessive wear, pitting, corrosion, erosion or damage and any sealing surface irregularities.
b) Replace as necessary.

6.8.2 Shaft and sleeve (if fitted)

Replace if grooved, pitted or worn.

6.8.3 Gaskets and O-rings

After dismantling, discard and replace.

6.8.4 Bearings

a) It is recommended that bearings are not re-used after any removal from the shaft.
b) The plain liquid lubricated bearings may be re-used if both the bearing bush and bearing sleeve show no sign of wear, grooving or corrosion attack. (It is recommended that both the bush and sleeve are replaced at the same time.)

6.8.5 Bearing isolators, labyrinths or lip seals (if fitted)

a) The lubricant, bearings and bearing housing seals are to be inspected for contamination and damage. If oil bath lubrication is utilized, these provide useful information on operating conditions within the bearing housing.
b) If bearing damage is not due to normal wear and the lubricant contains adverse contaminants, the cause should be corrected before the pump is returned to service.
c) Labyrinth seals and bearing isolators should be inspected for damage but are normally non-wearing parts and can be re-used.
d) Bearing seals are not totally leak free devices. Oil from these may cause staining adjacent to the bearings.

6.9 Assembly

To assemble the pump consult the sectional drawings, see Section 8, *Parts list and drawings*.

Ensure threads, gasket and O-ring mating faces are clean. Apply thread sealant to sealing pipe thread fittings.

6.9.1 Bearing Housing assembly – Oil lubricated

a) Be sure the shoulders where the bearings seat, are free of burrs and contaminants.
b) Mount the bearing cups (outer races) [16,18] into their respective bearing housing bores (either chill or press in to install). Be sure the cups seat against the bearing housing shoulders.
c) Assemble the line-bearing cone [16] on the shaft [6] (heat or press to install).
d) Install the shaft [6], with the thoroughly oiled line-bearing cone fitted, through the housing and support the assembly vertically (thrust end up).
e) Heat the thrust-bearing cone to approximately 95 °C (200 °F) and assemble it on the shaft together with the bearing washer, lock-washer [22A], and locknut [22]. Hand tighten the nut.
f) Install the line bearing oil thrower (see 6.9.1.1) by heat or press to install in the direction shown on the sectional detail. Assemble the line bearing inner and outer seal, line-bearing cover with gasket, shaft sleeve, stuffing box head, impeller, and impeller nut. Locate the impeller nut set screw in the impeller nut fillet at assembly by tapping a new hole in the impeller face.

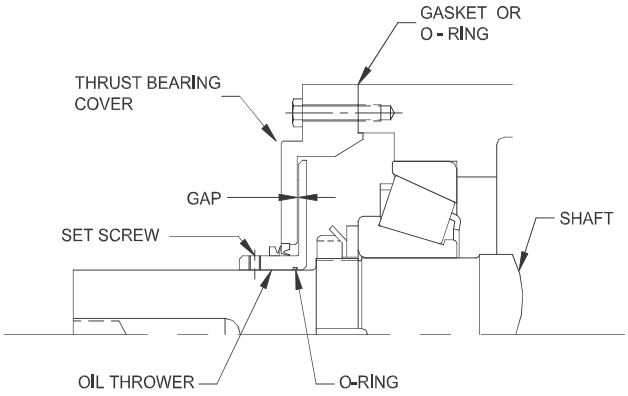
Note: A new tapped hole may be required each time the pump is assembled. Note that there are two impeller nut fillets located 180 ° apart and either fillet may be used to locate the impeller nut set screw; as shown in detail 6.9.1.2.

Note: The line bearing oil thrower gap is not adjustable. If the line bearing oil thrower rubs against the line bearing cover at assembly, increase the gap by doubling up on the line bearing cover gasket. If for any specific application, the pump is supplied with a line bearing thrower that is adjustable, the gap is adjusted by following the same procedure given in step (g) for thrust bearings.

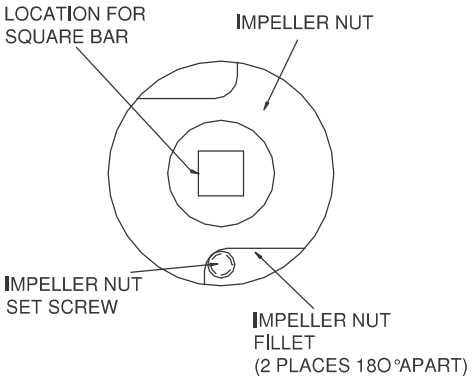
g) Adjust the bearing endplay; See Bearing end-play adjustment Section 6.7.4.
h) Install the thrust bearing oil thrower (See 6.9.1.1) with its O-ring, inner seal, and thrust bearing cover with gasket (O-ring for the 7H, 8H, and 8HA bearing frames).
i) Adjust the gap by pulling the thrower up to the cover and scribing a line on the pump shaft.
j) Push the oil thrower in 1.0 mm to 1.5 mm (0.040 in. to 0.060 in.) to set the gap.
k) Tighten the setscrews to secure the oil thrower to the shaft.

Note: Grease all the seal lips before installation. Position the outside seals (line and thrust bearing) with minimum lip contact to the covers. Excessive lip pressure will result in the seal running hot and premature seal failure.

6.9.1.1 oil thrower assembled



6.9.1.2 Impeller nut



6.9.2 Bearing housing assembly - Grease lubricated

a) Be sure the shoulders where the bearings seat, are free of burrs and contaminants.
b) Mount the grease retainers into their respective bores [51, 51A]. Prick punch the outer diameter at two places 180° apart to secure them to the bearing frame, if necessary. Do not remove the grease retainers on disassembly unless they are to be replaced.
c) Mount the bearing cups (outer races) [16,18] into their respective bearing housing bores (either chill or press in to install). Be sure the cups seat against the bearing housing shoulders.
d) Assemble the line-bearing cone [16] on the shaft [6] (heat or press to install). See section 6.7.3 for details.
e) Install the shaft [6] with the thoroughly grease-packed line-bearing cone fitted, through the housing and support the assembly vertically (thrust end up).
f) Heat the thrust-bearing cone to approximately 95 °C (200 °F) and assemble it on the shaft together with the bearing washer [22B], lock washer [22A], and locknut [22]. Hand tighten the nut.
g) Assemble the line bearing inner seal [40A], line bearing cover [35] and outer seal [40A]. Adjust the bearing endplay; See Bearing End Play adjustment in section 6.7.4.
h) Pack the thrust bearing [18] with grease.
i) Install the thrust bearing's inside seal [49], cover [37] and outside seal [40].

Note: The impeller set screw and wearing ring screws are locked in place using Loctite 271 or equivalent. The shaft sleeve is mounted using Loctite RC/680 or equivalent. Mating surfaces must be thoroughly cleaned and dry prior to application of the adhesive compound.

6.9.3 Pump assembly

To assemble the pump, reverse the dismantling instructions previously described.

a) Follow the bearing housing assembly, wearing ring, packing, and shaft sleeve assembly instructions. Torque all assembly bolts and screws to the recommended torque values listed in section 6.5.
b) If the unit is equipped with a mechanical seal, refer to the mechanical seal manufacturer's instructions for installation.
c) Install the rotating assembly in the casing [1].
d) Check that the impeller [2] turns freely and adjust the wearing ring gap. See section 6.1.6 for details.
e) Align the pump with the motor; see Section 4.5.
f) Install the packing and seal cage; see Section 6.1.8.
g) Add lubricant as described in Section 5.2.

7 FAULTS; CAUSES AND REMEDIES

FAULT SYMPTOM

Pump overheats and seizes	Bearings have short life	Pump vibrates or is noisy	Mechanical seal/Gland packing has short life	Mechanical seal/Gland leaks excessively	Pump requires excessive power	Pump loses prime after starting	Insufficient discharge pressure developed	Insufficient capacity delivered	Pump does not deliver liquid	PROBABLE CAUSES	POSSIBLE REMEDIES
										A. System troubles	
●								●	●	Pump not primed.	Check & fill completely. Vent and/or prime. Open the valves fully.
		●				●		●	●	Pump or suction pipe not completely filled with liquid or valves not fully open.	
		●				●		●	●	Suction lift too high or level too low.	Check $NPSH_A > NPSH_R$, proper submergence, losses at strainers and fittings.
●		●				●		●	●	Insufficient margin between suction pressure and vapor pressure.	
						●	●	●	●	Excessive amount of air or gas in liquid.	Check and purge pipes and system.
						●		●	●	Air or vapor pocket in suction line.	Check suction line design for vapor pockets.
						●		●		Air leaks into suction line.	Check suction pipe is airtight.
						●		●		Air leaks into pump through mechanical seal, sleeve joints, casing joint or pipe plugs.	Check and replace faulty parts. Refer to Seal User instructions/ Consult Flowserve, if needed.
		●					●	●		System design pressure requirement is greater than the pump can deliver.	Consult Flowserve.
		●			●		●	●		Impeller, casing piping partially /fully clogged.	Clean the effected area and prevent this happening again.
		●				●		●	●	Inlet of suction pipe insufficiently submerged.	Check out system design.
							●	●	●	Speed too low.	Consult Flowserve.
					●					Speed too high.	Consult Flowserve.
							●	●	●	Total head of system higher than differential head of pump.	Check system losses. Remedy or Consult Flowserve.
					●					Total head of system lower than pump design head.	
					●					Specific gravity of liquid different from design.	Check and Consult Flowserve.
					●		●	●		Viscosity of liquid differs from the designed.	
●		●								Operation at very low capacity.	Measure value and check minimum permitted. Remedy or Consult Flowserve.
	●	●			●					Operation at high capacity.	Measure value and check maximum permitted. Remedy or Consult Flowserve.
										B. Mechanical troubles	
●	●	●	●	●	●					Misalignment due to pipe strain.	Check the flange connections and eliminate strains using elastic couplings or a method permitted.
		●								Improperly designed foundation and /or improper piping.	Check setting of baseplate: tighten, adjust, grout base as required. Check piping.
	●	●	●	●	●					Shaft bent.	Check shaft runouts are within acceptable values.
●	●	●			●					Rotating part rubbing on stationary part internally.	Check/locate the problem or call Flowserve.
●	●	●	●	●	●					Bearings worn	Replace bearings.

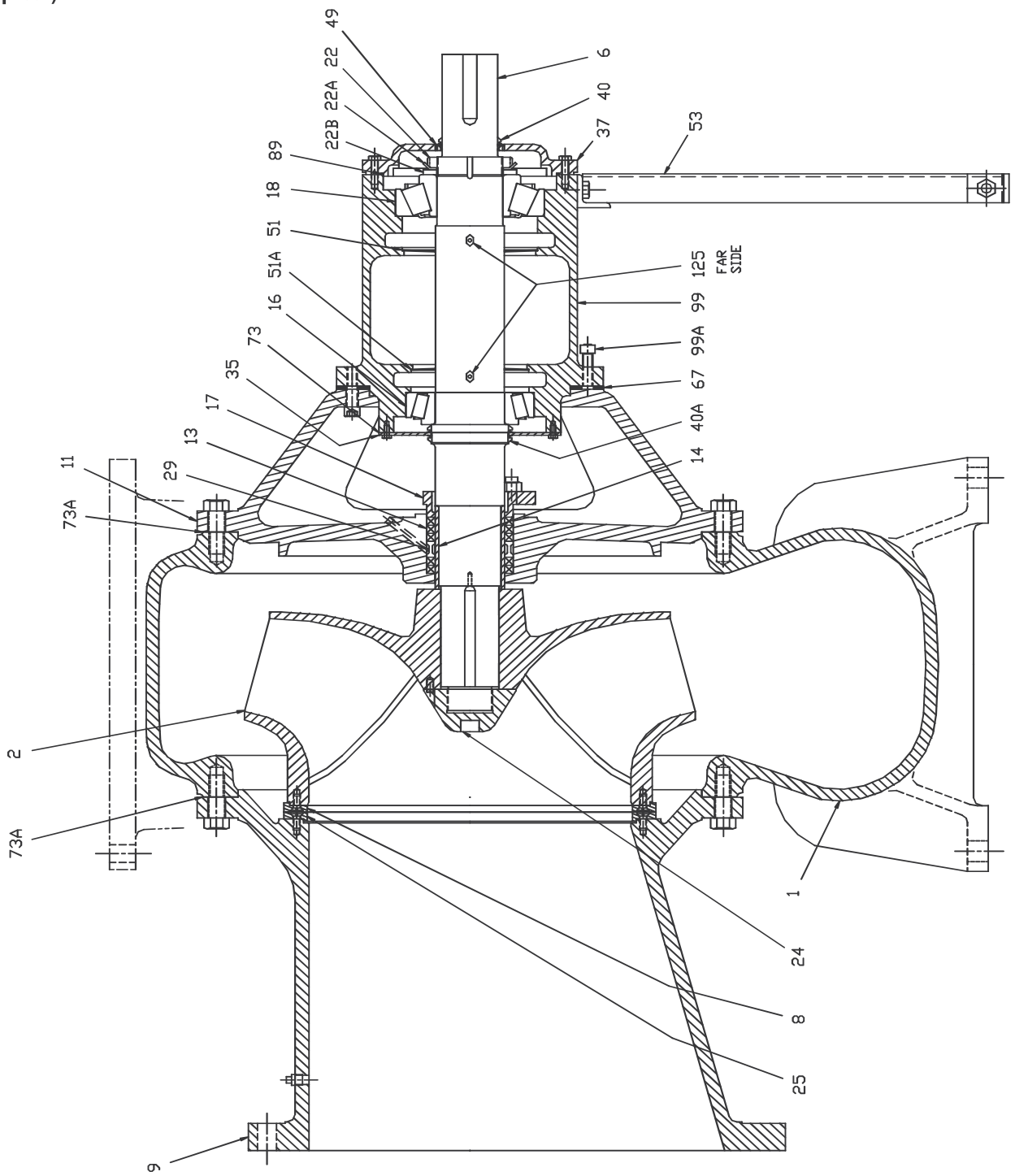
FAULT SYMPTOM

Pump overheats and seizes	Bearings have short life	Pump vibrates or is noisy	Mechanical seal/Gland packing has short life	Mechanical seal/Gland leaks excessively	Pump requires excessive power	Pump loses prime after starting	Insufficient discharge pressure developed	Insufficient capacity delivered	Pump does not deliver liquid	PROBABLE CAUSES	POSSIBLE REMEDIES
					●		●	●	●	Wearing ring surfaces worn.	Replace worn wearing ring.
		●					●	●	●	Impeller damaged or eroded.	Replace or call Flowserve for improved material selection.
				●						Leakage under sleeve due to joint failure.	Check for damage and replace joint.
			●	●						Shaft sleeve worn or scored or running off center.	Check and renew defective parts.
			●	●	●					Mechanical seal /Gland packing improperly installed.	Check alignment of faces or damaged parts and assembly method used.
			●	●	●					Incorrect type of mechanical seal/packing for the given operating conditions.	Call Flowserve Service Center.
●	●	●	●	●						Shaft running off center because of worn bearings or misalignment.	Check misalignment and /or for excessive bearing wear.
●	●	●	●	●						Impeller out of balance resulting in vibration.	Check and call Flowserve.
			●	●	●					Abrasive solids in liquid pumped.	
			●	●						Internal misalignment of parts preventing seal ring and seat from mating properly.	
			●	●						Mechanical seal / Gland packing was run dry	Check mechanical seal/packing condition and source of dry running and repair.
			●	●						Internal misalignment due to improper repairs causing impeller to rub.	Check method of assembly, possible damage or state of cleanliness during assembly. Remedy or Consult Flowserve, if necessary.
●	●	●								Excessive thrust caused by a mechanical failure inside the pump.	Check wear condition of impeller, its clearances and liquid passages.
	●	●								Excessive grease in ball bearings.	Check method of re-greasing.
	●	●								Lack of lubrication for bearings.	Check hours run since last change of lubricant, the schedule and its basis.
	●	●								Improper installation of bearings (damage during assembly, incorrect assembly, wrong type of bearing etc).	Check method of assembly, possible damage or cleanliness during assembly and type of bearing used. Consult Flowserve, if necessary.
	●	●								Damaged bearings due to contamination.	Check contamination source and replace damaged bearings.
										C. Motor electrical problems	
		●			●		●	●		Wrong direction of rotation.	Reverse 2 phases at motor terminal box.
					●			●		Motor running on 2 phases only.	Check supply and fuses.
	●	●						●		Motor running too slow.	Check motor terminal box connections and voltage.

8 PARTS LIST AND DRAWINGS

8.1 Grease lubricated MN

(typical)

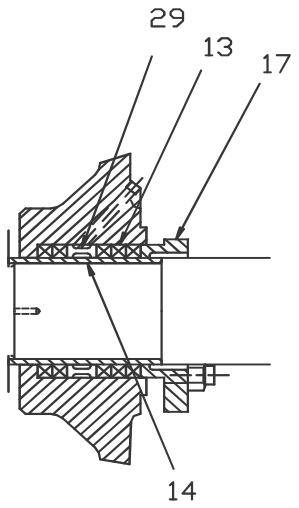


Note: All the sectional drawings provided in this section are typical representation of standard MN pump/grease lubricated. The details shown here may not reflect the specifics of the pump that you have purchased or ordered. You may purchase specific cross sections that matches your order separately. Please contact Flowserve for pricing and ordering information on such documentation.

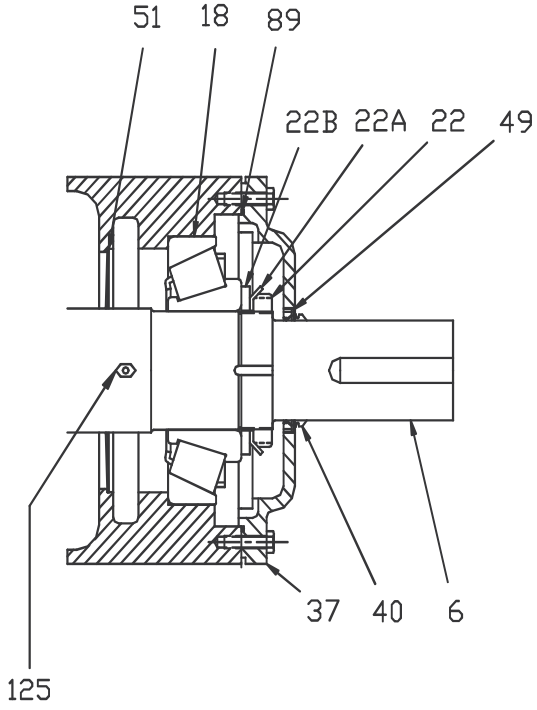
8.2 Parts list - MN

ROTATING PARTS		
REF. NO	QTY REQ'D	DESCRIPTION
2	1	Impeller
6	1	Pump shaft
8	1	Impeller wearing ring
14	1	Shaft sleeve
16	1	Line bearing
18	1	Thrust bearing
22	1	Bearing lock nut
22A	1	Bearing lock washer
22B	1	Bearing washer
24	1	Impeller nut
40	1	Seal ring (Thrust)
40A	2	Seal ring (Line)
STATIONARY PARTS		
1	1	Casing
9	1	Suction head
11	1	Stuffing box head
13	5 rings	Packing
17	1	Gland split
25	1	Suction head wearing ring
29	1	Seal cage split
35	1	Line bearing cover
37	1	Thrust bearing cover
49	1	Grease seal (thrust)
51	1	Grease retainer (outboard)
51A	1	Grease retainer (Inboard)
53	1	Bearing fame support
67	1 set	Adjusting shims
73	1	Line bearing cover gasket
73A	2	Casing gasket
89	1	Thrust bearing cover 'O' ring seal
99	1	Bearing frame
99A	2	Adjusting bolt
125	2	Grease fitting

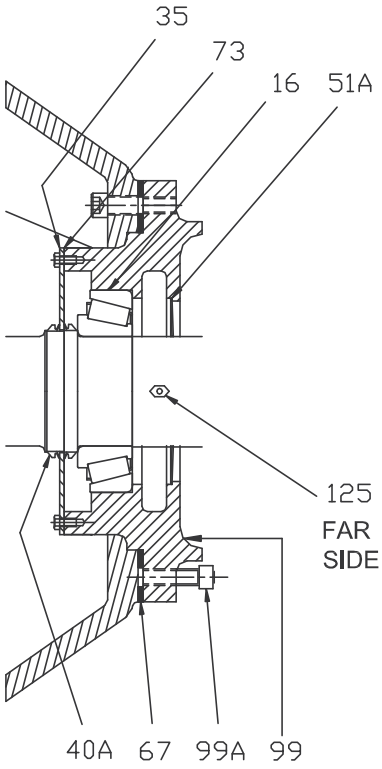
8.2.1 Gland packing (typical)



8.2.2 Thrust bearing assembly (typical)



8.2.3 Line bearing assembly (typical)



8.3 General arrangement drawing

The typical general arrangement drawing and any specific drawings required by the contract will be sent to the Purchaser separately unless the contract specifically calls for these to be included into the User Instructions. If these drawings are sent separately, the purchaser must retain those with the User Instructions.

9 CERTIFICATION

Certificates determined from the Contract requirements are provided with these Instructions where applicable. Examples are certificates for CE marking, ATEX marking etc. If required, copies of other certificates sent separately to the Purchaser should be obtained from the Purchaser for retention with these User Instructions.

10 OTHER RELEVANT DOCUMENTATION AND MANUALS

10.1 Supplementary user instructions

Supplementary instructions such as for a driver, instrumentation, controller, seals, sealant system etc are provided as separate documents in their original format. If further copies of these are required they should be obtained from the supplier for retention with these User Instructions.

10.2 Change notes

If any changes, agreed with Flowserve Pump Division, are made to the product after its supply, a record of the details should be maintained with these User Instructions.

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Taneytown, MD 21787-0091, USA

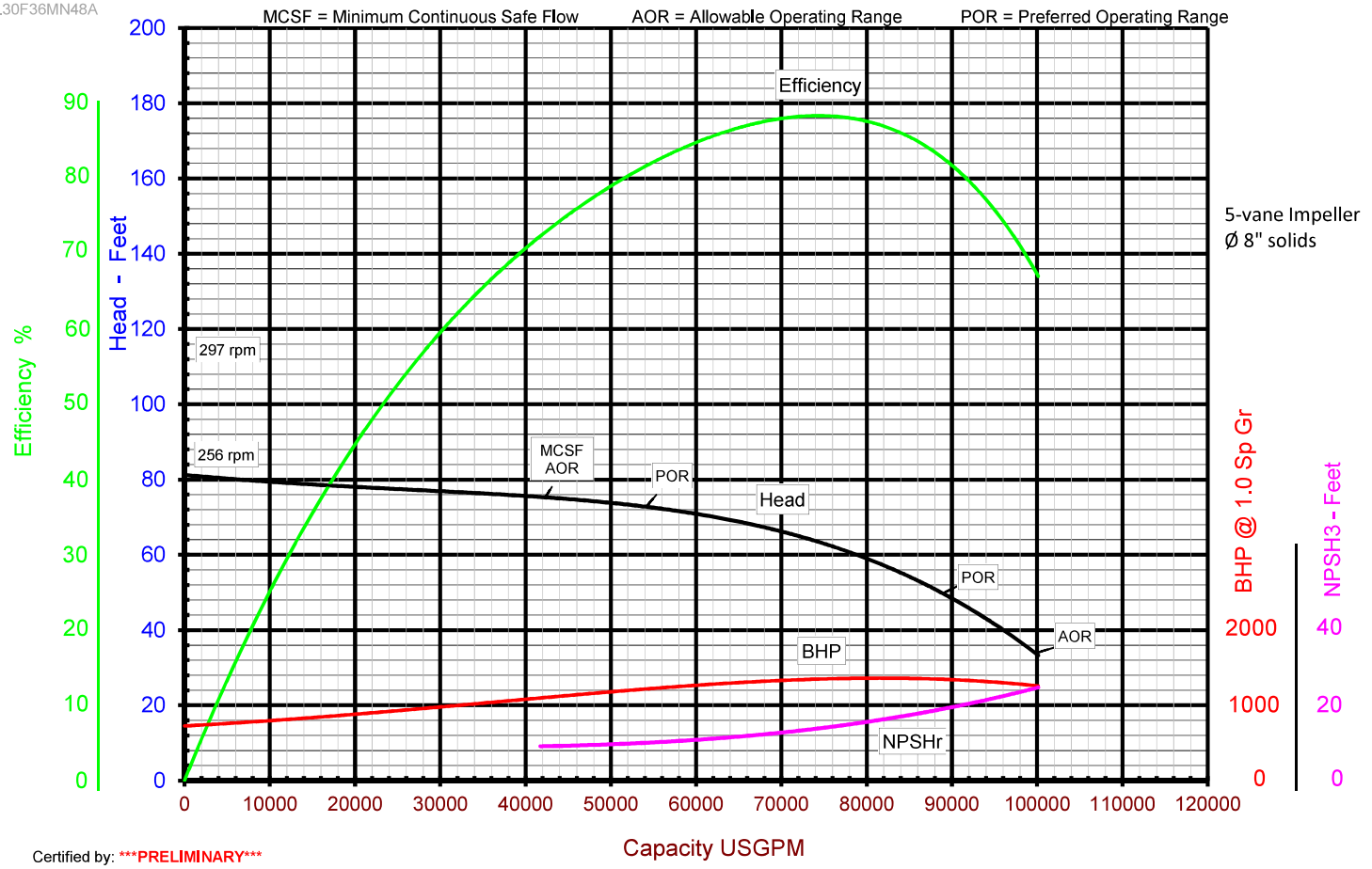
Customer Service-PH: +1 (410) 756 2602
Customer Service FAX: +1 (410) 756 2615
Parts inquiry/Order PH: +1 (800) 526 3569

Your local Flowserve representative:

To find your local Flowserve representative, please use the Sales Support Locator System found at www.flowserve.com

Appendix J: Pump Data Sheets

1.30F36MN48A

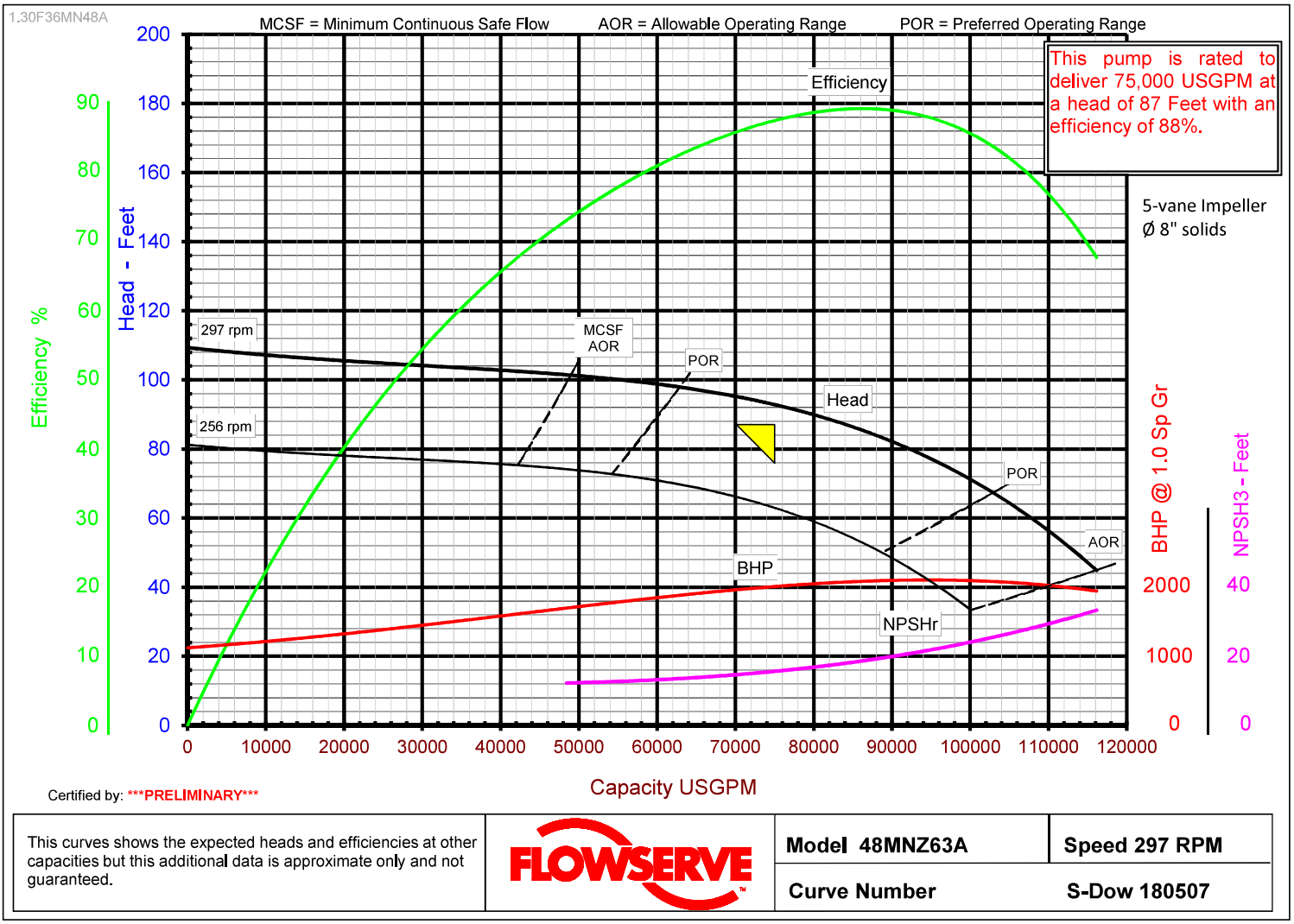


Certified by: ***PRELIMINARY***

This curves shows the expected heads and efficiencies at other capacities but this additional data is approximate only and not guaranteed.	FLOWSERVE	**Model 48MNZ63A**	**Speed 256 RPM**
		Curve Number	**S-Dow 180507**

Dow Chemical 48MN63A 256rpm rev_180507.xlsx

1.30F36MN48A



Certified by: ***PRELIMINARY***

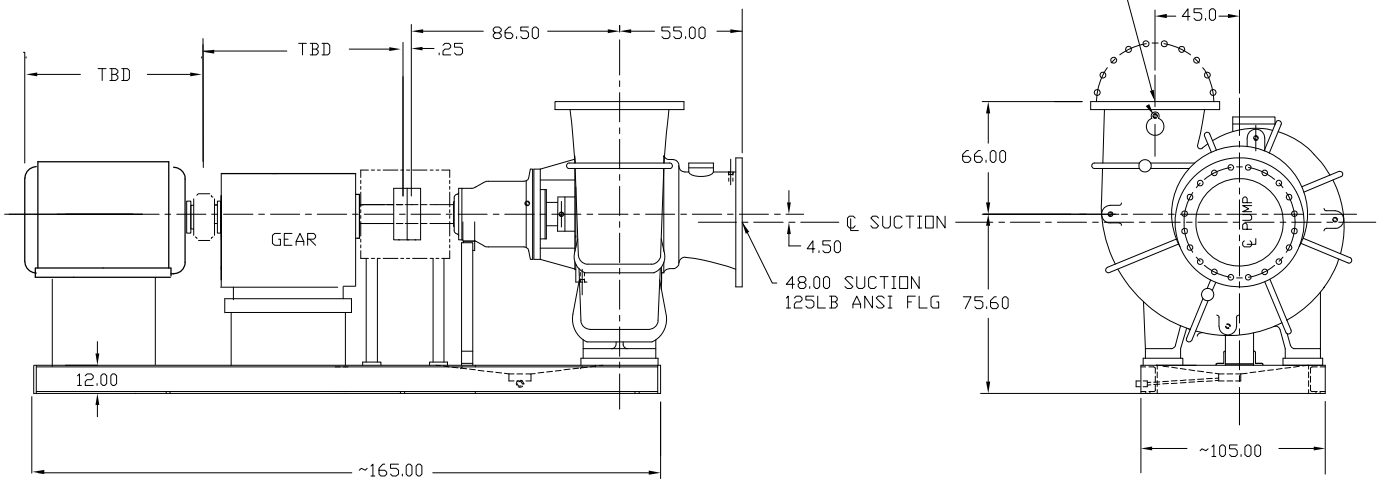
This curves shows the expected heads and efficiencies at other capacities but this additional data is approximate only and not guaranteed.	FLOWSERVE	**Model 48MNZ63A**	**Speed 297 RPM**
		Curve Number	**S-Dow 180507**

Dow Chemical 48MN63A rev_180507.xlsx

PRELIMINARY - NOT CERTIFIED FOR CONSTRUCTION

HORIZONTAL DISCHARGE AVAILABLE
OPPOSITE ROTATION IS MIRROR IMAGE.

COUNTER-CLOCKWISE ROTATION
(VIEWED FROM COUPLING END)



PRELIMINARY

CORRECT FOR CUSTOMER'S ORDER _____

CUSTOMER _____

DISTRICT OFFICE ORDER _____ WORKS ORDER _____

PRELIMINARY BY KAP DATE 3-29-18

DIMENSIONS ARE FROM DRAWINGS, CASTINGS MAY VARY SLIGHTLY. FOUNDATION BOLTS MUST NOT BE FIXED RIGIDLY UNTIL MACHINE IS IN PLACE. THIS PRINT IS LOANED SUBJECT TO RETURN ON DEMAND AND UNDER CONDITION THAT IT IS NOT TO BE USED IN ANY WAY DETRIMENTAL TO OUR INTERESTS. DO NOT SCALE; ADDITIONAL DIMENSIONS WILL BE FURNISHED UPON REQUEST.

FLOWSERVE

Pump Division
Taneytown Operations

WORTHINGTON 48MN63 FR-10H PUMP
ELEVATION

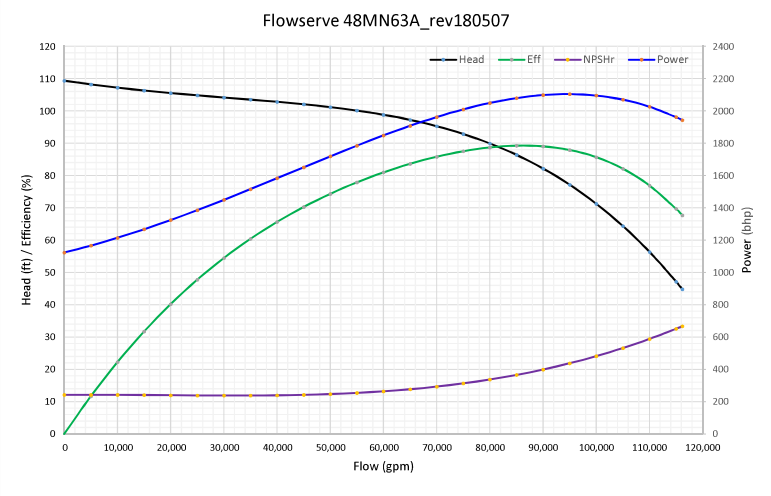
DWG. NO.	SCALE NONE	REV.
DRAWN		DATE

F:\CAD\JOB\GS002565

699038-CH-ED-MECAL-0003

Flowserve 48MN63A_rev180507

Flow	Head	NPSHr	Eff	Power	RPM
0	109.3	12.1	0.0	1123.0	297
5000	108.2	12.1	11.7	1166.1	297
10000	107.2	12.1	22.2	1214.3	297
15000	106.3	12.0	31.7	1267.3	297
20000	105.5	12.0	40.2	1324.5	297
25000	104.8	11.9	47.8	1385.4	297
30000	104.2	11.9	54.5	1449.3	297
35000	103.5	11.9	60.4	1515.4	297
40000	102.8	12.0	65.6	1582.9	297
45000	102.0	12.1	70.3	1651.0	297
50000	101.2	12.4	74.3	1718.6	297
55000	100.1	12.7	77.9	1784.7	297
60000	98.8	13.2	81.0	1848.0	297
65000	97.2	13.8	83.6	1907.5	297
70000	95.2	14.7	85.8	1961.8	297
75000	92.8	15.6	87.5	2009.5	297
80000	89.9	16.9	88.7	2049.2	297
85000	86.4	18.3	89.2	2079.2	297
90000	82.2	19.9	89.0	2098.1	297
95000	77.1	21.9	87.9	2104.0	297
100000	71.2	24.1	85.7	2095.1	297
105000	64.3	26.6	82.1	2069.7	297
110000	56.4	29.4	76.9	2025.8	297
115000	47.1	32.6	69.7	1961.4	297
116160	44.8	33.3	67.7	1943.3	297

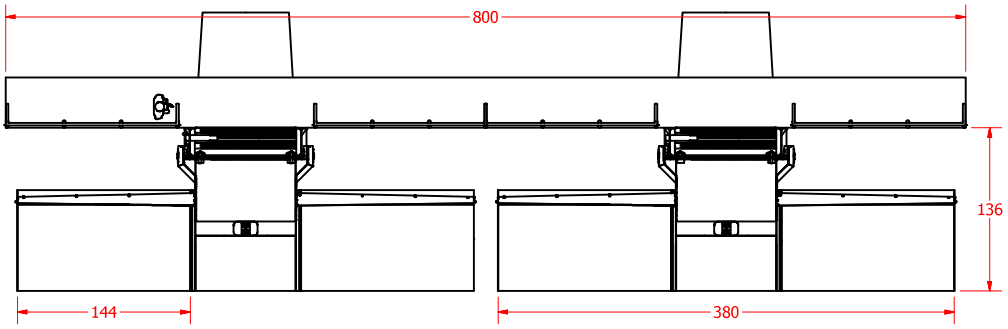


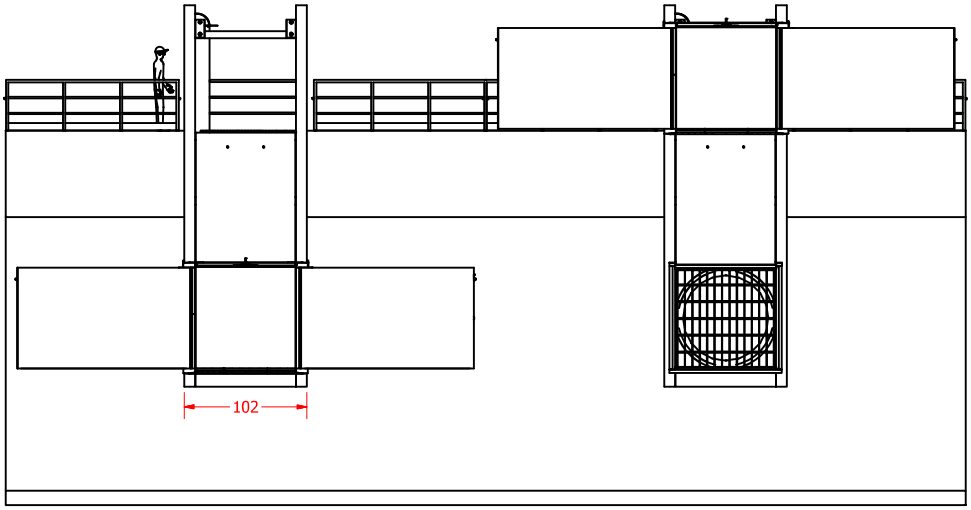
Appendix K: Intake Screen Operations & Maintenance

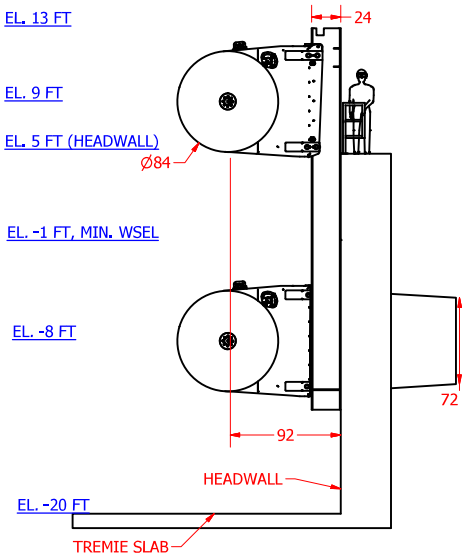
Intake Screens Operation & Maintenance: Rotating cylindrical wedgewire screens are designed to rotate the screening cylinders past fixed internal and external brushes to keep the screen clean. This mechanical system provides a good means for combating fouling on the screens' internal and external faces. If screens are rotated frequently enough, it's likely that fouling could be adequately managed. Keeping free-floating debris from accumulating and potentially occluding portions of the screen is the key objective.

Internal and external brushes rotation cycles are controlled by timer, differential pressure, and manual operation. Instrumentation consisting of differential pressure readings, motor run indication and start/stop controls are provided for the intake screens. Controls and monitoring of the intake screens is done via the programmable logic controller (PLC). If fouling is detected by the differential pressure at an intake screen, the screen will need to be cleaned, and if severe fouling is detected at an intake screen, the corresponding pump will shutdown by the PLC.

Activity	Cleaning Cycle Frequency	Responsible Resource
Normal Operation while pumps are not running	2-minutes Cleaning Cycle at every 12 hours	PLC & monitored by Reservoir Technician
Normal Operation while pumps are running	2-minutes Cleaning Cycle at every 4 hours	PLC & monitored by Reservoir Technician
Differential Pressure Cycle	Cleaning Cycle starts when differential pressure of 9" is detected and stops when the differential pressure reduces to 1". Pump will shut down if differential pressure reaches 12".	PLC & monitored by Reservoir Technician
Manual Operation Cycle	Manually run the Cleaning Cycle if pump was shut down due to differential pressure of 12". Continue Cleaning Cycle till differential pressure of 3" or smaller is achieved. Reset to normal operation.	Reservoir Technician







ALL DIMENSIONS IN INCHES UNLESS NOTED			
REV	DESCRIPTION	DATE	APPROVED
Designs are property of INTAKE SCREENS INC; and are subject to change without notice.	STANDARD TOLERANCES Fractional Dimensions ± 1/32 Decimal Dimensions ± 0.005		

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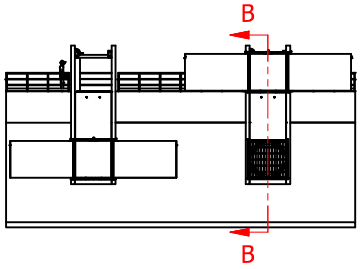
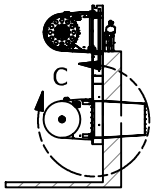
DATE 5/28/18	PROJECT DOW	DESCRIPTION MAIN ASSEMBLY	DRAWING NUMBER ISI-DOW-A
APP'D BY RUSSELL BERRY IV			SHEET NUMBER 1 of 7
DRAWN BY JACOB CHAPIN		MATERIAL ASSEMBLY	MASS N/A
"B" SHEET SCALE			

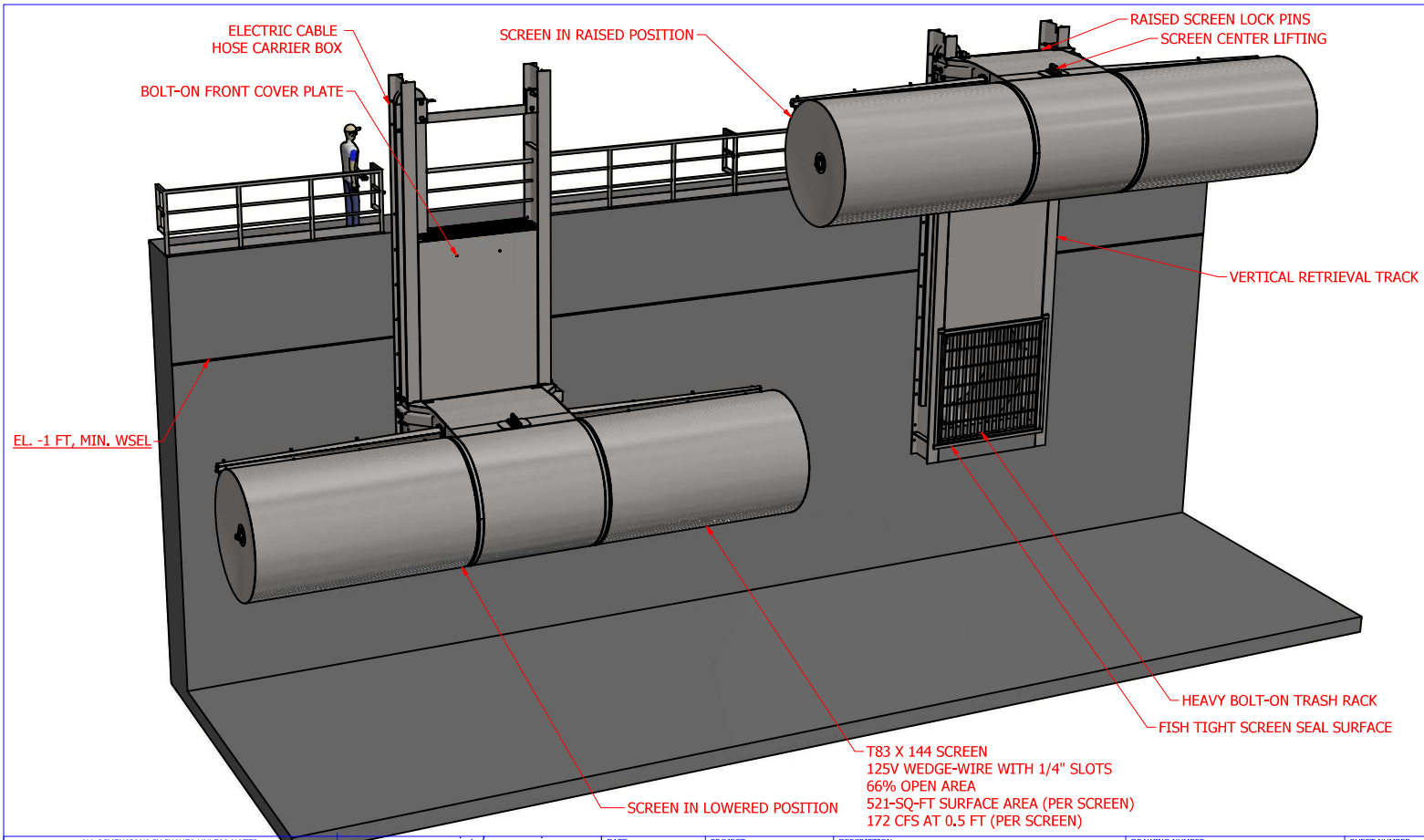




SECTION B-B

DETAIL C

ALL DIMENSIONS IN INCHES UNLESS NOTED	www.intakescreensinc.com CA.C.L. 796197	DATE 5/28/18	PROJECT	DESCRIPTION	DRAWING NUMBER	SHEET NUMBER
	ISI Intake Screens, Inc.	APP'D BY RUSSELL BERRY IV	DOW	MAIN ASSEMBLY	ISI-DOW-A	2 of 7
Designs are property of INTAKE SCREENS INC; and are subject to change without notice.	5417 River Road - Sacramento, California 95832 (916) 665-2727 (916) 665-2729 FAX	DRAWN BY JACOB CHAPIN		MATERIAL ASSEMBLY	MASS N/A	
STANDARD TOLERANCES Fractional Dimensions ± 1/32 Decimal Dimensions ± 0.005		"B" SHEET SCALE				



ALL DIMENSIONS IN INCHES UNLESS NOTED

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STANDARD TOLERANCES
Fractional Dimensions ± 1/32
Decimal Dimensions ± 0.005

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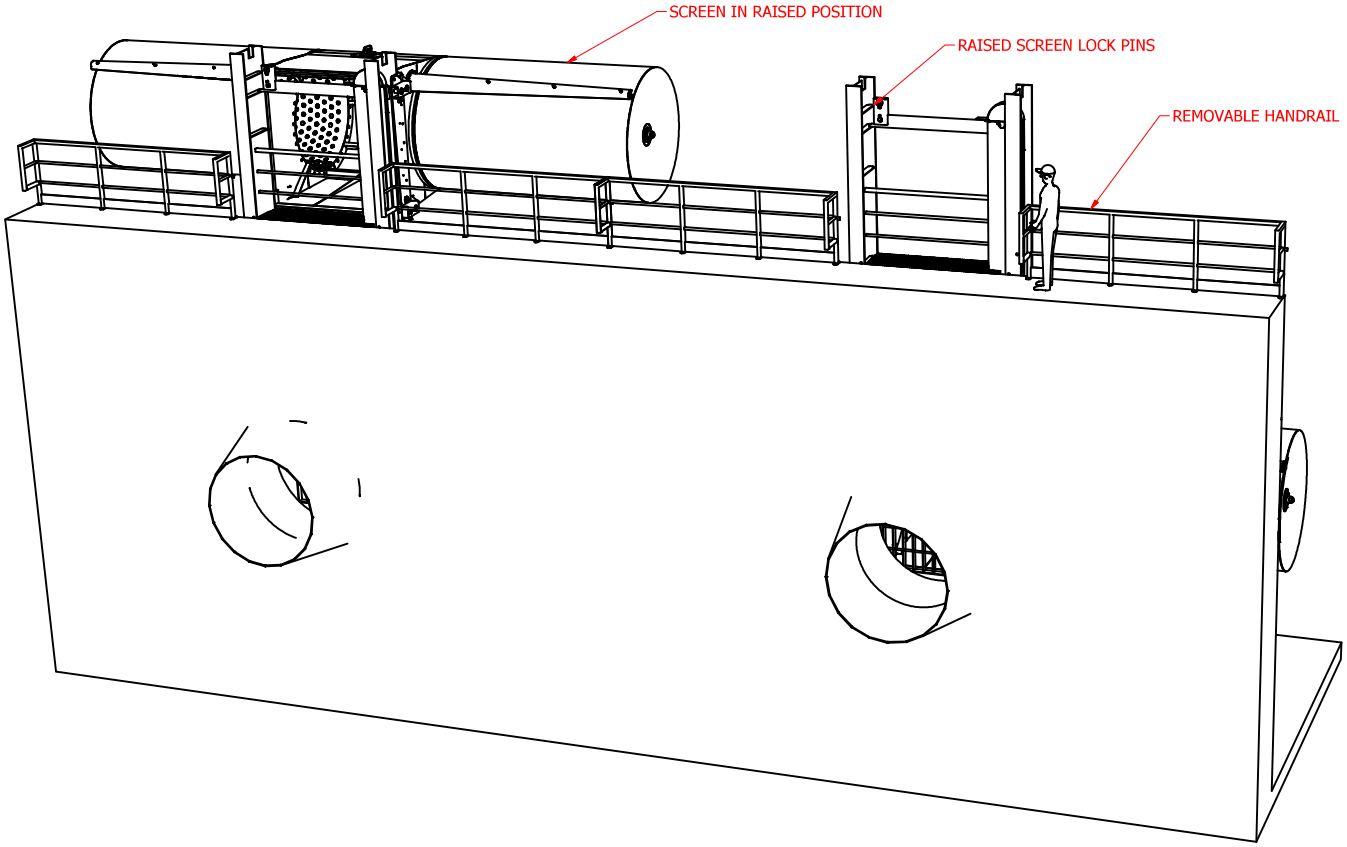
DATE	5/28/18
APP'D BY	RUSSELL BERRY IV
DRAWN BY	JACOB CHAPIN
"B" SHEET SCALE	
PROJECT	DOW
DESCRIPTION	MAIN ASSEMBLY
MATERIAL	ASSEMBLY
DRAWING NUMBER	ISI-DOW-A
MASS	N/A
SHEET NUMBER	3 of 7



ALL DIMENSIONS IN INCHES UNLESS NOTED

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STANDARD TOLERANCES
Fractional Dimensions ± 1/32
Decimal Dimensions ± 0.005

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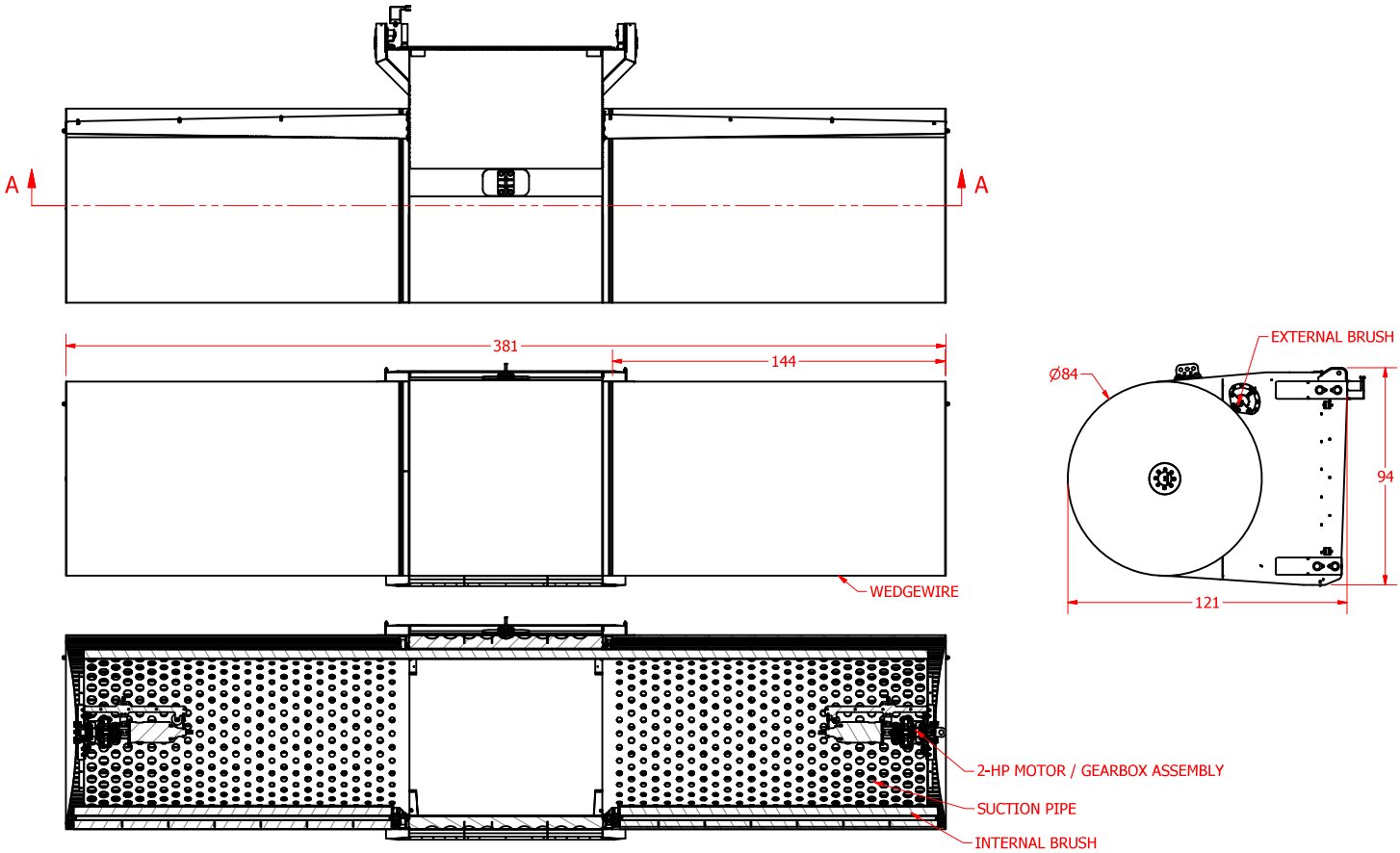
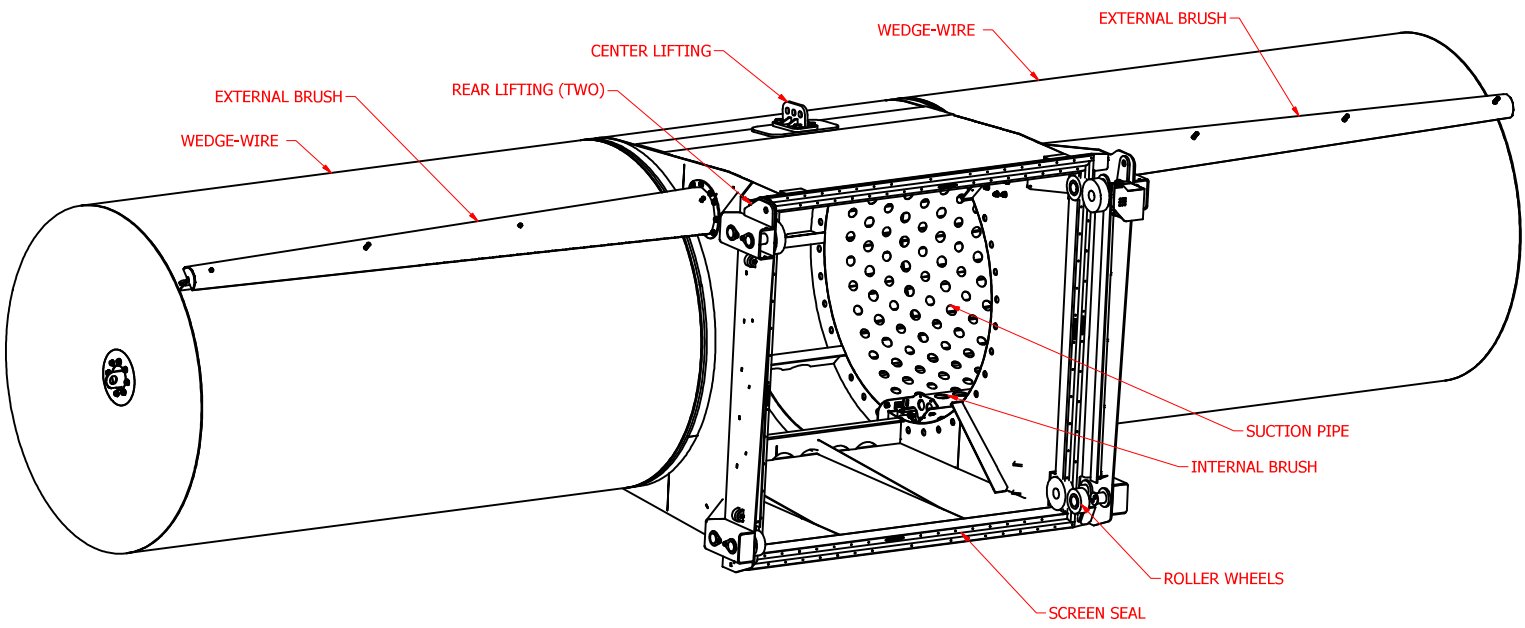
DATE	5/28/18
APP'D BY	RUSSELL BERRY IV
DRAWN BY	JACOB CHAPIN
"B" SHEET SCALE	
PROJECT	DOW
DESCRIPTION	MAIN ASSEMBLY
MATERIAL	ASSEMBLY
DRAWING NUMBER	ISI-DOW-A
MASS	N/A
SHEET NUMBER	4 of 7

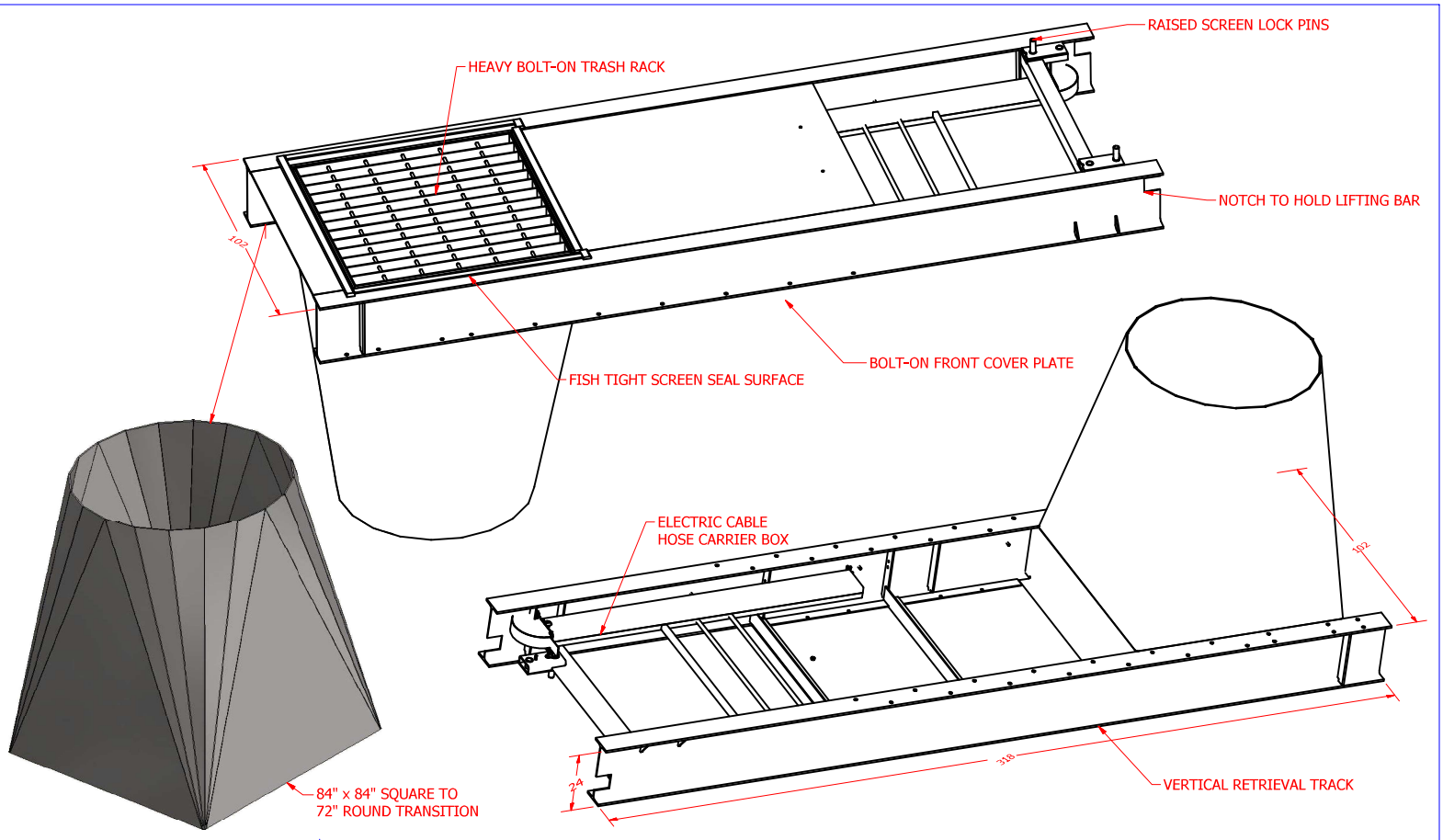


SECTION A-A

ALL DIMENSIONS IN INCHES UNLESS NOTED	www.intakescreensinc.com CA C.L. 796197	DATE 5/28/18	PROJECT	DESCRIPTION	DRAWING NUMBER	SHEET NUMBER
	ISI Intake Screens, Inc.	APP'D BY RUSSELL BERRY IV	DOW	T83 X144 SCREEN	ISI-DOW-SCREEN	5 of 7
Designs are property of INTAKE SCREENS INC; and are subject to change without notice.	5417 River Road - Sacramento, California 95832 (916) 665-2727 (916) 665-2729 FAX	DRAWN BY JACOB CHAPIN		MATERIAL ASSEMBLY	MASS N/A	
STANDARD TOLERANCES Fractional Dimensions ± 1/32 Decimal Dimensions ± 0.005		"B" SHEET SCALE				



ALL DIMENSIONS IN INCHES UNLESS NOTED	www.intakescreensinc.com CA C.L. 796197	DATE 5/28/18	PROJECT	DESCRIPTION	DRAWING NUMBER	SHEET NUMBER
	ISI Intake Screens, Inc.	APP'D BY RUSSELL BERRY IV	DOW	T83 X144 SCREEN	ISI-DOW-SCREEN	6 of 7
Designs are property of INTAKE SCREENS INC; and are subject to change without notice.	8417 River Road - Sacramento, California 95832 (916) 665-2727 (916) 665-2729 FAX	DRAWN BY JACOB CHAPIN		MATERIAL ASSEMBLY	MASS N/A	
STANDARD TOLERANCES Fractional Dimensions ± 1/32 Decimal Dimensions ± 0.005		"B" SHEET SCALE				



ALL DIMENSIONS IN INCHES UNLESS NOTED

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STANDARD TOLERANCES
Fractional Dimensions ± 1/32
Decimal Dimensions ± 0.005

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DATE	5/28/18
APP'D BY	RUSSELL BERRY IV
DRAWN BY	JACOB CHAPIN
"B" SHEET SCALE	
PROJECT	DOW
DESCRIPTION	FRAME ASSEMBLY
MATERIAL	WELDED STEEL
DRAWING NUMBER	ISI-DOW-B2
MASS	N/A
SHEET NUMBER	7 of 7

ISI Intake Screens, Inc.

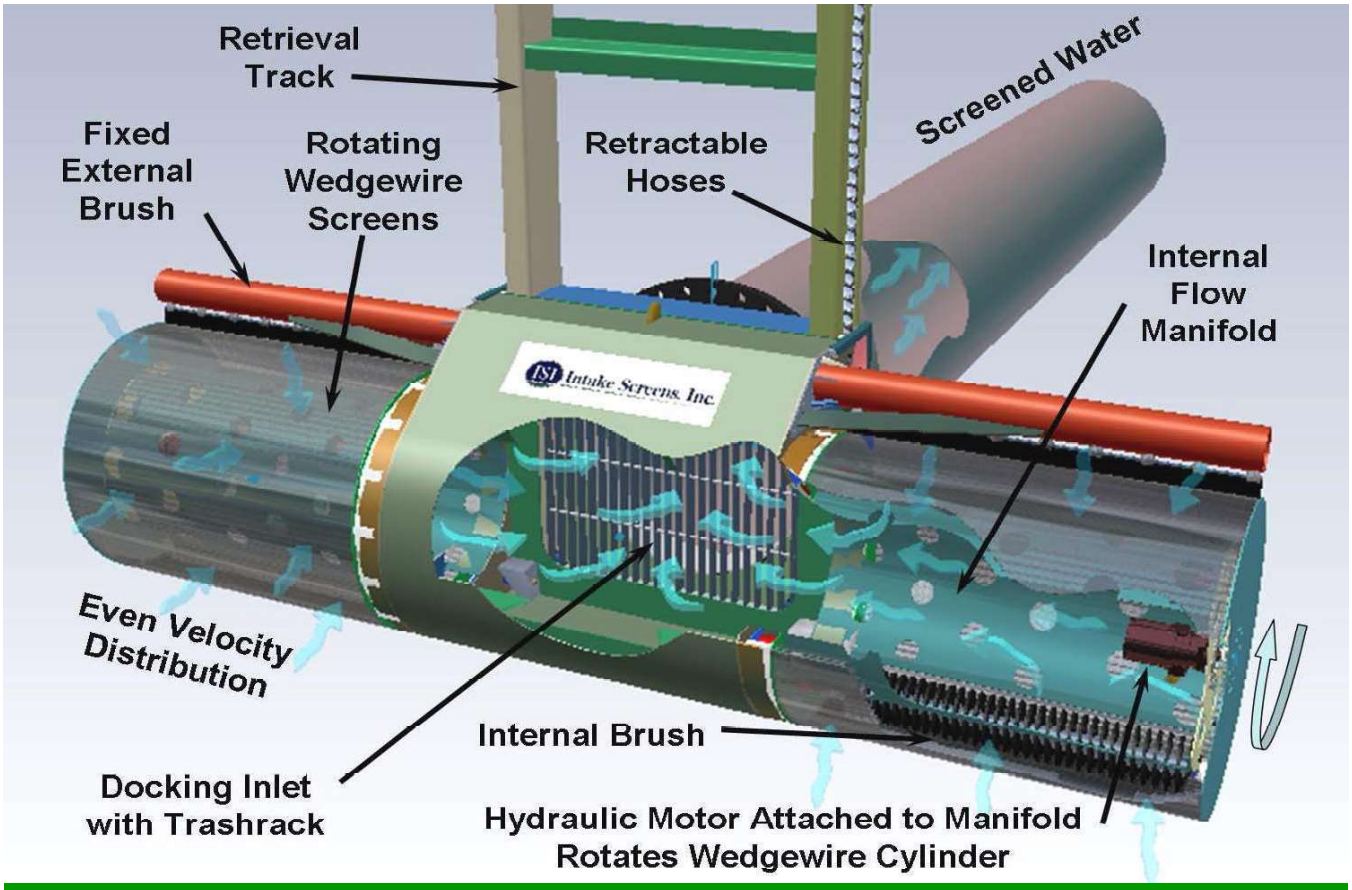
Since 1996

Revolutionary Cleaning Technology

Cylinder Screen with External and Internal Brush System

(Patent No. 7,347,933)

- **Strong, Innovative, Proven Technology using Wedgewire Screen**
- **Protects Downstream Equipment**
- **Minimizes Headloss and Clogging *Even* with Fine-Mesh Openings**
- **Complies with Regulatory Criteria**



FEATURES:

- **Powerful brushing *OUTSIDE* and *INSIDE* prevents biofouling and debris plugging**
- **Wedgewire screen designed for fish protection, filtration, and hydraulic loads**
- **Cylinder gives large screen surface area (small footprint)**
- **Easy retrieval on track system allows for easy inspection**
- **Even flow distribution for optimal cleaning and fish protection**
- **Hydraulic rotation is powerful, fully adjustable, and requires minimal power input**
- **Marine-duty hydraulic motor rotates screen for cleaning in *BOTH* Directions**
- **Custom-built systems available in cylinder diameters from 24 to 96 inches**
- **Remote monitoring and control systems available — SCADA interface**
- ***Design services and installation assistance available***

Off-Shore Intakes - River Diversions - Facility Retrofits



Left: Screens can be retrieved for inspection or during periods of non-use. Tracks can be installed on vertical walls or sloping banks.

Left Below: Cylinder screens can be mounted to existing facilities and can significantly increase intake screen surface area.

Right: Trashrack protects intake while screen is retracted. Rolling manifold and seating system holds unit securely sealed over intake when deployed.

Center : Screens can be manifolded to meet additional flow requirements for large installations. 72-inch diameter screens shown.

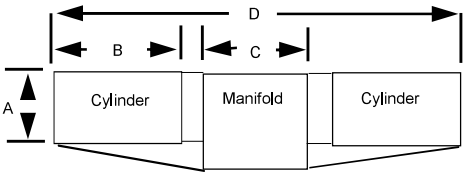








Above: Exterior and interior brushing action keeps screen surface very clean, minimizing headloss issues.



Cylinder Screen Specifications

Model *	Unit Dimensions A - B - C - D	Unit Weight	Screen Surface Area	Allowable Flow Rates ** Slot Velocity @ 0.5 ft/sec (0.08 m/s)	Approach Velocity @ 0.2 ft/sec (0.06 m/s)	Approach Velocity @ 0.33 ft/sec (0.10 m/s)	Approach Velocity @ 0.4 ft/sec (0.12 m/s)
ISI T30-42	30" - 42" - 36" - 128"	1,400 lbs.	**55.0 ft²** (5.11 m²)	**13.7 cfs** (388 l/s)	**9.4 cfs** (266 l/s)	**18.1 cfs** (513 l/s)	**22.0 cfs** (623 l/s)
ISI T36-54	36" - 54" - 48" - 164"	1,900 lbs.	**84.8 ft²** (7.88 m²)	**21.2 cfs** (600 l/s)	**17.0 cfs** (481 l/s)	**28.0 cfs** (793 l/s)	**33.9 cfs** (960 l/s)
ISI T42-66	42" - 66" - 60" - 200"	2,200 lbs.	**119.5 ft²** (11.10 m²)	**29.9 cfs** (847 l/s)	**23.9 cfs** (676 l/s)	**39.4 cfs** (1116 l/s)	**47.8 cfs** (1354 l/s)
ISI T48-72	48" - 72" - 60" - 212"	2,900 lbs.	**150.8 ft²** (14.01 m²)	**37.5 cfs** (1062 l/s)	**30.2 cfs** (885 l/s)	**48.8 cfs** (1382 l/s)	**60.3 cfs** (1708 l/s)
ISI T60-90	60" - 90" - 60" - 248"	3,800 lbs.	**235.6 ft²** (21.89 m²)	**58.9 cfs** (1668 l/s)	**47.1 cfs** (1334 l/s)	**77.8 cfs** (2203 l/s)	**94.2 cfs** (2667 l/s)

*** Available in Diameters from 24 to 96 inches (with custom lengths) — Call for more information**

** 1) Allowable flows based on using wedgewire screens with 50% open area. Typical screen with 1.75mm wire is shown below;
2) Maximum recommended slot velocity is 0.5 fps for most applications subjected to heavy debris or poor hydraulic conditions;
3) Cylinder lengths are typically limited to 1.5 times the diameter as shown in the table above. Shorter cylinder lengths are available;
4) Many fisheries agencies use a maximum approach velocity criteria instead of slot velocity. Approach Velocity is the component of velocity perpendicular to the screen surface and measured 3 inches away. A minimum open area is generally specified;
5) Single cylinder units (i.e. "drums" or half of a "T") are also available;
6) Regulatory design criteria varies and typically depends on fish protection needs. Call for information on slot sizes below 1mm.

ISI Intake Screens, Inc.



For more information contact:

E-mail: screens@intakescreensinc.com
Website: www.IntakeScreensInc.com

Office: 8417 River Road, Sacramento, CA 95832
Phone: (916) 665-2727 *Fax:* (916) 665-2729

Appendix L: Section 10 Drought Contingency Plan

Appendix M: Dow Reservoirs Operations Daily Electronic Logbook

Dow Reservoirs Operations Daily Electronic Log Book

Dow Reservoirs Operations **Month/Year**

MO/YR	Harris Expansion Reservoir							Harris Reservoir							Lake Jackson Pump Station		
	RIV SLT	SILT	TOT IN	LEVEL	DISCH	DISCH	DISCH	RIV SLT	SILT	TOT IN	LEVEL	DISCH	DISCH	DISCH	OC LVL	OC DAM	DISCH
DATE	%	ac-ft	ac-ft	ft	gpm	hrs	ac-ft	%	ac-ft	ac-ft	ft	gpm	hrs	ac-ft	ft	gpm	ac-ft
1																	
2																	
3																	
4																	
5																	
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26																	
27																	
28																	
29																	
30																	
31																	

Total Flows:	MTD	YTD
	ac-ft	ac-ft
Harris Expansion Reservoir Pumps:		
Harris Reservoir Pumps:		
Brazoria Reservoir Pumps:		
Lake Jackson Pumps:		
Buffalo Camp Bayou Divirsion Gates:		
Buffalo Camp Bayou Spillway:		
Oyster Creek Dam:		

Dow Reservoirs Operations Daily Electronic Log Book

Date Time of Report **Month/Year**

Brazoria Reservoir							Buffalo Camp Bayou				BWA Usage		Plant B Water Flow		
RIV SLT	SILT	TOT IN	LEVEL	DISCH	DISCH	DISCH	Diversion Gates		LEVEL	SPLWAY	TOTAL	TOTAL	PLT RATE	TOTAL	RETURNS
%	CY	ac-ft	ft	gpm	hrs	ac-ft	gpm	ac-ft	ft	ac-ft	Mgal/d	ac-ft	gpm	ac-ft	gpm

Dow Reservoirs Operations Daily Electronic Log Book

Dow River Water System Operations **Month/Year**

MO/YR	River Flow By USGS		Water Master		River Chlorides			Harris Pump Station										
	GAUGE	AMOUNT	REQUEST	GRANTED	WEDGE	@BRAZ	@HARRIS	P-1	P-1	P-1	P1 TOTAL	P1 TOTAL	P-2	P-2	P-2	P2 TOTAL	P1 TOTAL	TOTAL
DATE	LOC	ac-ft	ac-ft	ac-ft	Riv Mi	ppm	ppm	gpm	hrs	Totalizer	MMgal	ac-ft	gpm	hrs	Totalizer	MMgal	ac-ft	MMgal
1																		
2																		
3																		
4																		
5																		
6																		
7																		
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28																		
29																		
30																		
31																		

Rate Conversion Factors		
desired	known	
MMgal/d =	0.326	* ac-ft/d
MMgal/d =	0.646	* cfs
ac-ft/d =	3.069	* MMgal/d
ac-ft/d =	1.983	* cfs
cfs =	1.547	* MMgal/d
cfs =	0.504	* ac-ft/d
Cy =	0.001	* Ac-ft

Legend:		
	n.a. =	not applicable
	ac-ft =	acre-feet
	MMgal =	Million Gallons
	MTD =	Month to Date
	YTD =	Year to Date
	FOM =	First of Month
	gpm =	gallons per minute
	/d =	per day
	ppm =	parts per million

Dow Reservoirs Operations Daily Electronic Log Book

Date Time of Report **Month/Year**

Brazoria Pump Station											Lake Jackson Pump Station							
P-1	P-1	P-1	P1 TOTAL	P1 TOTAL	P-2	P-2	P-2	P2 TOTAL	P2 TOTAL	TOTAL	P-416A (40k)	P-416B (40k)	P-416C (40k)	P-416D (20k)	P-416E (10k)	P-5 (5k)	TO PLT	TOTAL
gpm	hrs	Totalizer	MMgal	ac-ft	gpm	hrs	Totalizer	MMgal	ac-ft	MMgal	hrs	hrs	hrs	hrs	hrs		max gpm	MMgal

Dow Reservoirs Operations Daily Electronic Log Book

Month/Year

Harris Expansion Pump Station										
P-1	P-1	P-1	P1 TOTAL	P1 TOTAL	P-2	P-2	P-2	P2 TOTAL	P1 TOTAL	TOTAL
gpm	hrs	Totalizer	MMgal	ac-ft	gpm	hrs	Totalizer	MMgal	ac-ft	MMgal

Water Stored:	FOM ac-ft	CURRENT ac-ft
Harris Expansion Reservoir		
Harris Reservoir		
Brazoria Reservoir		

Appendix N: Emergency Release Electronic Logbook

Harris Expansion Emergency Release Electronic Log Book

Event Number	
Emergency Release Start Date	
Emergency Release Start Time	
Emergency Release End Date	
Emergency Release End Time	

Notes:

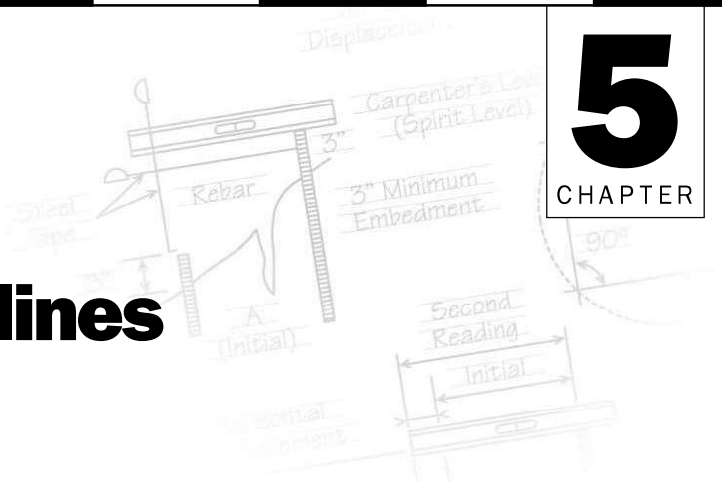
Date	Time (Hourly Record) Enter time as "x:xx AM/PM"	Discharge from Reservoir (cfs)	Reservoir Stage (ft)

Signature of Reservoir Technician: _____

Appendix O: TCEQ Inspection Guidelines

5
CHAPTER

Chapter 5: Inspection Guidelines



5.0 Introduction

An effective inspection program is essential for identifying problems and providing safe maintenance of a dam. An inspection program should involve three types of inspections: (1) periodic technical inspections; (2) periodic maintenance inspections; and (3) informal observations by project personnel as they operate the dam. Technical inspections must be performed by specialists familiar with the design and construction of dams and should include assessments of structure safety. Maintenance inspections are performed more frequently than technical inspections in order to detect, at an early stage, any developments that may be detrimental to the dam. They involve assessing operational capability as well as structural stability. The third type of inspection is actually a continuing effort by the dam owner's on-site project personnel (dam tenders, powerhouse operators, maintenance workers) performed in the course of their normal duties. The continued effectiveness of these inspections requires education of new personnel.

Regular visual inspections are among the most economical means you, the owner, can use to ensure the safety and long life of a dam and its immediate environment. Visual inspection is a straightforward procedure that can be used by any properly trained person to make a reasonably accurate assessment of a dam's condition. The inspection involves careful examination of the surface and all parts of the structure, including its adjacent environment. The equipment required is not expensive, and the inspection usually can be completed in less than one day.

A dam owner, by applying the maximum prudent effort, can identify any changes in previously noted conditions that may indicate a safety problem. Quick corrective action to conditions requiring attention will promote the safety and extend the useful life of the dam while possibly preventing costly future repairs.

5.1 Organizing for Inspection

All inspections should be organized and systematic, and inspectors should use equipment appropriate for the task, record observations accurately, and survey the structure and site comprehensively. It is essential that documentation be developed and maintained in order to ensure adequate follow-up and repair. Chapter 9 further discusses what form this documentation should take.

Equipment useful for inspections is listed in Table 5.1.

Recording Inspection Observations. An accurate and detailed description of conditions during each inspection will enable meaningful comparison of conditions observed at different times. The inspector should record all measurements and observed details required for an accurate picture of a dam's current condition and possible problems. Using the forms discussed in Chapter 9 and given in the appendixes will help record the details. This information has three elements:

(1) *Location*—Accurately describe the location of any questionable area or condition so that it can be evaluated for changes over time or reexamined by experts. Photographs can help. Record the location along the dam, as well as above the toe or below the crest. Similarly, document the location of problems in the outlet or spillway.

(2) *Extent or area*—The length, width, and depth or height of any suspected problem area should be determined.

(3) *Descriptive detail*—Give a brief yet detailed description of any anomalous condition. Some items to include:

- quantity of drain outflows
- quantity of seepage from point and area sources
- color or quantity of sediment in water
- depth of deterioration in concrete
- length, displacement, and depth of cracks
- extent of moist, wet, or saturated areas
- adequacy of protective cover
- adequacy of surface drainage
- steepness or configuration of slopes
- apparent deterioration rate
- changes in conditions

Coverage. An inspection is conducted by walking along and over a dam as many times as is required to observe the entire

Table 5.1
Inspection Equipment and Its Use

Notebook and pencil—should be available so that observations can be written down at the time they are made, reducing mistakes and avoiding the need to return to the site to refresh the inspector's memory.

Inspection checklist—serves as a reminder of all important conditions to be examined.

Tape recorder—can be effective in making a record of field observations.

Digital camera—can be used to photograph field conditions. Photographs taken from the same vantage points can also be valuable in comparing past and present conditions. Photographs can also be e-mailed to consultants or the Texas Dam Safety Program when necessary.

Hand level—may be needed to accurately locate areas of interest and to determine embankment heights and slope.

Probe—used to gather information on conditions below the surface, such as the depth and softness of a saturated area.

Hard hat—should be used when inspecting large outlets or working in construction areas.

Pocket tape—allows for accurate measurements so that meaningful comparisons can be made of movements.

Flashlight—may be needed to inspect the interior of an outlet in a small dam.

Shovel—useful in clearing drain outfalls, removing debris, and locating monitoring points.

Rock hammer—can be used to check questionable-looking riprap or concrete for soundness. Care must be taken not to break through thin spots or cause unnecessary damage.

Tapping device—is used to determine the condition of support material behind concrete or asphalt faced dams by firmly tapping the surface of the facing material. Concrete fully supported by fill material produces a "click" or "bink" sound, while facing material over a void or hole produces a "clonk" or "bonk" sound. The device can be made from a 1 -inch hardwood dowel with a metal tip firmly fixed to the tapping end, or it can be a length of reinforcing steel.

Binoculars—useful for inspecting limited-access areas, especially on concrete dams.

Volume container and timer—used to make accurate measurements of the rate of leakage. Various container sizes may be required, depending on the flow rates.

Stakes and flagging tape—used to mark areas requiring future attention and to stake the limits of existing conditions, such as cracks and wet areas, for future comparison.

GPS receiver—used to collect positional data on locations of interest.

Slope tool—used to measure degree of slope from horizontal.

Watertight boots—recommended for inspecting areas of the site where water is standing.

Snake leggings or chaps—recommended for situations where heavy brush or snakes may be encountered.

Bug repellent—recommended during warm weather. Insects that bite can reduce the efficiency and effectiveness of the inspector.

First-aid kit—particularly recommended for inspections in areas where poisonous snakes might be present.

structure. From any given location, a person can usually gain a detailed view for 10 to 30 feet in each direction, depending upon the smoothness of the surface or the type of material (grass, concrete, riprap, brush) on the surface. On the downstream slope, a zigzag inspection path will ensure that any cracking is detected.

Sequence. Here is sequence of inspection that ensures systematic coverage of an entire site:

- upstream slope
- crest
- downstream slope
- seepage areas
- inlet
- outlet
- spillway

Following a consistent sequence lessens the chance of an important condition being overlooked. Reporting inspection results in the same sequence is recommended to ensure consistent records. Inspection forms are included in Appendix A. The forms should be supplemented with additional details specific to a given dam.

Record keeping. The inspector should fill out a dated report for each inspection, which should be filed along with any photographs taken (which should also be dated). In addition to inspection observations, monitoring measurements and weather conditions (especially recent rains, extended dry spells and snow cover) should also be systematically included in the inspection record. A sketch of the dam with problem areas noted is helpful.

Immediately following an inspection, observations should be compared with previous records to see if there are any

trends that may indicate developing problems. If a questionable change or trend is noted, and failure is not imminent, you, the owner, should consult a professional engineer experienced in dam safety. Reacting quickly to questionable conditions will ensure the safety and long life of a dam and possibly prevent costly repairs or expensive litigation.

Crucial inspection times. There are at least five special times when an inspection is recommended regardless of the regular schedule:

(1) Prior to a predicted major rainstorm or heavy snow melt: check spillway, outlet channel, and riprap.

(2) During or after a severe rainstorm: check spillway, outlet channel, and riprap.

(3) During or after a severe windstorm: check riprap performance during the storm (if possible) and again after the storm has subsided.

(4) Following an earthquake in the area: make a complete inspection immediately after the event and weekly inspections for the next several months to detect any delayed effects.

(5) During and immediately after the first reservoir filling: schedule a regular program of frequent complete inspections during the period a reservoir is first being filled to ensure that design and site conditions are as predicted. In most states, including Texas, an inspection and filling schedule are prescribed by the design engineer and approved by the state engineer.

5.2 Embankment Dams and Structures

Embankment dams constitute the majority of structures in place in the U.S. The major features include:

- upstream slope
- downstream slope
- crest
- seepage areas

A spillway is also a necessary feature (Section 5.4). Many of the principles and guidelines presented in that section are also applicable to concrete structures.

5.2.1 Upstream Slope

Typically, major problems encountered on an upstream slope are:

- cracks
- slides
- cave-ins or sinkholes
- severe erosion

The first three conditions may indicate serious problems within the embankment. Severe erosion obviously can weaken the structure. An upstream slope should receive a close inspection because riprap, vegetative cover, and high water levels can hide problems. (When walking on riprap, take caution to avoid personal injury.) When a reservoir is emptied, the exposed slope should be thoroughly inspected for settlement areas, rodent (beaver) activity, sinkholes, or slides. Also, the reservoir basin (bottom of the reservoir) should be inspected for cave-ins or sinkholes.

Again, most importantly, a crisscross path should be used when inspecting the slope so that cracks and slides can be easily identified. In many instances, sighting along the waterline alignment will indicate a change in the uniformity of the slope; an inspector should stand at one end of the dam and sight along the waterline, checking for straightness and uniformity. If a crack is seen, the crest and downstream slope in its immediate area should be carefully inspected.

Cracks indicate possible foundation movement, embankment failure, or a surface slide. Locating them can be difficult. Cracks less than an inch in width can still be several feet deep. Cracks more than one foot deep usually are not produced by drying and usually are cause for concern. A line of recently dislodged riprap on an upstream slope could indicate a crack below the riprap.

Slides can be almost as difficult to detect as cracks. When a dam is constructed, the slopes may not be uniformly graded. Familiarity with the slope configuration at the end of construction can help identify subsequent slope movements. Moreover, the appearance of slides may be subtle; for example, they may produce only about two feet of settlement or bulging in a distance of 100 feet or more, yet that would still be a significant amount of settlement. Dated photographs are particularly helpful in detecting such changes.

Sinkholes or cave-ins result from internal erosion of the dam—a very serious condition for earthen embankments. The internal erosion, or piping, may be reflected by turbid seepage water on exit. Surface soil may be eroded by wave action, rain runoff, and animal burrowing. Such erosion, if allowed to continue, can lessen the thickness of the embankment and weaken the structure.

Animal burrows on the upstream slope can also indicate a serious problem on smaller dams. Beavers, nutria, and other burrowing animals can create pathways for seepage. See Chapter 7.

To ensure adequate inspection and prevent potential seepage paths, keep the upstream slope free from obscuring weeds, brush, or trees.

Figures 5.1 show potential problems with the upstream slope, causes, possible consequences, and recommended actions.

5.2.2 Downstream Slope

A downstream slope should be inspected carefully because it is the area where evidence of developing problems appears most frequently. To ensure

adequate inspection, keep this area free from obscuring weeds, brush, or trees.

When cracks, slides or seepage are noted in the downstream slope, notify the designated dam-safety authorities immediately.

On the downstream slope, some of the more threatening conditions that could be identified are:

- cracks
- slides
- seepage

Cracks can indicate settlement, drying and shrinkage, or the development of a slide. Whatever the cause, cracks should be monitored and changes in length and width noted. Drying cracks may appear and disappear seasonally and normally will not show vertical displacement as will settlement cracks or slide cracks.

Slides require immediate detailed evaluation. Early warning signs include a bulge in the embankment near the toe of a dam or vertical displacement in the upper portion of an embankment.

Seepage is discussed separately below (Section 5.2.4).

If a downstream slope is covered with heavy brush or vegetation, a more concentrated search must be made and may require cleaning off the vegetation.

In addition, the downstream slope should be inspected for animal burrows and excessive vegetative cover and for erosion, especially at the contacts with the abutments,.

Figures 5.2 show potential problems with the downstream slope, causes, possible consequences, and recommended action.

5.2.3 Crest

A dam's crest usually provides the primary access for inspection and maintenance. Because surface water will pond on a crest unless that surface is well maintained, this part of a dam usually requires periodic regrading. However, problems found on the crest should not be simply graded over or covered up. When a questionable condition is found, the Texas Dam Safety Program should be notified immediately.

On the crest, some of the more threatening conditions that may be identified are:

- longitudinal cracking
- transverse cracking
- misalignment
- sinkholes

Longitudinal cracking can indicate localized instability, differential settlement, movement between adjacent sections of the embankment, or any combination of the three. Longitudinal cracking is typically characterized by a single crack or a close, parallel system of cracks along the crest, more or less parallel to the axis of the dam. These cracks, which are usually continuous over their length and usually greater than one foot deep, can be differentiated from drying cracks, which are usually intermittent, erratic in pattern, shallow, very narrow, and numerous.

Longitudinal cracking may precede vertical displacement as a dam attempts to adjust to a position of greater stability. Frequently, longitudinal cracking occurs at the edge of the crest with either slope. Vertical displacements on the crest are usually accompanied by displacements on the upstream or downstream face of a dam.

Transverse cracking can indicate differential settlement or movement between adjacent segments of a dam. Transverse cracking usually manifests as a single crack or a close, parallel system of cracks that extend across the crest more or less perpendicular to the length of the dam. This type of cracking is usually greater than one foot in depth. If this condition is seen or suspected, notify the Texas Dam Safety Program office immediately.

Transverse cracking poses a definite threat to the safety and integrity of a dam. If a crack should progress to a point below the reservoir water-surface elevation, seepage could progress along the crack and through the embankment, causing severe erosion and—if not corrected—leading to failure of the dam.

Misalignment can indicate relative movement between adjacent portions of a dam—generally perpendicular to its axis. Excessive settlement of dam material, the foundation, or both can also cause misalignment. Most problems are usually detectable during close inspection. Misalignment may, however, only be detectable by viewing a dam from either abutment. If on close inspection the crest appears to be straight for the length of the structure, alignment can be further checked by standing away from the dam on either abutment and sighting along the upstream and downstream edges of the crest. On curved dams, alignment can be checked by standing at either end of a short segment of the dam and sighting along the crest's upstream and downstream edges, noting any curvature or misalignment in that section. Leaning utility poles or poles used for highway barriers also can indicate movement.

Sinkholes can indicate internal collapse, piping, or the presence of animal dens. The formation or progression of a sinkhole is dangerous because it poses a threat to inspectors or vehicles traversing the crest. A sinkhole collapse can also lead to a flow path through a dam, which can create an uncontrolled breach.

In addition, the crest should be inspected for animal burrows, low areas, vegetative cover, erosion, slope of the crest, narrowing of the crest, and traffic ruts.

Figures 5.3 show potential problems with the crest, causes, possible consequences, and recommended action.

5.2.4 Seepage Areas

As discussed previously, although all dams have some seepage, seepage in any area on or near a dam can be dangerous,

and all seepage should be treated as a potential problem. Wet areas downstream from dams are not usually natural springs, but seepage areas. Seepage must be controlled in both velocity and quantity. High-velocity flows through a dam can cause progressive erosion and, ultimately, failure. Saturated areas of an embankment or abutment can move in massive slides and thus also lead to failure.

Seepage can emerge anywhere on the downstream face of a dam, beyond the toe, or on the downstream abutments at elevations below normal reservoir levels. A potentially dangerous condition exists when seepage appears on the downstream face above the toe of a dam. If seepage is found on the top half of the downstream slope, the Texas Dam Safety Program should be notified immediately. Seepage on the downstream slope can cause a slide or failure of the dam by internal erosion (piping). Evidence of seepage may vary from a soft, wet area to a flowing spring and may appear initially as only an area where vegetation is lush and dark green in color. Cattails, reeds, mosses, and other marsh vegetation often become established in seepage areas. Downstream abutment areas should always be inspected closely for signs of seepage, as should the area of contact between an embankment and a conduit spillway, drain, or other appurtenant structures and outlets. Slides in the embankment or an abutment may be the result of seepage causing soil saturation and high pore pressures.

Since seepage can be present but not readily visible, an intensive search should be made of all downstream areas where seepage water might emerge. Even in short grass cover, seepage may not be visible and must be walked on to be found. Ideally, an inspection for seepage should be made when a reservoir is full.

Figures 5.4 show potential problems with seepage, causes, possible consequences, and recommended action.

5.3 Concrete Dams and Structures

From a safety standpoint, the principal advantage of concrete over earthen dams is their relative freedom from failure by erosion during overtopping as well as from embankment slides and piping failures. Although concrete dams comprise a minority of all dams, they are commonly of greater height and storage capacity than earthen structures. Thus, they often represent a potentially greater hazard to life and property. It is important that concrete-dam owners be aware of the principal modes of failure of such dams and that they be able to discern between conditions which threaten the safety of the dam and those that merely indicate a need for maintenance.

Concrete dams fail for reasons that are significantly different from earth dams. These include:

- structural cracks
- foundation and abutment weakness
- deterioration due to alkali-aggregate reaction

Should any of these conditions be discovered during inspection, an owner should obtain engineering assistance immediately.

Structural cracks occur when portions of the dam are overstressed; they result from inadequate design, poor construction, foundation settlement, or faulty materials. Structural cracks are often irregular, may run at an angle to the major axes of the dam and may exhibit abrupt changes in direction. These cracks can also be noticeably displaced, radially, transversely, or vertically.

Concrete dams transfer a substantial load to the abutments and foundation. Although the concrete of a dam may endure, the natural abutments or foundation may crack, crumble, or move in a massive slide. If that occurs, support for the dam is lost and it fails. Impending failure of the foundation or abutments may be difficult to detect because initial movements are often very small.

Severe deterioration can result from a chemical reaction between alkali present in cements and certain forms of silica present in some aggregates. This chemical reaction produces by-products of silica gels, which cause expansion and loss of strength within concrete. An alkali reaction is characterized by certain observable conditions such as cracking (usually a random pattern on a fairly large scale), and by excessive internal and overall expansion. Additional indications include the presence of a gelatinous exudation or whitish amorphous deposits on the surface and a chalky appearance in freshly fractured concrete.

The alkali-aggregate reaction takes place in the presence of water. Surfaces exposed to the elements or dampened by seepage will deteriorate most rapidly. Once suspected, the condition can be confirmed by a series of tests performed on core samples drilled from a dam. Although the deterioration is gradual, an alkali-aggregate reaction cannot be economically corrected by any means now known. Continued deterioration may require total replacement of a structure.

Inspection of a concrete dam is similar to that of an earthen dam. However, the following additional items should be considered:

- access and safety
- monitoring
- outlet system
- cracks at construction and expansion joints
- shrinkage cracks
- deterioration due to spalling
- minor leakage

Access and safety are important because the faces of concrete dams are often nearly vertical, and sites are com-

monly steep-walled rock canyons. Access to the downstream face, toe area, and abutments of such dams may be difficult and require special safety equipment, such as safety ropes or a boatswain's chair. Concrete dams pose a special problem for the dam owner because of the difficulty in gaining close access to the steep surfaces. Regular inspection with a pair of powerful binoculars can initially identify areas where change is occurring. When changes are noted, a detailed, close-up inspection should be conducted. Close inspection of the upstream face may also require a boatswain's chair or a boat.

Monitoring helps detect structural problems in concrete dams such as cracks in the dam, abutments, or foundation. Cracks may develop slowly at first, making it difficult to determine if they are widening or otherwise changing over time. If a structural crack is discovered, it should be monitored for changes in width, length, and offset, and a monitoring network of instruments should be installed and read regularly.

Outlet-system deterioration is a problem for all dams, but the frequency of such damage may be higher in concrete dams because of their greater average hydraulic pressure. Thus, outlet-system inspection should be emphasized for large concrete dams.

Cracks at construction joints exist because concrete dams are built in segments, while expansion joints—referred to as "designed" cracks—are built into dams to accommodate volumetric changes which occur in the structures after concrete placement. These joints are typically constructed so that no bond or reinforcing, except non-bonded water stops and dowels, extend across the joints.

Shrinkage cracks often occur when, during original construction, irregularities or pockets in the abutment contact are filled with concrete and not allowed to cure fully prior to placement of adjacent portions of the dam. Subsequent shrinkage of the concrete may lead to irregular cracking at or near the abutment.

Shrinkage cracks are also caused by temperature variation. During winter months, the upper portion of a dam may become significantly colder than those portions in direct contact with reservoir water. This temperature differential can result in cracks which extend from the crest for some distance down each face of the dam. These cracks will probably occur at construction or expansion joints, if any.

Shrinkage cracks can be a sign that certain portions of the dam are not carrying the design load. In such cases, the total compression load must be carried by a smaller proportion of the structure. It may be necessary to restore load-carrying capability by grouting affected areas. This work requires the assistance of an engineer.

Spalling is the process by which concrete chips and breaks away as a result of freezing and thawing, corrosion of the reinforcement, or movement. Almost every concrete dam in colder climates experiences continued minor deterioration due to spalling. Because it usually affects only the surface of a structure, it is not ordinarily considered dangerous. However, if allowed to continue, spalling can result in structural damage, particularly if a dam is thin in cross-section. Repair is also necessary when reinforcing steel becomes exposed. The method of repairing spalled areas depends upon the depth of the deterioration. In severe situations, engineering assistance is required.

Minor leakage through concrete dams, although unsightly, is not usually dangerous unless accompanied by structural cracking. The effect may be to promote deterioration due to freezing and thawing. However, increases in seepage could indicate that, through chemical action, materials are being leached from the dam and carried away by the flowing water. Dam owners should note that decreases in seepage can also occur as mineral deposits are formed in portions of the seepage channel. In either case, the condition is not inherently dangerous and detailed study is required to determine if repair is necessary for other than cosmetic reasons.

Figures 5.4 show potential problems with concrete dams and structures, causes, possible consequences, and recommended action.

5.4 Spillways

As detailed in Chapter 2, the main function of a spillway is a safe exit for excess water in a reservoir. If a spillway is too small, a dam could be overtopped and fail. Similarly, defects in a spillway can cause failure by rapid erosion. A spillway should always be kept free of obstructions, have the ability to resist erosion, and be protected from deterioration. Because dams represent a substantial investment and spillways make up a major part of dam costs, a conscientious annual maintenance program should be pursued not only to protect the public but also to minimize costs as well.

The primary problems encountered with spillways include:

- inadequate capacity
- obstructions
- erosion
- deterioration
- cracks
- open joints
- undermining of the spillway outlet
- deterioration of spillway gates

Inadequate capacity is determined by several factors, such as the drainage area served, the magnitude or intensity of storms in the watershed, the storage capacity of the reservoir, and the speed with which rainwater flows into and fills the reservoir. An inadequate spillway can cause the water in a reservoir to overtop the dam.

A spillway may be obstructed by excessive growth of grass and weeds, thick brush, trees, debris, fences across channels to prevent migration of fish, or landslide deposits. An obstructed spillway can have a substantially reduced discharge capacity which can lead to overtopping of the dam. Grass is usually not considered an obstruction; however, tall weeds, brush, and young trees should periodically be cleared from spillways. Similarly, any substantial amount of soil deposited in a spillway—whether from sloughing, landslide or sediment transport—should be immediately removed. Timely removal of large rocks is especially important, since they can obstruct flow and encourage erosion.

Erosion of a spillway may occur during a large storm when large amounts of water flow for many hours. Severe damage of a spillway or complete washout can result if the spillway cannot resist erosion. If a spillway is excavated out of a rock formation or lined with concrete, erosion is usually not a problem. However, if a spillway is excavated in sandy soil, deteriorated granite, clay, or silt deposits, protection from erosion is very important. Generally, resistance to erosion can be increased if a spillway channel has a mild slope, or if it is covered with a layer of grass or riprap with bedding material.

A spillway cannot be expected to perform properly if it has deteriorated. Examples include the collapse of side slopes, riprap, concrete lining, approach section, the chute channel, the stilling basin, the discharge channel, or protective grass cover. These problems can cause water to flow under and around the protective material and lead to severe erosion. Remedial action must be taken as soon as any sign of deterioration has been detected.

Drying cracks in an earthen spillway channel are usually not regarded as a functional problem. However, missing rocks in a riprap lining can be considered a crack in the protective cover, and must be repaired at once.

Cracks in concrete lining of a spillway are commonly encountered. These cracks may be caused by uneven foundation settlement, shrinkage, slab displacement, or excessive earth or water pressure. Large cracks will allow water to wash out fine material below or behind the concrete slab, causing erosion, more cracks, and even severe displacement of the slab. The slab may even be dislodged and washed away by the flow. A severely cracked concrete spillway should be examined by and repaired under the supervision of an engineer.

Open or displaced joints can occur from excessive and uneven settlement of the foundation or the sliding of a concrete slab. In some cases, a construction joint is too wide or has been left unsealed. Sealants deteriorate and wash away. Water can flow through the joints, undermining the slabs, which in turn could result in collapse of the spillway slabs. Pressures resulting from water flowing over the open slabs could also result in lifting and displacement of slabs. Joints need to be sealed and kept sealed.

Erosion of foundation material may weaken support and cause further cracks; pressure induced by water flowing over displaced joints may wash away part of a wall or slab, or cause extensive undermining.

Undermining of a spillway causes erosion at a spillway outlet, whether it be a pipe or overflow spillway, and is one of the most common spillway problems. Severe undermining of the outlet can displace sections of pipe, cause slides in the downstream embankment of the dam, and eventually lead to complete failure of a dam. Water must be conveyed safely from the reservoir to a point downstream of the dam without endangering the spillway itself or the embankment. Often the spillway outlet is adequately protected for normal flow conditions, but not for extreme turbulent flows. It is easy to mis-estimate the energy and force of flowing water and the resistance of outlet material (earth, rock, concrete, etc). The required level of protection is difficult to establish by visual inspection but can usually be determined by hydraulic calculations performed by a professional engineer.

Structures that completely control erosion at a spillway outlet are usually expensive, but often necessary. Less expensive protection can also be effective, but require extensive periodic maintenance as areas of erosion and deterioration develop.

The following four factors, often interrelated, contribute to erosion at the spillway outlet:

1. Flows emerging from the outlet are above the stream channel. If outlet flows emerge at the correct elevation, tailwater in the stream channel can absorb a substantial amount of the high velocity. The flow and the hydraulic energy will be contained in the stilling basin.
2. Flows emerging from the spillway are generally free of sediment and therefore have substantial sediment-carrying capacity. In taking on sediment, moving water will scour soil material from the channel and leave eroded areas. Such erosion is difficult to design for and requires protection of the outlet for a safe distance downstream from the dam.
3. Flows leaving the outlet at high velocity can create negative pressures that can cause material to come loose and separate from the floor and walls of the outlet channel. This process is called *cavitation* when it occurs on concrete or metal surfaces. Venting can sometimes be used to relieve negative pressures.
4. Water leaking through pipe joints or flowing along a pipe from the reservoir may weaken the soil structure around the pipe. Inadequate compaction adjacent to such structures during construction can compound this problem.

Deterioration of gates in spillways can result in an inability of the gates to

function during storm events. Causes of structural deterioration include, but are not limited to:

1. *Corrosion* can seriously weaken a structure or impair its operation. The effect of corrosion on the strength, stability, and serviceability of gates must be evaluated. A loss of cross-section in a member causes a reduction in strength and stiffness that leads to increased stress levels and deformation without any change in the imposed loading. Flexure, shear, and buckling strength may be affected. A buildup of corrosion products can be damaging at connection details. For example, corrosion buildup in a tainter gate trunnion can lead to extremely high hoist loads. Localized pitting corrosion can form notches that may serve as fracture initiation sites, which could significantly reduce the member's fatigue life.
2. ***Fracture*** usually initiates at a discontinuity that serves as a local stress raiser. Structural connections that are welded, bolted, or riveted are sources of discontinuities and stress concentrations.
3. *Fatigue* is the process of cumulative damage caused by repeated cyclic loading. Fatigue damage generally occurs at stress-concentrated regions where the localized stress exceeds the yield stress of the material. Fatigue is particularly a concern with spillway gates with vibration problems.
4. *Operation and maintenance.* Proper operation and maintenance of spillway gates are necessary to prevent structural deterioration. The following items are possible causes of structural deterioration.
   a. Weld repairs are often sources of future cracking or fracture problems, particularly if the existing steel had poor weldability.
   b. If moving connections are not lubricated properly, the bushings will wear and result in misalignment of the gate, resulting in wear of other parts and unforeseen loads.
   c. Malfunctioning limit switches could result in detrimental loads and wear.
   d. A coating system or cathodic protection that is not maintained can result in detrimental corrosion of metal components.
5. *Unforeseen loading.* Accidental overload or dynamic loading of a gate can result in deformed members or fracture. When structural members become deformed or buckled, they may have significantly reduced strength or otherwise impair the performance of the gate. Dynamic loading may be caused by hydraulic flow at the seals. Other unusual loadings may occur from malfunctioning limit switches or debris trapped at interfaces between moving parts. Unusual loads may also develop on gates supported by walls that are settling or moving. These unusual loads can cause overstressing and lead to deterioration.

Procedure for inspection—Spillway inspection is an important part of a dam-safety program. Its basic objective is to detect any sign of obstruction, erosion, deterioration, misalignment, or cracking.

An inspection of an earth spillway should determine whether side slopes have sloughed and whether there is excessive vegetation in the channel, and should look for signs of erosion and rodent activity. The inspector should also use a probe to determine the hardness and moisture content of the soil, note the location of particularly wet or soft spots, and see if the stilling basin or drop structure is properly protected with rocks or riprap. Because some erosion is unavoidable during spilling, an owner should also determine whether such erosion might endanger the embankment itself. If the spillway is installed with a sill or wall, a dam owner should also determine if there are any cracks or misalignment in the sill or wall and check for erosion beneath of the sill or wall or downstream from it.

Hairline cracks are usually harmless. Large cracks should be carefully inspected and their location, width, length, and orientation noted. Deterioration should be determined. The concrete should be examined for exposure of reinforcing bars.

Spillway surfaces exposed to freeze-thaw cycles often suffer from surface spalling. Chemical action, corrosion of the reinforcement, movement, contamination, and unsound aggregates can also cause spalling. If spalling is extensive, the spalled area should be sketched or photographed, showing its length, width, and depth. The problem should be examined closely to see if the remaining concrete has deteriorated or if reinforcing bars are exposed. The concrete should be tapped with a tapping device or rock hammer to determine if voids exist below the surface. Shallow spalling should be examined from time to time to determine if it is becoming worse. Deep spalling should be repaired as soon as possible by an experienced contractor.

Walls of spillways are usually equipped with weep (or drain) holes. Occasionally spillway chute slabs are also equipped with weep holes. If all such holes are dry, the soil behind the wall or below the slab is probably dry as well. If some holes are draining while others are dry, the dry holes may be plugged by mud or mineral deposits. Plugged weep holes increase the chances for failure of retaining walls or chute slabs. The plugged holes should be probed to determine causes of blockage, and soil or deposits cleaned out to restore drainage. If that work is not successful, rehabilitate the drain system as soon as possible under the supervision of a professional engineer.

Spillway retaining walls and chute slabs are normally constructed in sections. Between adjoining sections, gaps or joints must be tightly sealed with flexible

materials such as tar, epoxies, or other chemical compounds. Sometimes rubber or plastic diaphragm materials or copper foil are used to obtain watertightness. During inspection, one should note the location, length, and depth of any missing sealant, and probe open gaps to determine if soil behind the wall or below the slab has been undermined.

Misalignment of spillway retaining walls or chute slabs may be caused by foundation settlement or earth or water pressure. The inspector should carefully look at the upstream or downstream end of a spillway near the wall to determine if it has been tipped inward or outward. Relative displacement or offset between neighboring sections can be readily identified at joints. The horizontal as well as vertical displacement should be measured. A fence on top of the retaining wall is usually erected in a straight line at the time of construction; thus any curve or distortion of the fence line may indicate wall deformation.

At the time of construction, the entire spillway chute should form a smooth surface. Thus, measurement of relative movement between neighboring chute slabs at joints will give a good indication of slab displacement. Misalignment or displacement of walls or the slab is often accompanied by cracks. A clear description of crack patterns should be recorded or photos taken to help in understanding the nature of the displacement.

The following areas should be inspected on all gates in spillways:

- main framing members and lifting and support assemblies
- locations susceptible to fracture or weld-related cracking
- corrosion-susceptible areas—normal waterline, abrasion areas, crevices, areas where water could stand
- lifting connections and chains or cables
- trunnions
- intersecting welds
- previous cracks repaired by welding
- locations of previous repairs or where damage has been reported
- seal plates

Figures 5.6 show potential problems with spillways, causes, possible consequences, and recommended action.

5.5 Inlets, Outlets, and Drains

A dam's inlet and outlet works, including internal drains, are essential to its operation. Items for inspection and special attention include:

- reservoir pool levels
- lake drains and internal drains
- Corrosion
- trashracks on pipe spillways
- cavitation

The topics discussed above for spillways also are relevant.

Reservoir pool levels are controlled by spillway gates, lake drain-and-release structures, or flashboards. Flashboards, sometimes used to permanently or temporarily raise the pool level of water supply reservoirs, should not be installed or allowed unless there is sufficient freeboard remaining to safely accommodate a design flood. Pool-level drawdown should not exceed about 1 foot per week for slopes composed of clay or silt materials except in an emergency. Very flat slopes or slopes with free-draining upstream soils can, however, withstand more rapid drawdown rates. Conditions causing or requiring temporary or permanent adjustment of the pool level include:

- A problem that requires lowering of the pool. Drawdown is a temporary solution until the problem is solved.
- Release of water downstream to supplement stream flow during dry conditions.
- Fluctuations in the service area's demand for water.
- Repair of boat docks in the winter and growth of aquatic vegetation along the shoreline.
- Requirements for recreation, hydropower, or waterfowl and fish management.

Lake drains—A lake drain should always be operable so that the pool level can be drawn down in case of an emergency or for necessary repair. Lake-drain valves or gates that have not been operated for a long time can present a special problem for owners. If the valve cannot be closed after it is opened, the impoundment could be completely drained. An uncontrolled and rapid drawdown could also cause more serious problems such as slides along the saturated upstream slope of the embankment or downstream flooding. Therefore, when a valve or gate is operated, it should be inspected and all appropriate parts lubricated and repaired. It is also prudent to advise downstream residents of large or prolonged discharges.

Testing a valve or gate without risking complete drainage entails physically blocking the drain inlet upstream from the valve. Some drains have been designed with this capability and have dual valves or gates, or slots for stoplogs (sometimes called *bulkheads*) upstream from the valve. Otherwise, divers can be hired to inspect the drain inlet and may be able to construct a temporary block at the inlet. Since that could be dangerous, safety precautions are needed.

Other problems may be encountered when operating a lake drain. Sediment can build up and block the drain inlet, or debris can enter the valve chamber, hindering its function. The likelihood of these problems is greatly decreased if the valve or gate is operated and maintained on a schedule prepared by a professional engineer.

Corrosion is a common problem of pipe spillways and other conduits made of

metal. Exposure to moisture, acid conditions, or salt will accelerate corrosion. In particular, acid runoff from strip mine areas will cause rapid corrosion of steel pipes. In such areas, pipes made of noncorrosive materials such as concrete or plastic should be used. Metal pipes which have been coated to resist accelerated corrosion are also available. The coating can be of epoxy, aluminum, zinc (galvanization), asbestos or mortar. Coatings applied to pipes in service are generally not very effective because of the difficulty of establishing a bond. Similarly, bituminous coating cannot be expected to last more than one to two years on flow ways. Of course, corrosion of metal parts of operating mechanisms can be effectively treated and prevented by keeping those parts greased and/or painted.

Corrosion can also be controlled or arrested by installing cathodic protection. A sacrificial metallic anode made out of a material such as magnesium is buried in the soil and is connected to the metal pipe by wire. An electric potential is established which causes the magnesium to corrode and not the pipe.

Trash on pipe spillways. Many dams have pipe and riser spillways. As with concrete spillways, pipe inlets that become plugged with debris or trash reduce spillway capacity. As a result, the potential for overtopping is greatly increased, particularly if there is only one outlet. If a dam has an emergency spillway channel, a plugged principal spillway will cause more frequent, and greater than normal, flow in the emergency spillway; because emergency spillways are generally designed for infrequent flows of short duration, serious damage may result. For these reasons trash collectors or trashracks should be installed at the inlets to pipe spillways and lake drains.

A well-designed trashrack will stop large debris that could plug a pipe but allow unrestricted passage of water and smaller debris. Some of the most effective racks have submerged openings which allow water to pass beneath the trash into the riser inlet as the pool level rises. Openings that are too small will stop small debris such as twigs and leaves, which in turn will cause a progression of larger items to build up, eventually completely blocking the inlet. Trashrack openings should be at least 6 inches across, regardless of the pipe size. The larger the principal spillway conduit, the larger the trashrack opening should be. The largest possible openings should be used, up to a maximum of about 2 feet. A trashrack should be properly attached to the riser inlet and strong enough to withstand the forces of fast-flowing debris, heavy debris, and ice. If the riser is readily accessible, vandals may throw riprap stone into it. The size of the trashrack openings should not be decreased to prevent this. Instead rock that is larger than the trashrack openings or too large to handle should be used for riprap.

Maintenance should include periodic checking of the trashrack for rusted and broken sections and repair as needed. The rack should be checked frequently during and after storms to ensure that it is functioning properly and to remove accumulated debris.

Cavitation. When water flows through an outlet system and passes restrictions (e.g., valves), the pressure may drop. If localized water pressures drop below the vapor pressure of water, a partial vacuum is created and the water actually boils, causing shock-waves which can damage the outlet pipes and control valves. This process can be a serious problem for large dams where discharge velocities are high.

Testing the outlet system. All valves should be fully opened and closed at least once a year. This not only limits corrosion buildup on control stems and gate guides, but also provides an opportunity to check for smooth operation of the system. Jerky or erratic operation could signal problems, and indicate the need for more detailed inspection.

The full range of gate settings should be checked. The person performing the inspection should slowly open the valve, checking for noise and vibration—certain valve settings may result in greater turbulence. He or she should also listen for noise like gravel being rapidly transported through the system—this sound indicates cavitation and these gate settings should be avoided. The operation of all mechanical and electrical systems, backup electric motors, power generators, and power and lighting wiring associated with the outlet should also be checked.

Inspecting the outlet system. Accessible portions of the outlet, such as the outfall structure and control, can be inspected easily and regularly. However, severe problems are commonly associated with deterioration or failure of portions of the system either buried in the dam or normally under water.

- Outlet pipes 30 inches or greater in diameter can be inspected internally, provided the system has an upstream valve allowing the pipe to be emptied. Tapping the conduit interior with a hammer can help locate voids behind the pipe. This type of inspection should be performed at least once a year.
- Small-diameter outlet pipes can be inspected by remote TV camera if necessary. The camera is channeled through the conduit and transmits a picture back to an equipment truck. This type of inspection is expensive and usually requires the services of an engineer. However, if no other method of inspection is possible, inspection by TV is recommended at least once every five years.
- Outlet intake structures, wet wells, and outlet pipes with only downstream valves are the most difficult dam appurtenances to inspect because they are usually under water. These should

be inspected whenever the reservoir is drawn down or at five-year intervals. If a definite problem is suspected, or if the reservoir remains full over extended periods, divers should be hired to perform an underwater inspection.

Figures 5.7 show potential problems with inlets, outlets, and drains, causes, possible consequences, and recommended action.

5.6 General Areas

Other areas requiring inspection include:

- mechanical and electrical systems
- the reservoir surface and shoreline
- the upstream watershed
- downstream floodplains

Mechanical equipment includes spillway gates, sluice gates or valves for lake drains or water supply pipes, stoplogs, sump pumps, flashboards, relief wells, emergency power sources, siphons, and other devices. All mechanical and associated electrical equipment should be operated at least once a year and preferably more often. The test should cover the full operating range of the equipment under actual operating conditions. Each operating device should be permanently marked for easy identification, and all operating equipment should be kept accessible. All controls should be checked for proper security to prevent vandalism or malicious intent, and finally, all operating instructions should be checked for clarity and maintained in a secure, but readily accessible, location.

The reservoir surface and shoreline should be inspected to identify possible problems away from the actual structure. Whirlpools can indicate submerged outlets. Large landslides into the reservoir could cause waves to overtop the dam.

Floods arise from the upstream watershed. Therefore, characteristics of the watershed, such as impervious areas (e.g., parking lots), relate directly to the magnitude of a flood. Urban development in a watershed can increase the size of flood peaks and the volume of runoff, making a previously acceptable spillway inadequate. Awareness of upstream development and other factors that might influence reservoir inflows is important in order to determine the necessity for any modifications to the dam or spillways.

Development in downstream floodplains is also very important to the dam owner as the extent of development and flood preparedness relates directly to loss of life and damages should the dam fail. Downstream development may raise the hazard rating of the dam; therefore, it should be accounted for during annual assessments.

(Chapter figures on following pages.)

Figure 5.1
Inspection Guidelines - Upstream Slope

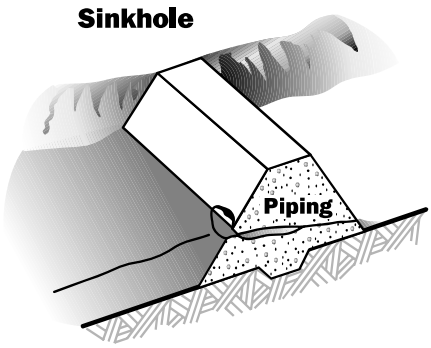


Figure 5.1a

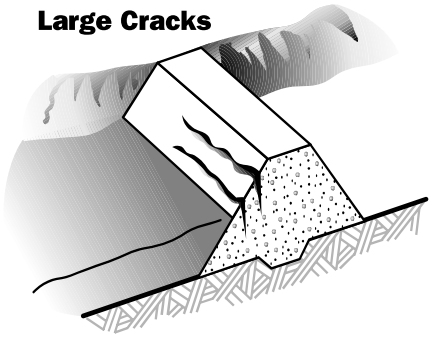


Figure 5.1b

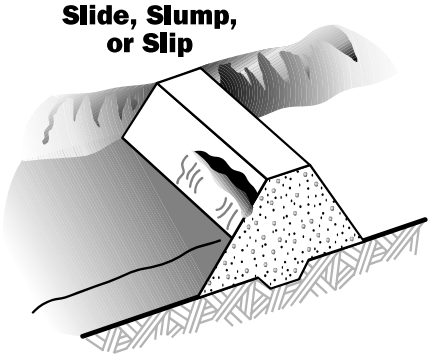


Figure 5.1c

Problem	Probable Cause and Possible Consequences	Recommended Actions
Sinkhole *(Figure 5.1a)*	Piping or internal erosion of embankment materials or foundation causes a sinkhole. The cave-in of an eroded cavern can result in a sinkhole. A small hole in the wall of an outlet pipe can develop into a sinkhole. Dirty water at the exit indicates erosion of the dam. Piping can empty a reservoir through a small hole in the wall or can lead to failure of a dam as soil pipes erode through the foundation or a pervious part of the dam. Dispersive soils are particularly susceptible to sinkholes.	Inspect other parts of the dam for seepage or more sinkholes. Check seepage and leakage outflows for dirty water. A qualified engineer should inspect the conditions, identify the exact cause of sinkholes, and recommend further actions. Depending on the location in the embankment, the reservoir may need to be drawn down. ENGINEER REQUIRED
Large Cracks *(Figure 5.1b)*	A portion of the embankment has moved because of loss of strength, or the foundation may have moved, causing embankment movement. Indicates onset of massive slide or settlement caused by foundation failure.	Depending on embankment involved, draw reservoir level down. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED
Slide, Slump, or Slip *(Figure 5.1c)*	Earth or rocks move down the slope along a slippage surface because of too steep a slope, or the foundation moves. Also, look for slide movements in reservoir basin. A series of slides can lead to obstruction of the inlet or failure of the dam.	Evaluate extent of the slide. Monitor slide. (See Chapter 6.) Draw the reservoir level down if safety of dam is threatened. A qualified engineer should inspect the conditions and recommend further actions. ENGINEER REQUIRED

Figure 5.1 *(cont.)*
Inspection Guidelines - Upstream Slope

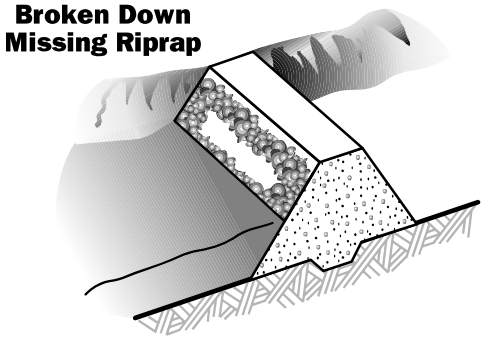


Figure 5.1d

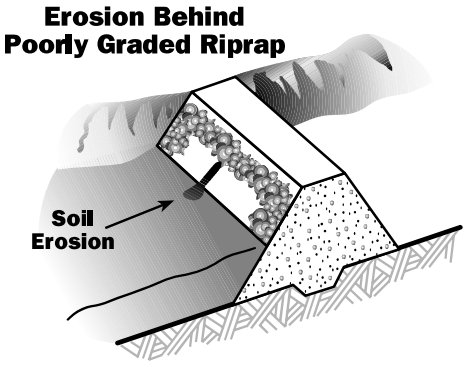


Figure 5.1e

Problem	Probable Cause and Possible Consequences	Recommended Actions
Scarps, Benches, Oversteep Areas	Wave action, local settlement, or ice action cause soil and rock to erode and slide to the lower part of the slope, forming a bench. Erosion lessens the width and possible height of the embankment and could lead to seepage or overtopping of the dam.	Determine exact cause of scarps. Do necessary earthwork, restore embankment to original slope, and supply adequate protection (bedding and riprap). (See Chapter 7.)
Broken Down, Missing Riprap ***(Figure 5.1d)***	Poor-quality riprap has deteriorated. Wave action or ice action has displaced riprap. Round and similar-sized rocks have rolled downhill. Wave action against these unprotected areas decreases embankment width.	Reestablish normal slope. Place bedding and competent riprap. (See Chapter 7.)
Erosion Behind Poorly Graded Riprap ***(Figure 5.1e)***	Similar-sized rocks allow waves to pass between them and erode small gravel particles and soil. Soil is eroded away from behind the riprap. This allows riprap to settle, offering less protection and decreased embankment width.	Reestablish effective slope protection. Place bedding material. ENGINEER REQUIRED for design—for graduation and size for rock for bedding and riprap. A qualified engineer should inspect the conditions and recommend further actions.

Figure 5.2
Inspection Guidelines - Downstream Slope

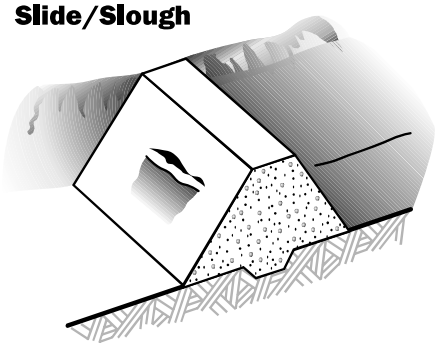


Figure 5.2a

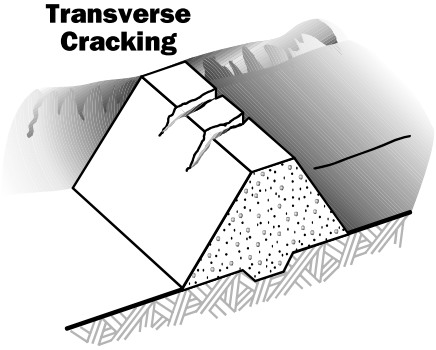


Figure 5.2b

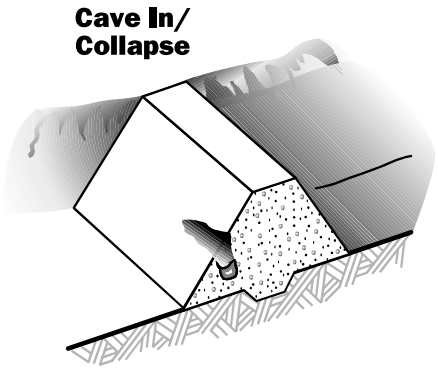


Figure 5.2c

Problem	Probable Cause and Possible Consequences	Recommended Actions
Slide or Slough *(Figure 5.2a)*	Lack loss of strength of embankment material. Loss of strength can be attributed to infiltration of water into the embankment or loss of support by the foundation. Massive slide cuts through crest or upstream slope reducing freeboard and cross-section. Structural collapse or overtopping can result	1. Measure extent and displacement of slide. If continued movement is seen, begin lowering water level until movement stops. 2. Have a qualified engineer inspect the condition and recommend further action. ENGINEER REQUIRED
Transverse Cracking *(Figure 5.2b)*	1. Uneven movement between adjacent segments of the embankment. 2. Deformation caused by structural stress or instability. 1. Can provide a path for seepage through the embankment cross-section. 2. Provides local area of low strength within embankment. Future structural movement, deformation or failure could begin. 3. Provides entrance point for surface runoff to enter embankment	1. Inspect crack and carefully record crack location, length, depth, width and other pertinent physical features. Stake out limits of cracking. Engineer should determine cause of cracking and supervise all steps necessary to reduce danger to dam and correct condition. 2. Excavate slope along crack to a point below the bottom of the crack. Then, backfill excavation using competent material and correct construction techniques. This will seal the crack against seepage and surface runoff. This should be supervised by engineer. Continue to monitor crest routinely for evidence of future cracking. ENGINEER REQUIRED
Cave-in or Collapse *(Figure 5.2c)*	1. Lack of adequate compaction. 2. Rodent hole below. 3. Piping through embankment or foundation. 4. Presence of dispersive soils. Indicates possible washout of embankment.	1. Inspect for and immediately repair rodent holes. Control rodents to prevent future damage. 2. Have a qualified engineer inspect the condition and recommend further action. ENGINEER REQUIRED

Figure 5.2 *(cont.)*
Inspection Guidelines - Downstream Slope

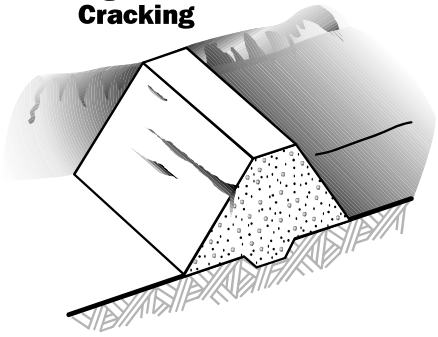


Figure 5.2d

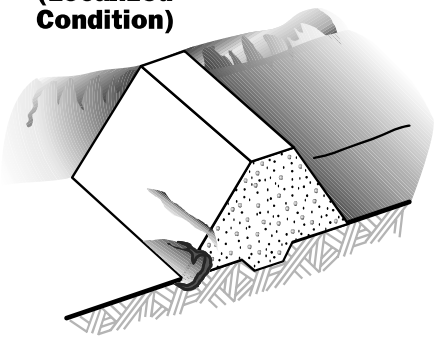


Figure 5.2e

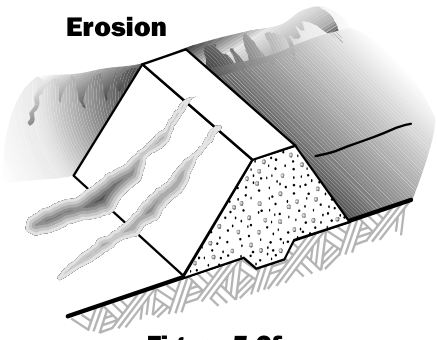


Figure 5.2f

Problem	Probable Cause and Possible Consequences	Recommended Actions
Longitudinal Cracking ***(Figure 5.2d)***	1. Drying and shrinkage of surface material. 2. Downstream movement or settlement of embankment. 1. Can be an early warning of a potential slide. 2. Shrinkage cracks allow water to enter the embankment and freezing will further crack the embankment. 3. Settlement or slide, showing loss of strength in embankment that can lead to failure.	1. If cracks are from drying, dress area with well-compacted material to keep surface water out and natural moisture in. 2. If cracks are extensive, a qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED
Slump *(localized condition)* ***(Figure 5.2e)***	Preceded by erosion undercutting a portion of the slope. Can also be found on steep slopes. Can expose impervious zone to erosion and lead to additional slumps.	1. Inspect area for seepage. 2. Monitor for progressive failure. 3. Have a qualified engineer inspect the condition and recommend further action. ENGINEER REQUIRED
Erosion ***(Figure 5.2f)***	Water from intense rainstorms or snowmelt carries surface material down the slope, resulting in continuous troughs. Can be hazardous if allowed to continue. Erosion can lead to eventual deterioration of the downstream slope and failure of the structure.	1. The preferred method to protect eroded areas is rock or riprap. 2. Reestablishing protective grasses can be adequate if the problem is detected early.

Figure 5.2 *(cont.)*
Inspection Guidelines - Downstream Slope

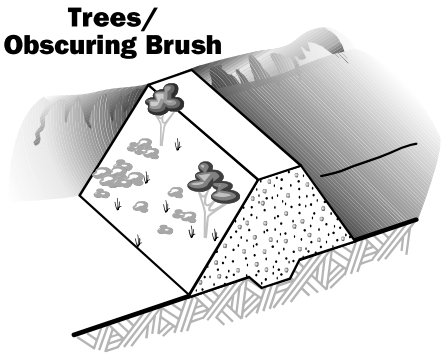


Figure 5.2g

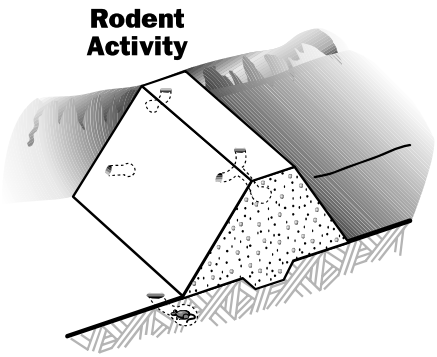


Figure 5.2h

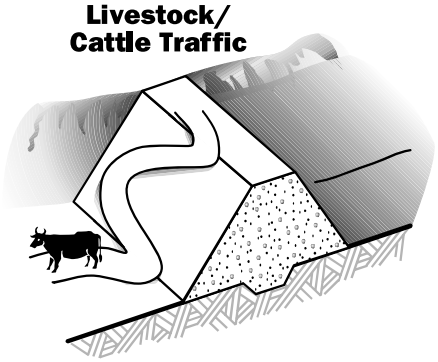


Figure 5.2i

Problem	Probable Cause and Possible Consequences	Recommended Actions
Trees, Obscuring Brush *(Figure 5.2g)*	Natural vegetation in area. Large tree roots can create seepage paths. Large trees can blow over during storms and damage dam or cause breach. Bushes can obscure visual inspection and harbor rodents.	1. Remove all brush and trees less than 4" in diameter. Larger trees may be allowed to stay until they die. At that time, the tree, with its root system, should be removed and the void properly filled with compacted soil. (See Chapter 7.) 2. Control vegetation on the embankment that obscures visual inspection. (See Chapter 7.)
Rodent Activity *(Figure 5.2h)*	Overabundance of rodents. Animal burrowing creates holes, tunnels, and caverns. Certain habitats, such as cattail-filled areas and trees close to the reservoir encourage these animals. Can reduce length of seepage path and lead to piping failure. If tunnel runs through most of the dam, it can lead to collapse.	1. Control rodents to prevent more damage. 2. Backfill existing rodent holes. 3. Remove rodents. Determine exact location and extent of tunneling. Remove habitat and repair damages. (See Chapter 7.)
Livestock *(such as cattle)* **Traffic** *(Figure 5.2i)*	Excessive travel by livestock especially harmful to slope when wet. Creates areas bare of erosion protection and causes erosion channels. Allows water to stand. Area susceptible to drying cracks.	1. Fence livestock outside embankment area. 2. Repair erosion protection, i.e. riprap, grass.

Figure 5.3
Inspection Guidelines - Embankment Crest

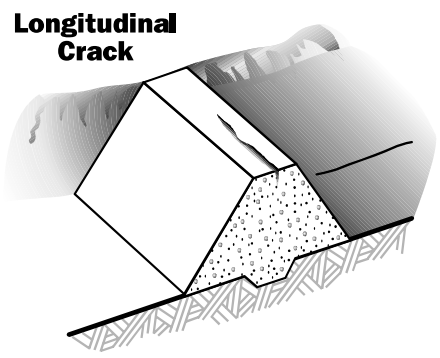


Figure 5.3a

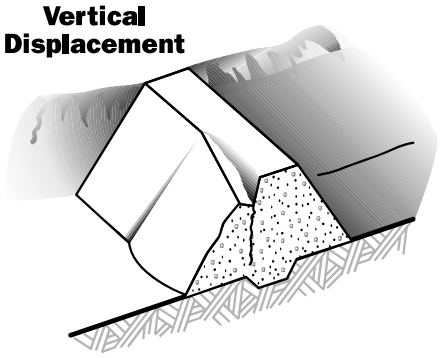


Figure 5.3b

Problem	Probable Cause and Possible Consequences	Recommended Actions
Longitudinal Crack *(Figure 5.3a)*	1. Uneven settlement between adjacent sections or zones within the embankment. 2. Foundation failure causing loss of support to embankment. 3. Initial stages of embankment slide. 1. Creates local area of low strength within an embankment. Could be the point of initiation of future structural movement, deformation or failure. 2. Provides entrance point for surface runoff into embankment, allowing saturation of adjacent embankment area and possible lubrication which could lead to localized failure.	1. Inspect crack and carefully record location, length, depth, width, alignment, and other pertinent physical features. Immediately stake out limits of cracking. Monitor frequently. 2. Engineer should determine cause of cracking and supervise steps necessary to reduce danger to dam and correct condition. 3. Effectively seal the cracks at the crest surface to prevent infiltration by surface water. 4. Continue to routinely monitor crest for evidence of further cracking. ENGINEER REQUIRED
Vertical Displacement *(Figure 5.3b)*	1. Vertical movement between adjacent sections of the embankment. 2. Structural deformation or failure caused by structure stress or instability, or by failure of the foundation. 1. Creates local area of low strength within embankment which could cause future movement. 2. Leads to structural instability or failure. 3. Creates entrance point for surface water that could further lubricate failure plane. 4. Reduces available embankment cross-section.	1. Carefully inspect displacement and record its location, vertical and horizontal displacement, length and other physical features. Immediately stake out limits of cracking. 2. Engineer should determine cause of displacement and supervise all steps necessary to reduce danger to dam and correct condition. 3. Excavate area to the bottom of the displacement. Backfill excavation using competent material and correct construction techniques, under supervision of engineer. 4. Continue to monitor areas routinely for evidence of cracking or movement. (See Chapter 6.) ENGINEER REQUIRED

Figure 5.3 *(cont.)*
Inspection Guidelines - Embankment Crest

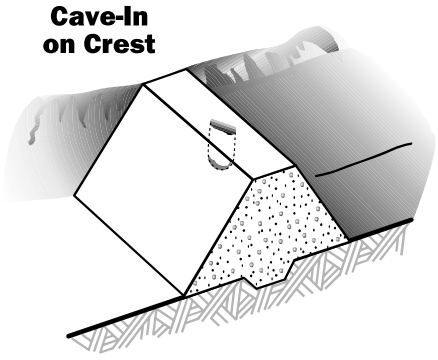


Figure 5.3c

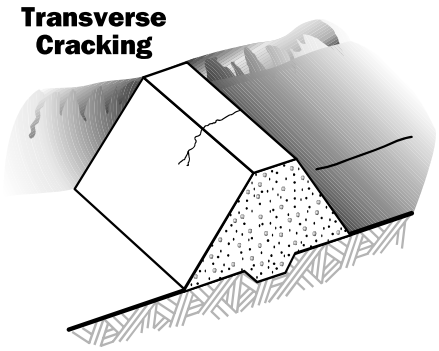


Figure 5.3d

Problem	Probable Cause and Possible Consequences	Recommended Actions
Cave-in On Crest *(Figure 5.3c)*	1. Rodent activity. 2. Hole in outlet conduit is causing erosion of embankment material. 3. Internal erosion or piping of embankment material by seepage. 4. Breakdown of dispersive clays within embankment by seepage waters. 1. Void within dam could cause localized caving, sloughing, instability or reduced embankment cross-section. 2. Entrance point for surface water.	1. Carefully inspect and record location and physical characteristics (depth, width, length) of cave-in. 2. Engineer should determine cause of cave-in and supervise all steps necessary to reduce threat to dam and correct condition. 3. Excavate cave-in, slope sides of excavation and backfill hole with competent material using proper construction techniques. (See Chapter 7.) This should be supervised by engineer. ENGINEER REQUIRED
Transverse Cracking *(Figure 5.3d)*	1. Uneven movement between adjacent segments of the embankment. 2. Deformation caused by structural stress or instability. 1. Can provide a path for seepage through the embankment cross-section. 2. Provides local area of low strength within embankment. Future structural movement, deformation or failure could begin. 3. Provides entrance point for surface runoff to enter embankment.	1. Inspect crack and carefully record crack location, length, depth, width and other pertinent physical features. Stake out limits of cracking. 2. Engineer should determine cause of cracking and supervise all steps necessary to reduce danger to dam and correct condition. 3. Excavate crest along crack to a point below the bottom of the crack. Then backfilling excavation using competent material and correct construction techniques. This will seal the crack against seepage and surface runoff. (See Chapter 7.) This should be supervised by engineer. 4. Continue to monitor crest routinely for evidence of future cracking. (See Chapter 4.) ENGINEER REQUIRED

Figure 5.3 *(cont.)*
Inspection Guidelines - Embankment Crest

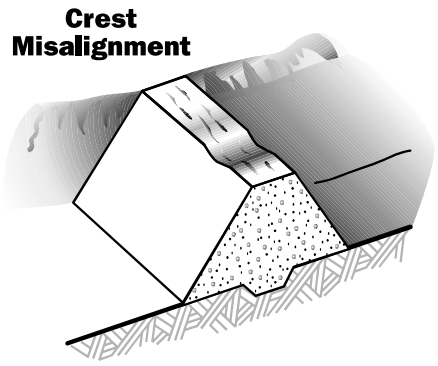


Figure 5.3e

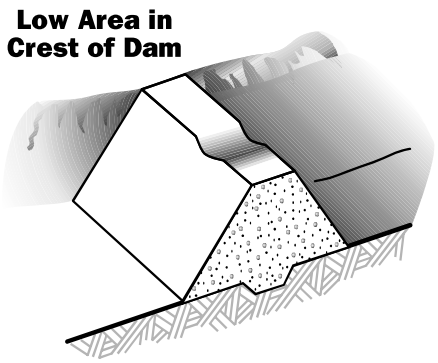


Figure 5.3f

Problem	Probable Cause and Possible Consequences	Recommended Actions
Crest Misalignment ***(Figure 5.3e)***	1. Movement between adjacent parts of the structure. 2. Uneven deflection of dam under loading by reservoir. 3. Structural deformation or failure near area of misalignment. 1. Area of misalignment is usually accompanied by low area in crest which reduces freeboard. 2. Can produce local areas of low embankment strength which may lead to failure.	1. Establish monuments across crest to determine exact amount, location, and extent of misalignment. 2. Engineer should determine cause of misalignment and supervise all steps necessary to reduce threat to dam and correct condition. 3. Following remedial action, monitor crest monuments according to a schedule to detect any movement. (See Chapter 6.) ENGINEER REQUIRED
Low Area in Crest ***(Figure 5.3f)***	1. Excessive settlement in the embankment or foundation directly beneath the low area in the crest. 2. Internal erosion of embankment material. 3. Foundation spreading to upstream and/or downstream direction. 4. Prolonged wind erosion of crest area. 5. Improper final grading following construction. Reduces freeboard available to pass flood flows safely through spillway.	1. Establish monuments along length of crest to determine exact amount, location, and extent of settlement in crest. 2. Engineer should determine cause of low area and supervise all steps necessary to reduce possible threat to the dam and correct condition. 3. Reestablish uniform crest elevation over crest length by filling in low area using proper construction techniques. This should be supervised by engineer. 4. Reestablish monuments across crest of dam and routinely monitor monuments to detect any settlement. ENGINEER REQUIRED

Figure 5.3 *(cont.)*
Inspection Guidelines - Embankment Crest

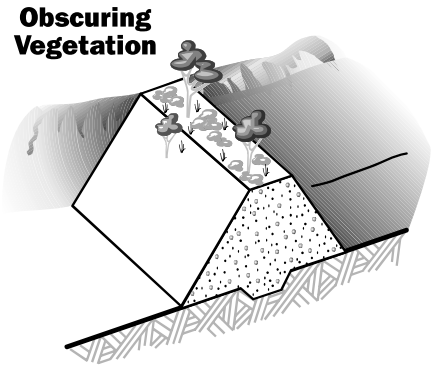


Figure 5.3g

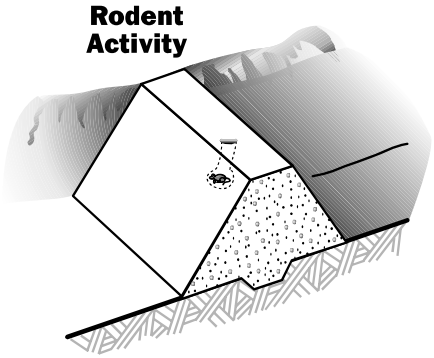


Figure 5.3h

Problem	Probable Cause and Possible Consequences	Recommended Actions
Obscuring Vegetation *(Figure 5.3g)*	Neglect of dam and lack of proper maintenance procedures. 1. Obscures large parts of the dam, preventing adequate, accurate visual inspection of all parts of the dam. Problems which threaten the integrity of the dam can develop and remain undetected until they progress to a point that threatens the dam's safety. 2. Associated root systems develop and penetrate into the dam's cross-section. When the vegetation dies, the decaying root systems can provide paths for seepage. This reduces the effective seepage path through the embankment and could lead to possible piping situations. 3. Prevents easy access to all parts of the dam for operation, maintenance and inspection. 4. Provides habitat for rodents. 5. Large trees can blow over during storms, resulting in damage and possible breach of the dam.	1. Remove all damaging growth from the dam. This would include removal of trees (4-inches or less in diameter), bushes, brush, conifers and growth other than grass. Grass should be encouraged on all segments of the dam to prevent erosion by surface runoff. Root systems should also be removed to the maximum practical extent. The void which results from removing the root system should backfilled with well-competent, well-compacted material. 2. Future undesirable growth should be removed by cutting or spraying, as part of an annual maintenance program. (See Chapter 7.) 3. All cutting or debris resulting from the vegetative removal should be immediately taken from the dam and properly disposed of outside the reservoir basin. An engineer should be involved if the tree removal process poses a threat to the dam.
Rodent Activity *(Figure 5.3h)*	Burrowing animals. 1. Entrance point for surface runoff to enter dam. Could saturate adjacent portions of the dam. 2. Especially dangerous if hole penetrates dam below phreatic line. During periods of high storage, seepage path through the dam would be greatly reduced and a piping situation could develop. Tunnels can lead to collapse of crest and possible failure.	1. Completely backfill the hole with competent well-compacted material. 2. Initiate a rodent control program to reduce the burrowing animal population and to prevent future damage to the dam. (See Chapter 7.)

Figure 5.3 *(cont.)*
Inspection Guidelines - Embankment Crest

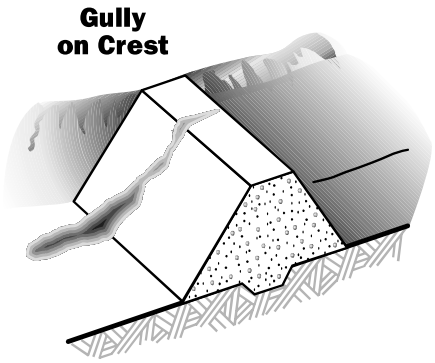


Figure 5.3i

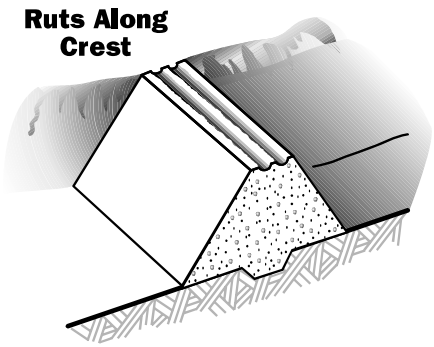


Figure 5.3j

Problem	Probable Cause and Possible Consequences	Recommended Actions
Gully on Crest ***(Figure 5.3i)***	1. Poor grading and improper drainage of crest. Improper drainage causes surface runoff to collect and drain off crest at low point in upstream or downstream shoulder. 2. Inadequate spillway capacity which has caused dam to overtop. 1. Can reduce available freeboard. 2. Reduces cross-sectional area of dam. 3. Inhibits access to all parts of the crest and dam. 4. Can result in a hazardous condition if due to overtopping.	1. Restore freeboard to dam by adding fill material to low area, using proper construction techniques. (See Chapter 7.) 2. Regrading crest to provide proper drainage of surface runoff. 3. If gully was caused by overtopping, create adequate spillway that meets current design standards. This should be done by engineer. 4. Reestablish protective cover.
Ruts Along Crest ***(Figure 5.3j)***	Heavy vehicle traffic without adequate or proper maintenance or proper crest surfacing 1. Inhibits easy access to all parts of crest. 2. Allows continued development of rutting. 3. Allows standing water to collect and saturate crest of dam. 4. Operating and maintenance vehicles can get stuck.	1. Drain standing water from ruts. 2. Regrade and re-compact crest to restore integrity and provide proper drainage to upstream slope. (See Chapter 7.) 3. Provide gravel or roadbase material to accommodate traffic. 4. Periodically maintain and regrade to prevent ruts reforming.

Figure 5.3 *(cont.)*
Inspection Guidelines - Embankment Crest

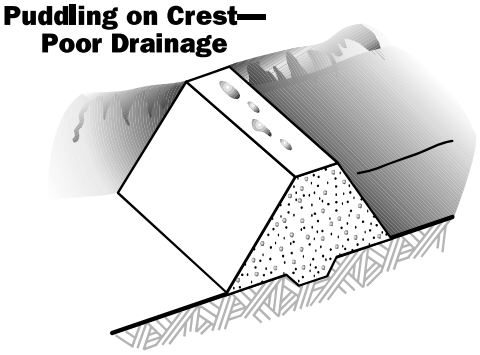


Figure 5.3k

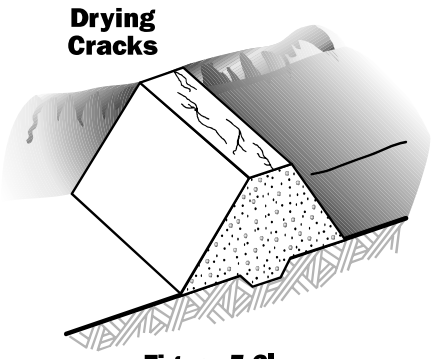


Figure 5.3l

Problem	Probable Cause and Possible Consequences	Recommended Actions
Puddling on Crest—Poor Drainage *(Figure 5.3k)*	1. Poor grading and improper drainage of crest. 2. Localized consolidation or settlement on crest allows puddles to develop. 1. Causes localized saturation of the crest. 2. Inhibits access to all parts of the dam and crest. 3. Becomes progressively worse if not corrected.	1. Drain standing water from puddles. 2. Regrade and re-compact crest to restore integrity and provide proper drainage to upstream slope. (See Chapter 7.) 3. Provide gravel or roadbase material to accommodate traffic. 4. Periodically maintain and regrade to prevent low areas reforming.
Drying Cracks *(Figure 5.3l)*	Material on the crest of dam expands and contracts with alternate wetting and drying of weather cycles. Drying cracks are usually short, shallow, narrow, and numerous. Point of entry for surface runoff and surface moisture, causing saturation of adjacent embankment areas. This saturation, and later drying of the dam, could cause further cracking.	1. Seal surface cracks with a tight, impervious material. (See Chapter 7.) 2. Routinely grade crest to proper drainage and fill cracks. 3. Cover crest with non-plastic material (not clay) to prevent large variations in moisture content.

Figure 5.4
Inspection Guidelines - Embankment Seepage Areas

Excessive Quantity and/or Muddy Water Exiting From a Point

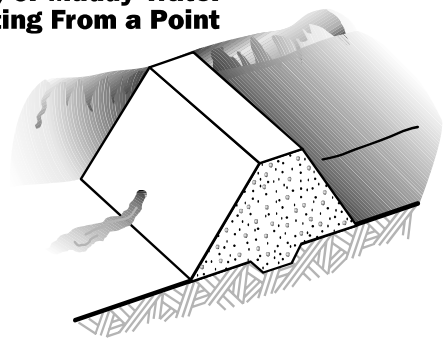


Figure 5.4a

Stream of Water Exiting Through Cracks Near the Crest

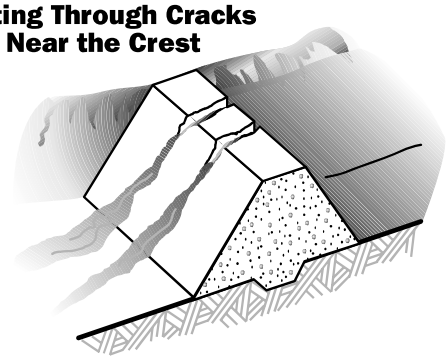


Figure 5.4b

Problem	Probable Cause and Possible Consequences	Recommended Actions
Excessive Quantity and/or Muddy Water Exiting From a Point *(Figure 5.4a)*	1. Water has created an open pathway, channel or pipe through the dam. The water is eroding and carrying embankment material. 2. Large amounts of water have accumulated in the downstream slope. Water and embankment materials are exiting at one point. Surface agitation may be causing the muddy water. 3. Rodents, frost action or poor construction have allowed water to create an open pathway or pipe through the embankment. 1. Continued flows can saturate parts of the embankment and lead to slides in the area. 2. Continued flows can further erode embankment materials and lead to failure of the dam.	1. Begin measuring outflow quantity and establishing whether water is getting muddier, staying the same or clearing up. 2. If quantity of flow is increasing, water level in reservoir should be lowered until flow stabilizes or stops. 3. Search for opening on upstream side and plug if possible. 4. A qualified engineer should inspect the condition and recommend further actions to be taken. ENGINEER REQUIRED
Stream of Water Exiting Through Cracks Near the Crest *(Figure 5.4b)*	1. Severe drying has caused shrinkage of embankment material. 2. Settlement in the embankment or foundation is causing the transverse cracks. Flow through the crack can cause failure of the dam.	1. Plug upstream side of crack to stop flow. 2. Lower water level in the reservoir should be lowered until below level of cracks. 3. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED

Figure 5.4 *(cont.)*
Inspection Guidelines - Embankment Seepage Areas

Seepage Water Exiting as a Boil in the Foundation

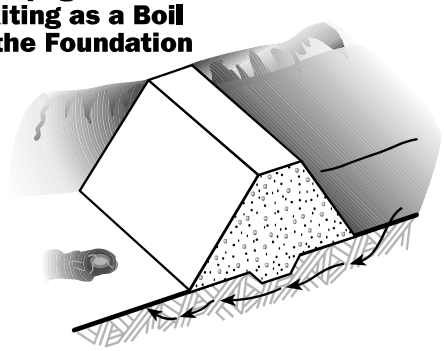


Figure 5.4c

Seepage Exiting at Abutment Contact

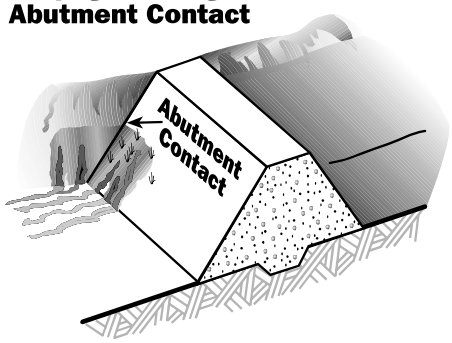


Figure 5.4d

Problem	Probable Cause and Possible Consequences	Recommended Actions
Seepage Water Exiting as a Boil in the Foundation *(Figure 5.4c)*	Some part of the foundation material is supplying a flow path. This could be caused by a sand or gravel layer in the foundation. Increased flows can lead to erosion of the foundation and failure of the dam.	1. Examine the boil for transportation of foundation materials. 2. If soil particles are moving downstream, sandbags or earth should be used to create a dike around the boil. The pressures created by the water level with the dike may control flow velocities and temporarily prevent further erosion. 3. If erosion is becoming greater, the reservoir level should be lowered. 4. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED
Seepage Exiting at Abutment Contact *(Figure 5.4d)*	1. Water flowing through pathways in the abutment. 2. Water flowing through the embankment. Can lead to erosion of embankment materials and failure of the dam.	1. Study leakage area to determine quantity of flow and extent of saturation. 2. Inspect daily for developing slides. 3. Water level in reservoir may need to be lowered to assure the safety of the embankment. 4. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED

Figure 5.4 *(cont.)*
Inspection Guidelines - Embankment Seepage Areas

Large Area Wet or Producing Flow

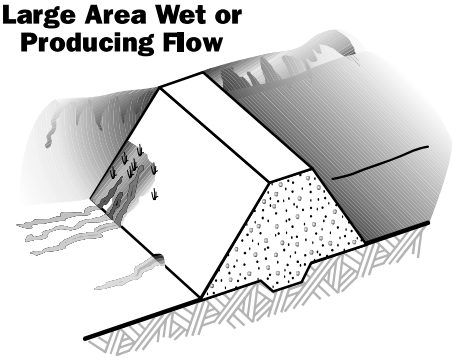


Figure 5.4e

Marked Change in Vegetation

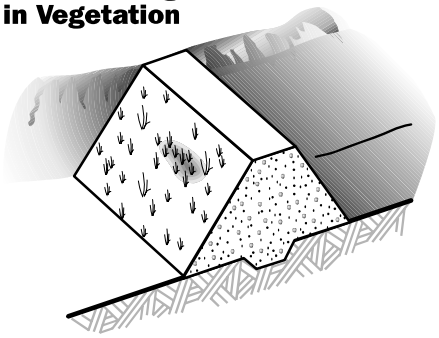


Figure 5.4f

Bulge in Large Wet Area

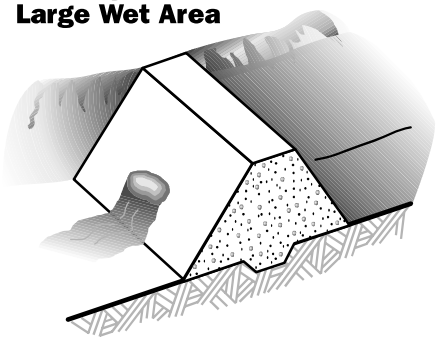


Figure 5.4g

Problem	Probable Cause and Possible Consequences	Recommended Actions
Large Area Wet or Producing Flow *(Figure 5.4e)*	A seepage path has developed through the abutment or embankment materials and failure of the dam can occur. 1. Increased flows could lead to erosion of embankment material and failure of the dam. 2. Saturation of the embankment can lead to local slides which could cause failure of the dam.	1. Stake out the saturated area and monitor for growth or shrinking. 2. Measure any outflows as accurately as possible. 3. Reservoir level may need to be lowered if saturated areas grow at a fixed storage level or if flow increases. 4. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED
Marked Change in Vegetation *(Figure 5.4f)*	1. Embankment materials are supplying flow paths. 2. Natural seeding by wind. 3. Change in seed type during early post-construction seeding. Can show a saturated area.	1. Use probe and shovel to establish if the materials in this area are wetter than surrounding areas. 2. If area shows wetness, when surrounding areas are dry or drier, a qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED
Bulge in Large Wet Area *(Figure 5.4g)*	Downstream embankment materials have begun to move. Failure of the embankment resulting from massive sliding can follow these early movements.	1. Compare embankment cross-section to the end of construction condition to see if observed condition may reflect end of construction. 2. Stake out affected area and accurately measure outflow. 3. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED

Figure 5.4 ***(cont.)***
Inspection Guidelines - Embankment Seepage Areas

Trampoline Effect in Large Soggy Area

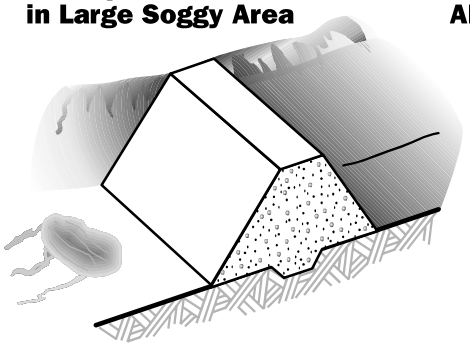


Figure 5.4h

Leakage From Abutments Beyond the Dam

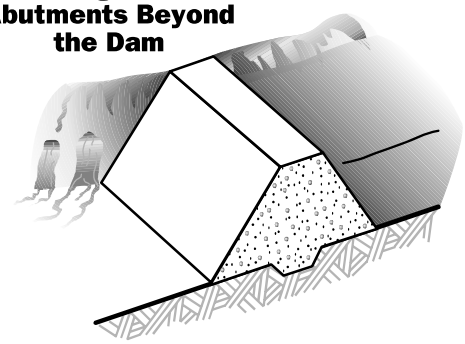


Figure 5.4i

Wet Area in Horizontal Band

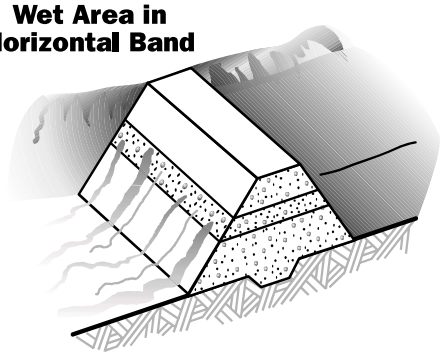


Figure 5.4j

Problem	Probable Cause and Possible Consequences	Recommended Actions
Trampoline Effect ***(bouncy when jumped on)*** **in Large Soggy Area** ***(Figure 5.4h)***	Water moving rapidly through the embankment or foundation is being controlled or contained by a well- established turf root system. Condition shows excessive seepage in the area. If control layer of turf is destroyed, rapid erosion of foundation materials could result in failure of the dam.	1. Carefully inspect the area for outflow quantity and any transported material. 2. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED
Leakage From Abutments Beyond the Dam ***(Figure 5.4i)***	Water moving through cracks and fissures in the abutment materials. Can lead to rapid erosion of abutment and evacuation of the reservoir. Can lead to massive slides near or downstream from the dam.	1. Carefully inspect the area to determine quantity of flow and amount of transported material. 2. A qualified engineer or geologist should inspect the condition and recommend further actions. ENGINEER REQUIRED
Wet Area in Horizontal Band ***(Figure 5.4j)***	Frost layer or layer of sandy material in original construction. 1. Wetting of areas below the area of excessive seepage can lead to localized instability of the embankment, resulting in slides. 2. Excessive flows can lead to accelerated erosion of embankment materials and failure of the dam.	1. Determine as closely as possible the flow being produced. 2. If flow increases, reservoir level should be reduced until flow stabilizes or stops. 3. Stake out the exact area involved. 4. Using hand tools, try to identify the material allowing the flow. 5. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED

Figure 5.5
Inspection Guidelines - Concrete Upstream Slope

Large Increase in Flow or Sediment in Drain Outfall

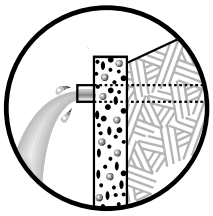


Figure 5.5a

Cracked Deteriorated Concrete Face

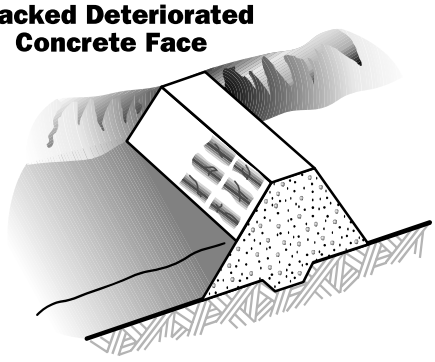


Figure 5.5b

Cracks Due to Drying

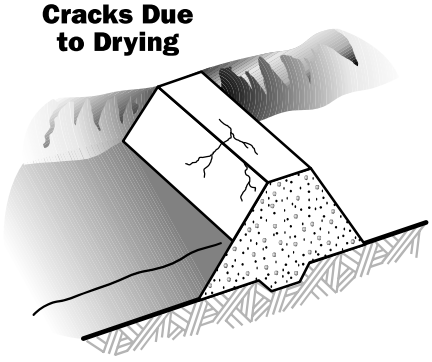


Figure 5.5c

Problem	Probable Cause and Possible Consequences	Recommended Actions
Large Increase in Flow or Sediment in Drain Outfall *(Figure 5.5a)*	Shortened seepage path or increased storage levels. 1. Higher-velocity flows can cause erosion of drain, then embankment materials. 2. Can lead to piping failure.	1. Accurately measure outflow quantity and determine amount of increase over previous flow. 2. Collect jar samples to compare turbidity. 3. If either quantity or turbidity has increased by 25%, a qualified engineer should evaluate the condition and recommend further actions. ENGINEER REQUIRED
Cracked Deteriorated Concrete Face *(Figure 5.5b)*	Concrete deteriorated from weathering. Joint filler deteriorated or displaced. Soil is eroded behind the face and caverns can be formed. Unsupported sections of concrete crack. Ice action may displace concrete.	1. Determine cause. Either patch with grout or contact engineer for permanent repair method. 2. If damage is extensive, a qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED
Cracks Due to Drying *(Figure 5.5c)*	Soil loses its moisture and shrinks, causing cracks. *Note:* Usually limited to crest and downstream slope. Heavy rains can fill cracks and cause small parts of embankment to move along internal slip surface.	1. Monitor cracks for increases in width, depth , or length. 2. A qualified engineer should inspect condition and recommend further actions. ENGINEER REQUIRED

Figure 5.6
Inspection Guidelines - Spillways

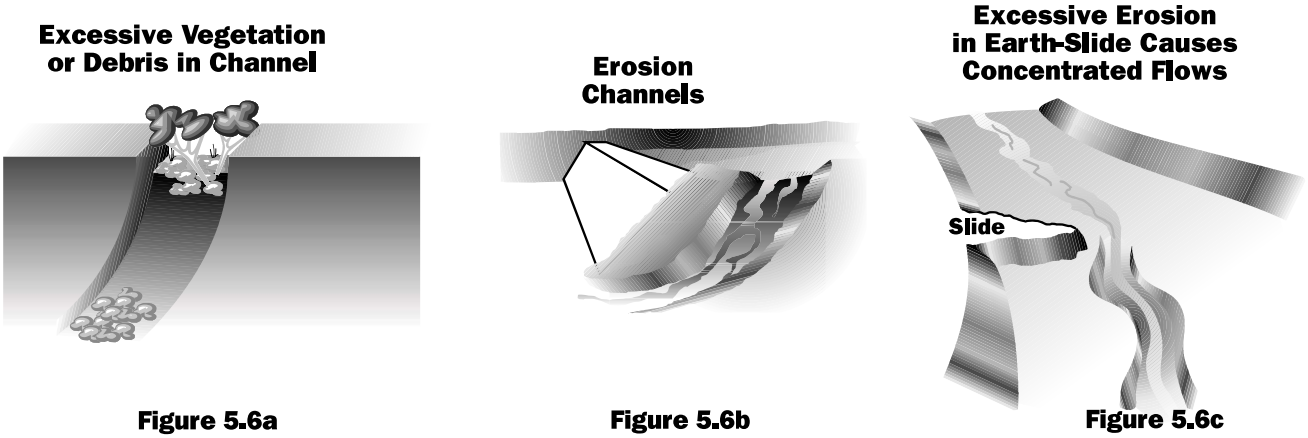


Figure 5.6a | Figure 5.6b | Figure 5.6c

Problem	Probable Cause and Possible Consequences	Recommended Actions
Excessive Vegetation or Debris in Channel *(Figure 5.6a)*	Accumulation of slide materials, dead trees, excessive vegetative growth, etc., in spillway channel. Reduced discharge capacity; overflow of spillway, overcropping of dam. Prolonged overtopping can cause failure of the dam.	Clean out debris periodically; control vegetative growth in spillway channel. Install log boom in front of spillway entrance to intercept debris.
Erosion Channels *(Figure 5.6b)*	Surface runoff from intense rainstorms or flow from spillway carries surface material down the slope, resulting in continuous troughs. Livestock traffic creates gullies where flow concentrates varies. Unabated erosion can lead to slides, slumps or slips which can result in reduced spillway capacity. Inadequate spillway capacity can lead to embankment overtopping and result in dam failure.	Photograph condition. Repair damaged areas by replacing eroded material with compacted fill. Protect areas against future erosion by installing suitable rock riprap. Re-vegetate area if appropriate. Bring condition to the attention of the engineer during next inspection.
Excessive Erosion in Earth-Slide Causes Concentrated Flows *(Figure 5.6c)*	Discharge velocity too high; bottom and slope material loose or deteriorated; channel and bank slopes too steep; bare soil unprotected; poor construction protective surface failed. Disturbed flow pattern; loss of material, increased sediment load downstream, collapse of banks; failure of spillway; can lead to rapid evacuation of the reservoir through the severely eroded spillway.	Minimize flow velocity by proper design. Use sound material. Keep channel and bank slopes mild. Encourage growth of grass on soil surface. Construct smooth and well- compacted surfaces. Protect surface with riprap, asphalt or concrete. Repair eroded portion using sound construction practices.

Figure 5.6 *(cont.)*
Inspection Guidelines - Spillways

End of Spillway Chute Undercut

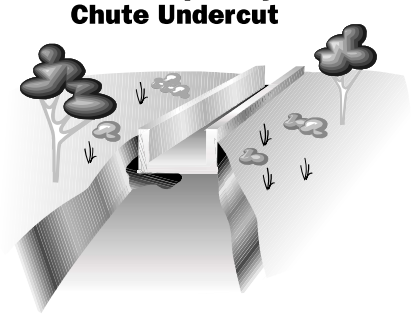


Figure 5.6d

Wall Displacement

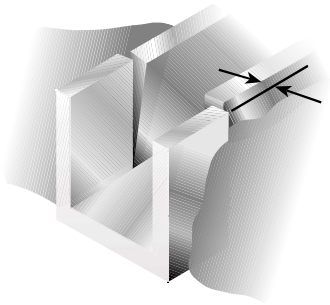


Figure 5.6e

Large Cracks

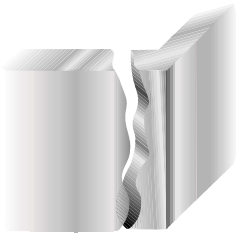


Figure 5.6f

Problem	Probable Cause and Possible Consequences	Recommended Actions
End of Spillway Chute Undercut *(Figure 5.6d)*	Poor configuration of stilling basin area. Highly erodible materials. Absence of cut-off wall at end of chute. Structural damage to spillway structure; collapse of slab and wall lead to costly repair.	Dewater affected area; clean out eroded area and properly backfill. Improve stream channel below chute; provide properly sized riprap in stilling basin area. Install cutoff wall.
Wall Displacement *(Figure 5.6e)*	Poor workmanship; uneven settlement of foundation; excessive earth and water pressure; insufficient steel bar reinforcement of concrete. Minor displacement will create eddies and turbulence in the flow, causing erosion of the soil behind the wall. Major displacement will cause severe cracks and eventual failure of the structure.	Reconstruction should be done according to sound engineering practices. Foundation should be carefully prepared. Adequate weep holes should be installed to relieve water pressure behind wall. Use enough reinforcement in the concrete. Anchor walls to present further displacement. Install struts between spillway walls. Clean out and backflush drains to assure proper operations. Consult an engineer before actions are taken. ENGINEER REQUIRED
Large Cracks *(Figure 5.6f)*	Construction defect; local concentrated stress; local material deterioration; foundation failure, excessive backfill pressure. Disturbance in flow patterns; erosion of foundation and backfill; eventual collapse of structure.	Large cracks without large displacement should be repaired by patching. Surrounding areas should be cleaned or cut out before patching material is applied. (See Chapter 7.) Installation of weep holes or other actions may be needed.

Figure 5.6 *(cont.)*
Inspection Guidelines - Spillways

Open or Displaced Joints

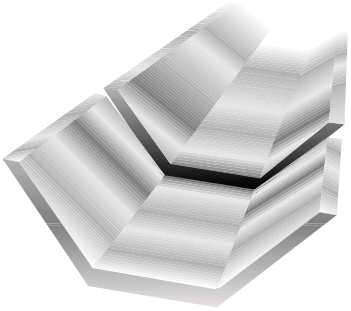


Figure 5.6g

Breakdown and Loss of Riprap

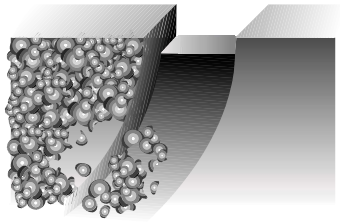


Figure 5.6h

Material Deterioration—Spalling and Disintegration of Riprap, Concrete, Etc.

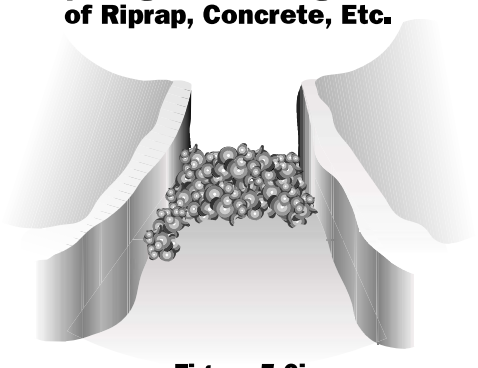


Figure 5.6i

Problem	Probable Cause and Possible Consequences	Recommended Actions
Open or Displaced Joints *(Figure 5.6g)*	Excessive and uneven settlement of foundation; sliding of concrete slab; construction joint too wide and left unsealed. Sealant deteriorated and washed away. Erosion of foundation material may weaken support and cause further cracks; pressure induced by water flowing over displaced joints may wash away wall or slab, or cause extensive undermining.	Construction joint should be no wider than 1/2". All joints should be sealed with asphalt or other flexible materials. Water stops should be used where feasible. Clean the joint, replace eroded materials, and seal the joint. Foundations should be properly drained and prepared. Underside of chute slabs should have ribs of enough depth to prevent sliding. Avoid steep chute slope. ENGINEER REQUIRED
Breakdown and Loss of Riprap *(Figure 5.6h)*	Slope too steep; material poorly graded; failure of subgrade; flow velocity too high; improper placement of material; bedding material or foundation washed away. Erosion of channel bottom and banks; failure of spillway.	Design a stable slope for channel bottom and banks. Riprap material should be well-graded (the material should contain small, medium and large particles). Subgrade should be properly prepared before placement of riprap. Install filter fabric if necessary. Control flow velocity in the spillway by proper design. Riprap should be placed according to specification. ENGINEER REQUIRED
Material Deterioration—Spalling and Disintiegration of Riprap, Concrete, Etc. *(Figure 5.6i)*	Use of unsound or defective materials; structures subject to freeze-thaw cycles; improper maintenance practices; harmful chemicals. Structure life will be shortened; premature failure.	Avoid using shale or sandstone for riprap. Add air-entraining agent when mixing concrete. Use only clean, good-quality aggregates in the concrete. Steel bars should have at least 1" of concrete cover. Concrete should be kept damp and protected from freezing during curing.

Figure 5.6 *(cont.)*
Inspection Guidelines - Spillways

Poor Surface Drainage

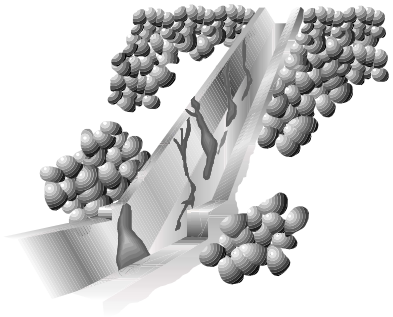


Figure 5.6j

Concrete Erosion, Abrasion, and Fracturing

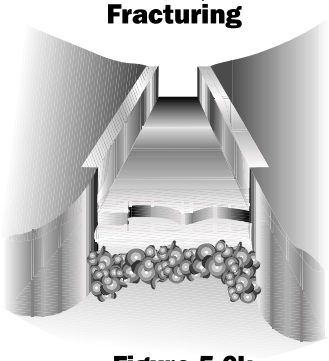


Figure 5.6k

Leakage in or Around Spillway

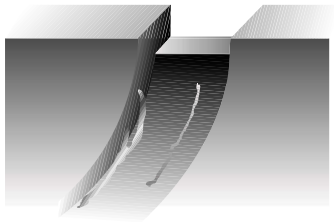


Figure 5.6l

Problem	Probable Cause and Possible Consequences	Recommended Actions
Poor Surface Drainage *(Figure 5.6j)*	No weep holes; no drainage facility; plugged drains. Wet foundation has lower supporting capacity; uplift pressure resulting from seepage water may damage spillway chute; accumulation of water may also increase total pressure on spillway walls and cause damage.	Install weep holes on spillway walls. Inner end of hole should be surrounded and packed with graded filtering material. Install drain system under spillway near downstream end. Clean out existing weep holes. Backflush and rehabilitate drain system under the supervision of an engineer. ENGINEER REQUIRED
Concrete Erosion, Abrasion, and Fracturing *(Figure 5.6k)*	Flow velocity too high (usually occurs at lower end of chute in high dams); rolling of gravel and rocks down the chutes; cavity behind or below concrete slab. Pockmarks and spalling of concrete surface may progressively worsen; small hole may cause undermining of foundation, leading to failure of structure.	Remove rocks and gravels from spillway chute before flood season. Raise water level in stilling basin. Use good-quality concrete. Assure concrete surface is smooth. ENGINEER REQUIRED
Leakage in or Around Spillway *(Figure 5.6l)*	1. Cracks and joints in geologic formation at spillway are permitting seepage. 2. Gravel or sand layers at spillway are permitting seepage. 1. Could lead to excessive loss of stored water. 2. Could lead to a progressive failure if velocities are high enough to cause erosion of natural materials.	1. Examine exit area to see if type of material can explain leakage. 2. Measure flow quantity and check for erosion of natural materials. 3. If flow rate or amount of eroded materials increases rapidly, reservoir level should be lowered until flow stabilizes or stops. 4. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED

Figure 5.6 *(cont.)*
Inspection Guidelines - Spillways

Too Much Leakage From Spillway Under Drains

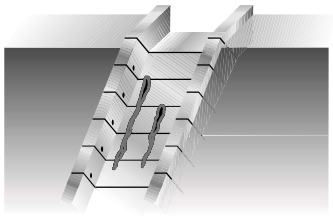


Figure 5.6m

Seepage From a Construction Joint or Crack in Concrete Structure

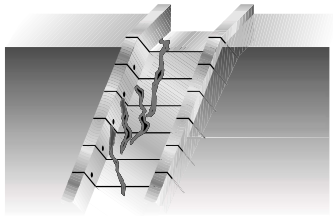


Figure 5.6n

Problem	Probable Cause and Possible Consequences	Recommended Actions
Too Much Leakage From Spillway Under Drains *(Figure 5.6m)*	Drain or cutoff may have failed. 1. Excessive flows under the spillway could lead to erosion of foundation material and collapse of parts of the spillway. 2. Uncontrolled flows could lead to loss of stored water.	1. Examine exit area to see if type of material can explain leakage. 2. Measure flow and check for erosion of natural materials. 3. If flow rate or amount of eroded materials increases rapidly, reservoir level should be lowered until flow stabilizes or stops. 4. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED
Seepage From a Construction Joint or Crack in Concrete Structure *(Figure 5.6n)*	Water is collecting behind structure because of insufficient drainage or clogged weep holes. 1. Can cause walls to tip in and over. Flows through concrete can lead to rapid deterioration from weathering. 2. If spillway is located within embankment, rapid erosion can lead to failure of the dam.	1. Check area behind wall for puddling of surface water. 2. Check and clean as needed; drain outfalls, flush lines and weep holes. 3. If condition persists, a qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED

Figure 5.7
Inspection Guidelines - Inlets, Outlets, and Drains

Outlet Pipe Damage

Crack



Figure 5.7a-1

Hole

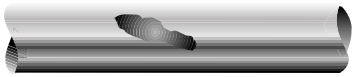


Figure 5.7a-2

Joint Offset

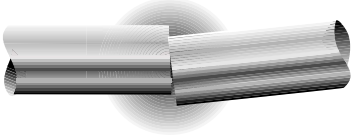


Figure 5.7a-3

Problem	Probable Cause and Possible Consequences	Recommended Actions
Outlet Pipe Damage: Crack *(Figure 5.7a-1)*	Settlement; impact. Excessive seepage, possible internal erosion.	Check for evidence of water either entering or exiting pipe at crack, hole, etc.
Outlet Pipe Damage: Hole *(Figure 5.7a-2)*	Rust (steel pipe); erosion (concrete pipe); cavitation. Excessive seepage, possible internal erosion.	Tap pipe in vicinity of damaged area, listening for hollow sound which indicates a void has formed along the outside of the conduit.
Outlet Pipe Damage: Joint Offset *(Figure 5.7a-3)*	Settlement or poor construction practice. Provides passageway for water to exit or enter pipe, resulting in erosion of internal materials of the dam.	If a progressive failure is suspected, request engineering advice.

Figure 5.7 *(cont.)*
Inspection Guidelines - Inlets, Outlets, and Drains

Control Works

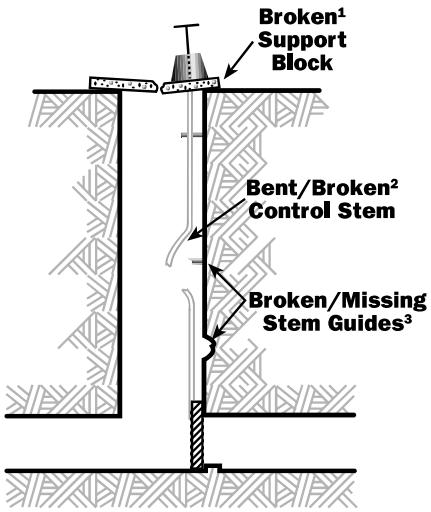


Figure 5.7b

Problem	Probable Cause and Possible Consequences	Recommended Actions
Damage to Control Works ***(Figure 5.7b)***	1. BROKEN SUPPORT BLOCK Concrete deterioration. Excessive force exerted on control stem by trying to open gate when it was jammed. Causes control support block to tile; control stem may bind. Control head works may settle. Gate may not open all the way. Support block may fail completely, leaving outlet inoperable. 2. BENT/BROKEN CONTROL STEM Rust. Excess force used to open or close gate. Inadequate or broken stem guides. Outlet is inoperable. 3. BROKEN/MISSING STEM GUIDES Rust. Inadequate lubrication. Excess force used to open or close gate when jammed. Loss of support for control stem. Stem may buckle and break under normal use (as in this example).	Any of these conditions can mean the control is either inoperable or, at best, partly operable. Use of the system should be minimized or discontinued. If the outlet system has a second control valve, consider using it to regulate releases until repairs can be made. Engineering help is recommended.

Figure 5.7 *(cont.)*
Inspection Guidelines - Inlets, Outlets, and Drains

Failure of Concrete Outfall Structure

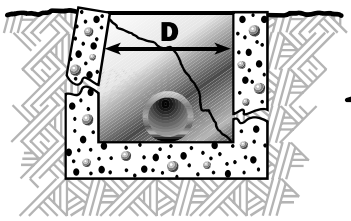


Figure 5.7c

Outlet Releases Eroding Toe of Dam

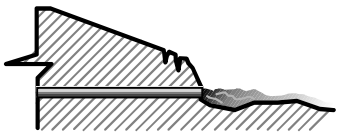


Figure 5.7d

Valve Leakage

Debris Stuck Under Gate



Figure 5.e-1

Cracked Gate Leaf

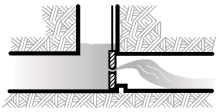


Figure 5.e-2

Damage Gate Seat or Guides



Figure 5.e-3

Problem	Probable Cause and Possible Consequences	Recommended Actions
Failure of Concrete Outfall Streucture *(Figure 5.7c)*	Excessive side pressures on nonreinforced concrete structure. Poor concrete quality. Loss of outfall structure exposes embankment to erosion by outlet releases.	1. Check for progressive failure by monitoring typical dimension, such as "D" shown in figure. 2. Repair by patching cracks and supplying drainage around concrete structure. Outfall structure may need total replacement.
Outlet Releases Eroding Toe of Dam *(Figure 5.7d)*	Outlet pipe too short. Lack of energy-dissipating pool or structure at downstream end of conduit. Erosion of toe oversteepens downstream slope, causing progressive sloughing.	1. Extend pipe beyond toe (use pipe of same size and material, and form watertight connection to existing conduit). 2. Protect embankment with riprap over suitable bedding.
Valve Leakage: Debris Stuck Under Gate *(Figure 5.7e-1)*	Trashrack missing or damaged. Gate will not close. Gate or stem may be damaged in effort to close gate.	Raise and lower gate slowly until debris is loosened and floats past valve. When reservoir is lowered, repair or replace trashrack.
Valve Leakage: Cracked Gate Leaf *(Figure 5.7e-2)*	Ice action, rust, affect vibration, or stress resulting from forcing gate closed when it is jammed. Gate-leaf main fail completely, evacuating reservoir.	Use valve only in fully open or closed position. Minimize use of valve until leaf can be repaired or replaced.
Valve Leakage: Damaged Gate Seat or Guides *(Figure 5.7e-3)*	Rust, erosion, cavitation, vibration or wear. Leakage and loss of support for gate leaf. Gate may bind in guides and become inoperable.	Minimize use of valve until guides or seats can be repaired. If cavitation is the cause, check to see if air-vent pipe exists, and is unobstructed.

Figure 5.7 *(cont.)*
Inspection Guidelines - Inlets, Outlets, and Drains

Seepage Water Exiting From a Point Adjacent to the Outlet

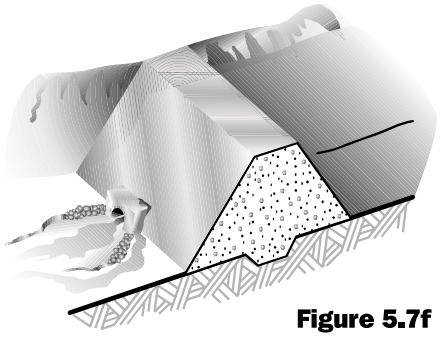


Figure 5.7f

Problem	Probable Cause and Possible Consequences	Recommended Actions
Seepage Water Exiting From a Point Adjacent to the Outlet ***(Figure 5.7f)***	1. A break in the outlet pipe. 2. A path for flow has developed along the outside of the outlet pipe. Continued flows can lead to erosion of the embankment materials and failure of the dam.	1. Thoroughly investigate the area by probing and/or shoveling to try to determine cause. 2. Determine if leakage water is carrying soil particles. 3. Determine quantity of flow. 4. If flow increases or is carrying embankment materials, reservoir level should be lowered until leakage stops. 5. A qualified engineer should inspect the condition and recommend further actions. ENGINEER REQUIRED

Appendix P: Project Diagrams



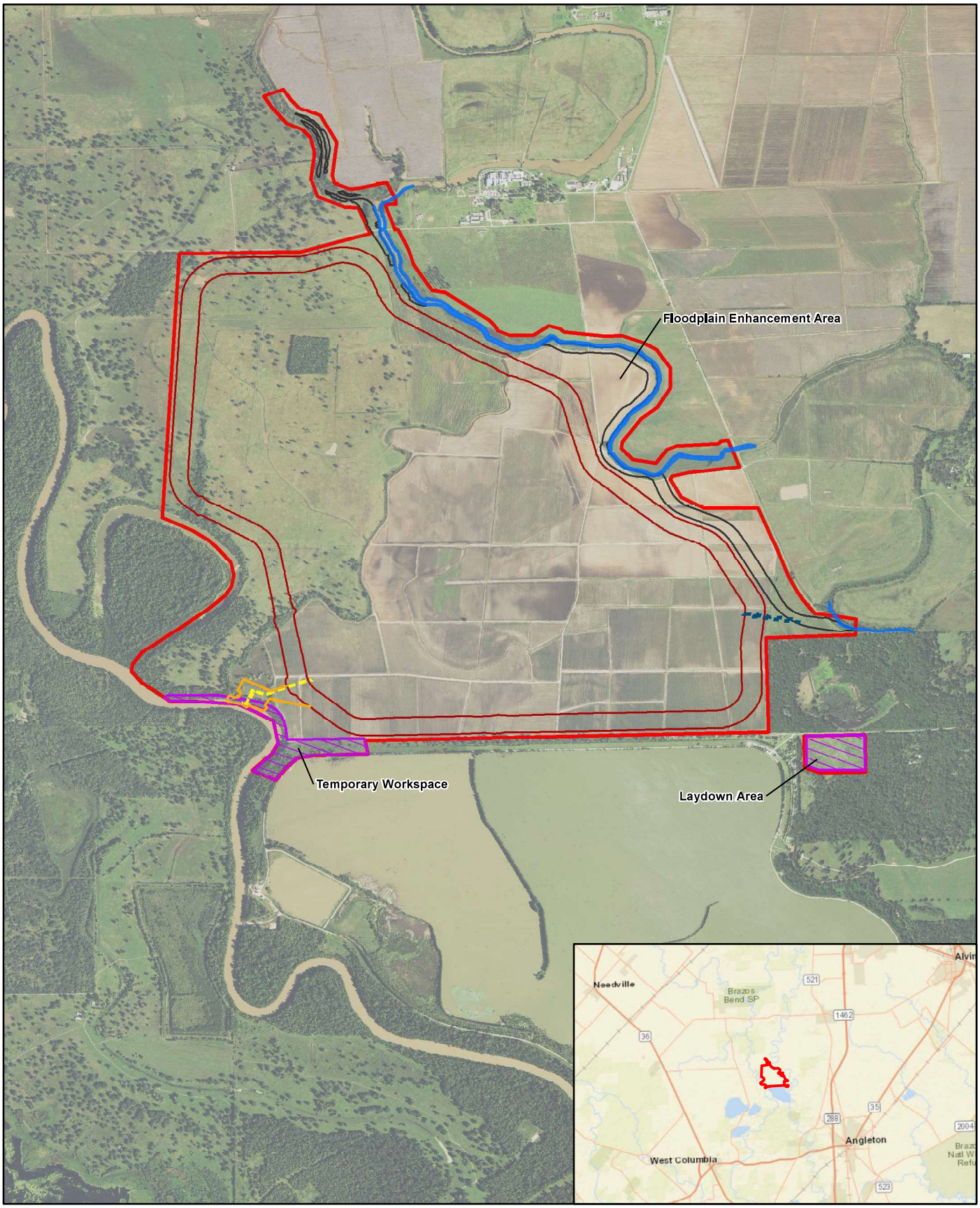
LEGEND

- Temporary Workspace Area
- Project Boundary
- Pump Station
- Embankment Limits

BASE MAP SOURCE
USGS 7.5-minute Topographic Quadrangle
Otey, TX (published, 1981)

0 2,000 4,000
Feet

FIGURE 1
Harris Expansion Project:
Vicinity Map
The Dow Chemical Company
Brazoria County, Texas



LEGEND

- Embankment Limits
- Pump Station
- Inlet Pipe
- Spillway
- Oyster Creek
- Grading Boundary
- Temporary Workspace Area
- Project Boundary

BASE MAP SOURCE: NAIP Imagery, 2014

N

0 1,500 3,000

Feet

FIGURE 2
Harris Expansion Project:
Project Components Map
The Dow Chemical Company
Brazoria County, Texas

UNK \\GECKO\WBG\672534_TXO_DOW_RESERVOIR_PERMITTING\03_GIS\MAPFILES\404PERMIT\PROJECT_COMPONENTS_MAP.MXD SASELAGE 12/21/2017 10:32:02 PM

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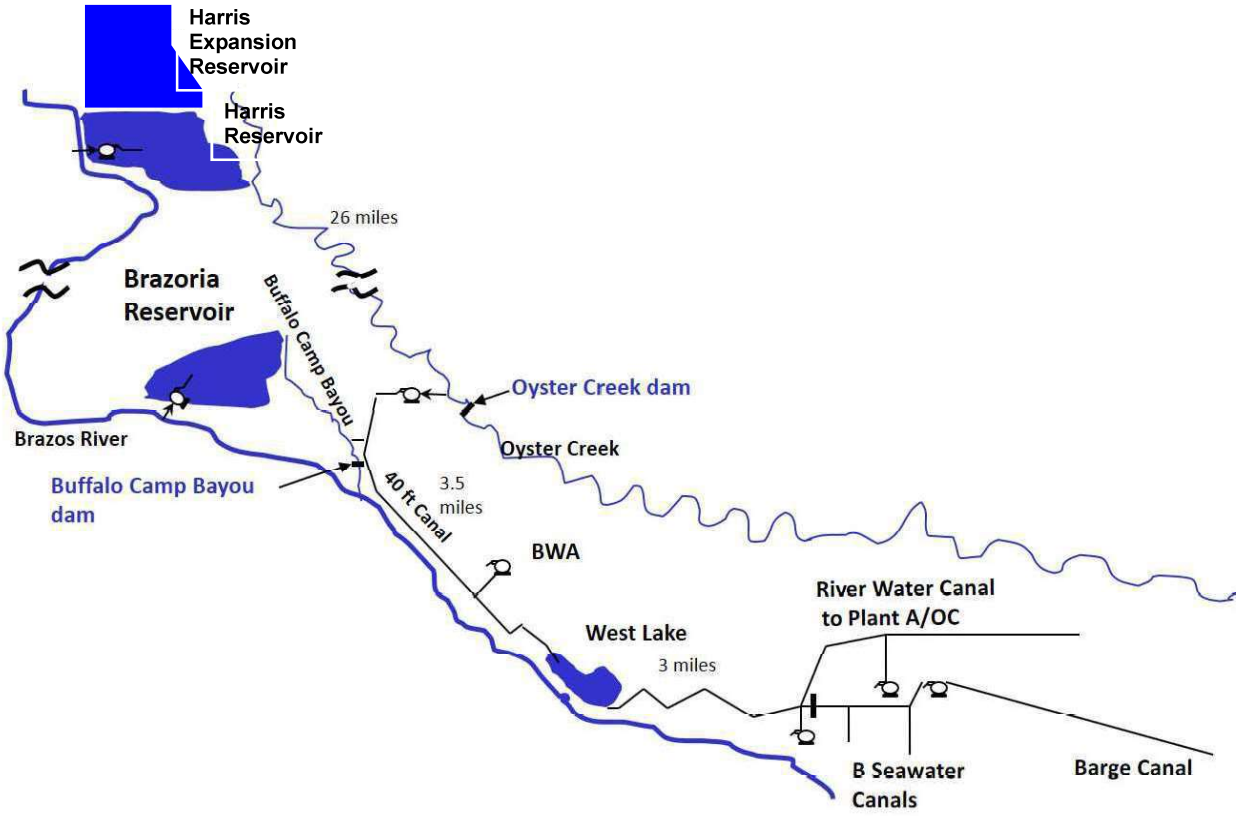

Figure 3
Harris Expansion Project:
River Water Supply System Overview
Brazoria County, Texas

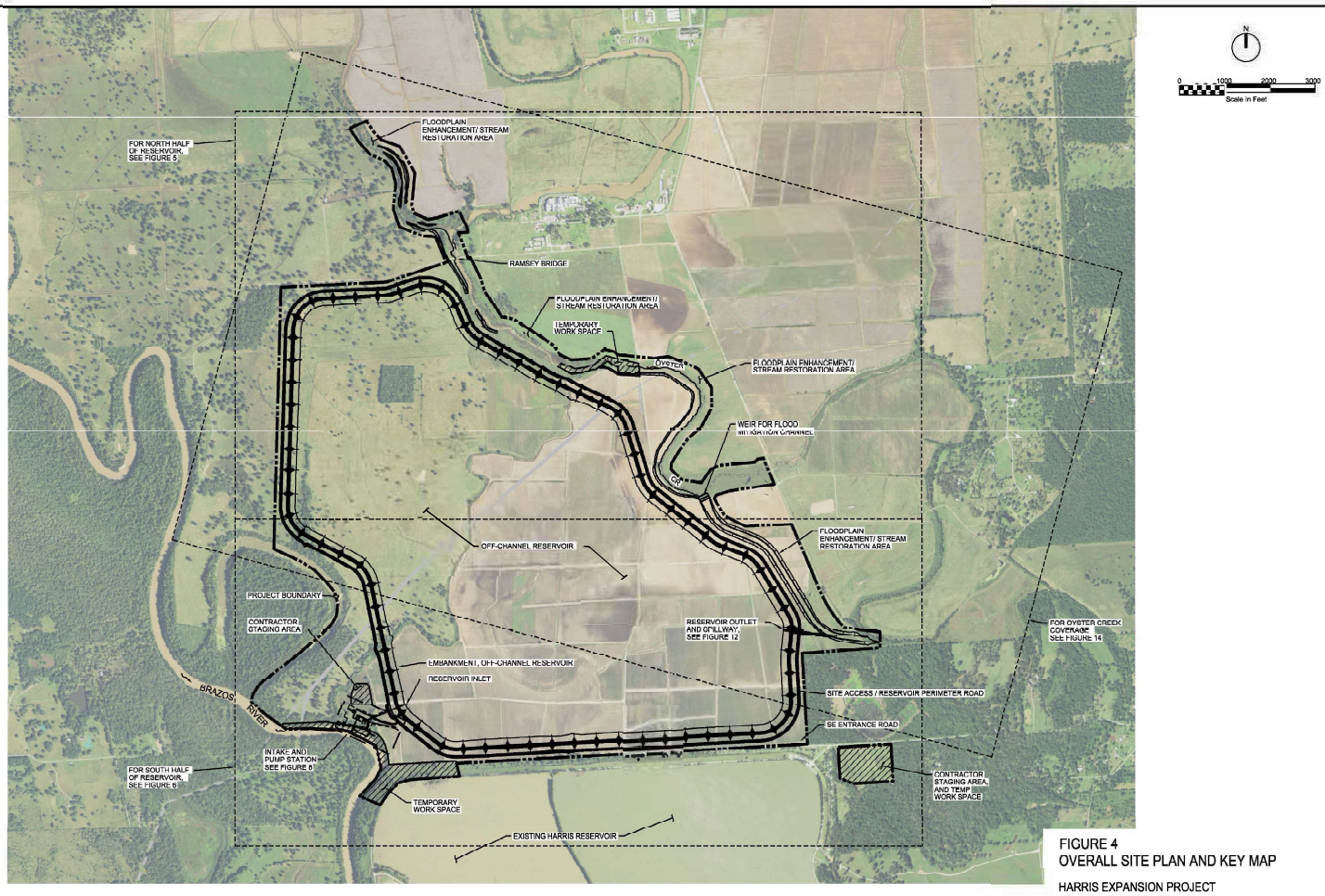

FIGURE 4
OVERALL SITE PLAN AND KEY MAP

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

672534

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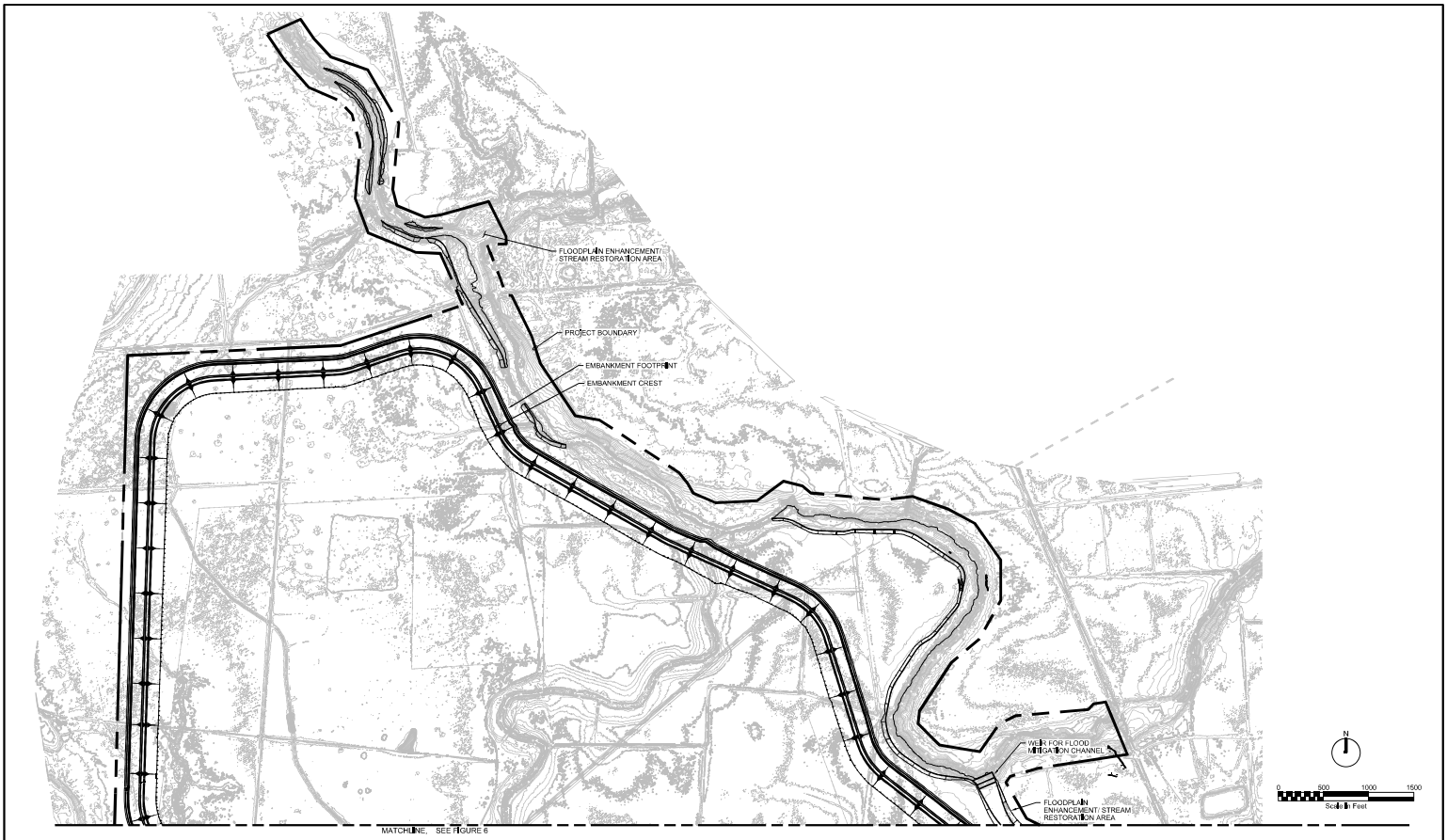

FIGURE 5
PLAN - NORTH HALF OF RESERVOIR

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

672534

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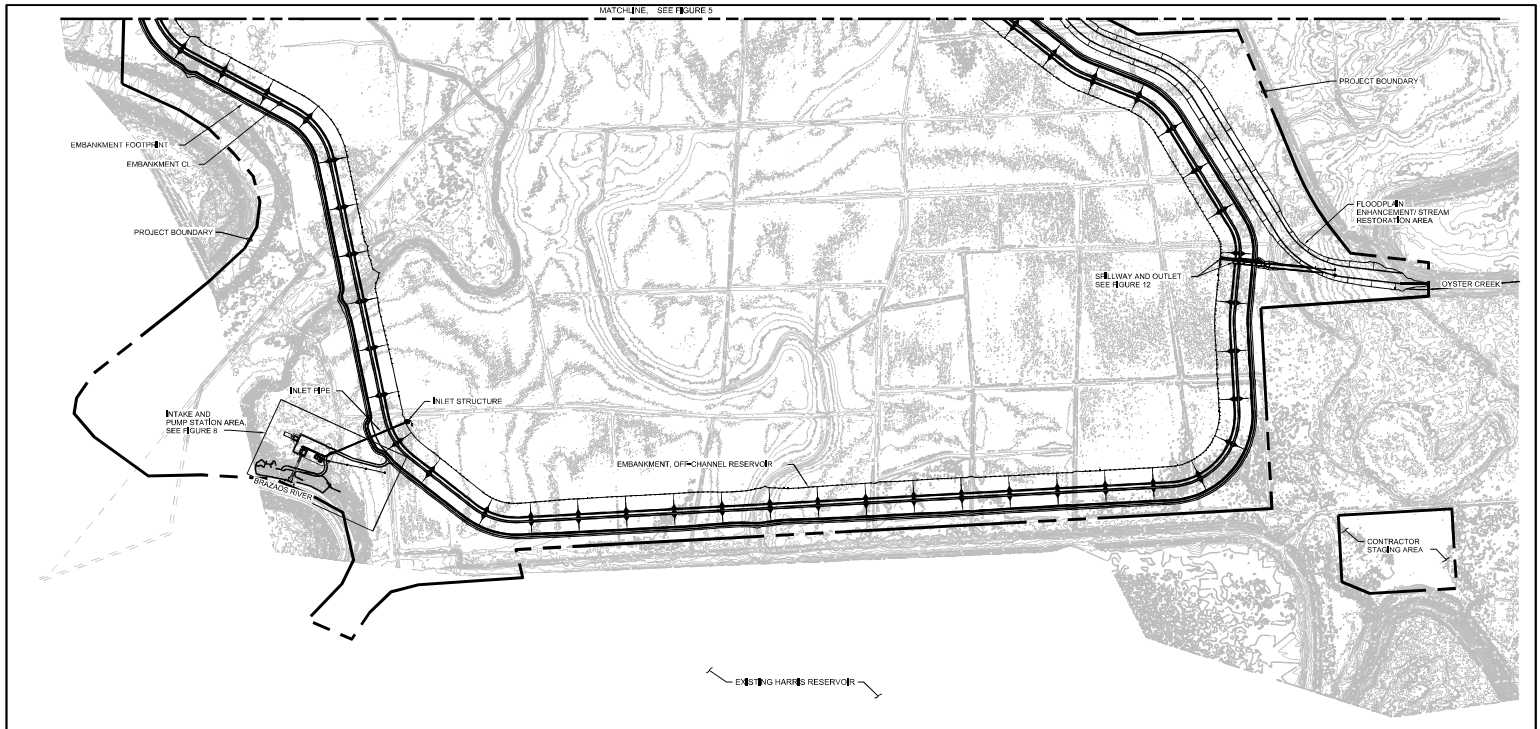

FIGURE 6
PLAN - SOUTH HALF OF RESERVOIR

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

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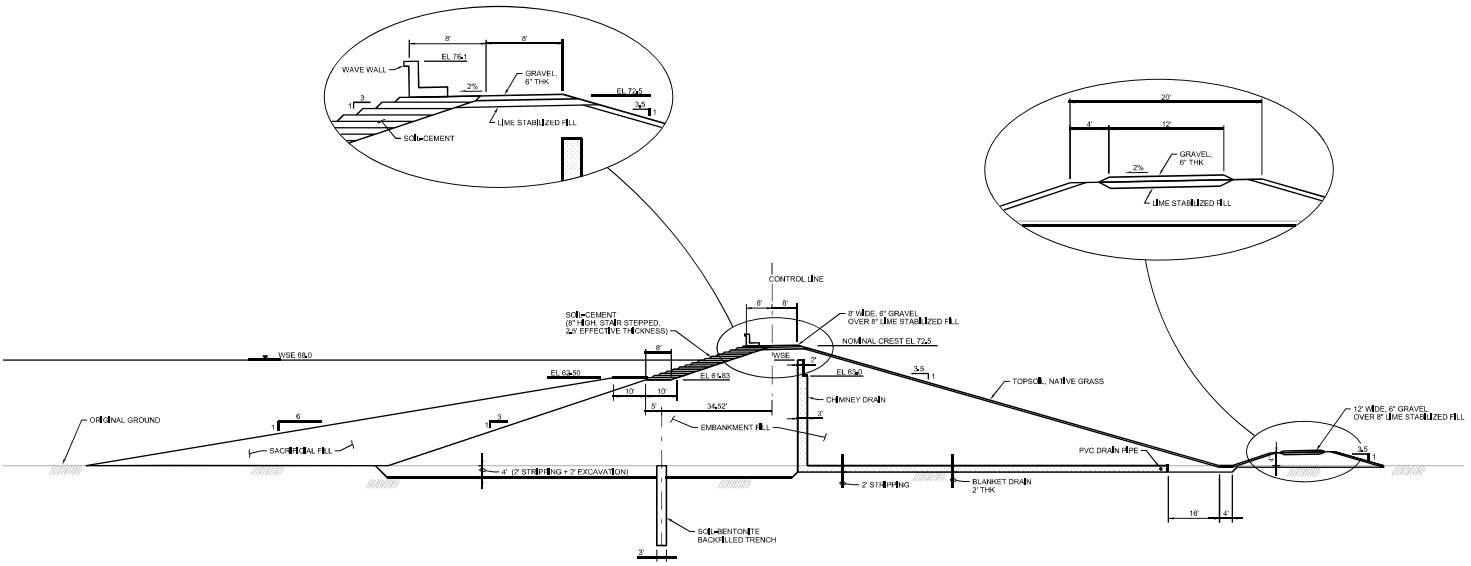

TYPICAL EMBANKMENT SECTION
1"=15'

FIGURE 7
TYPICAL EMBANKMENT SECTION

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

672534

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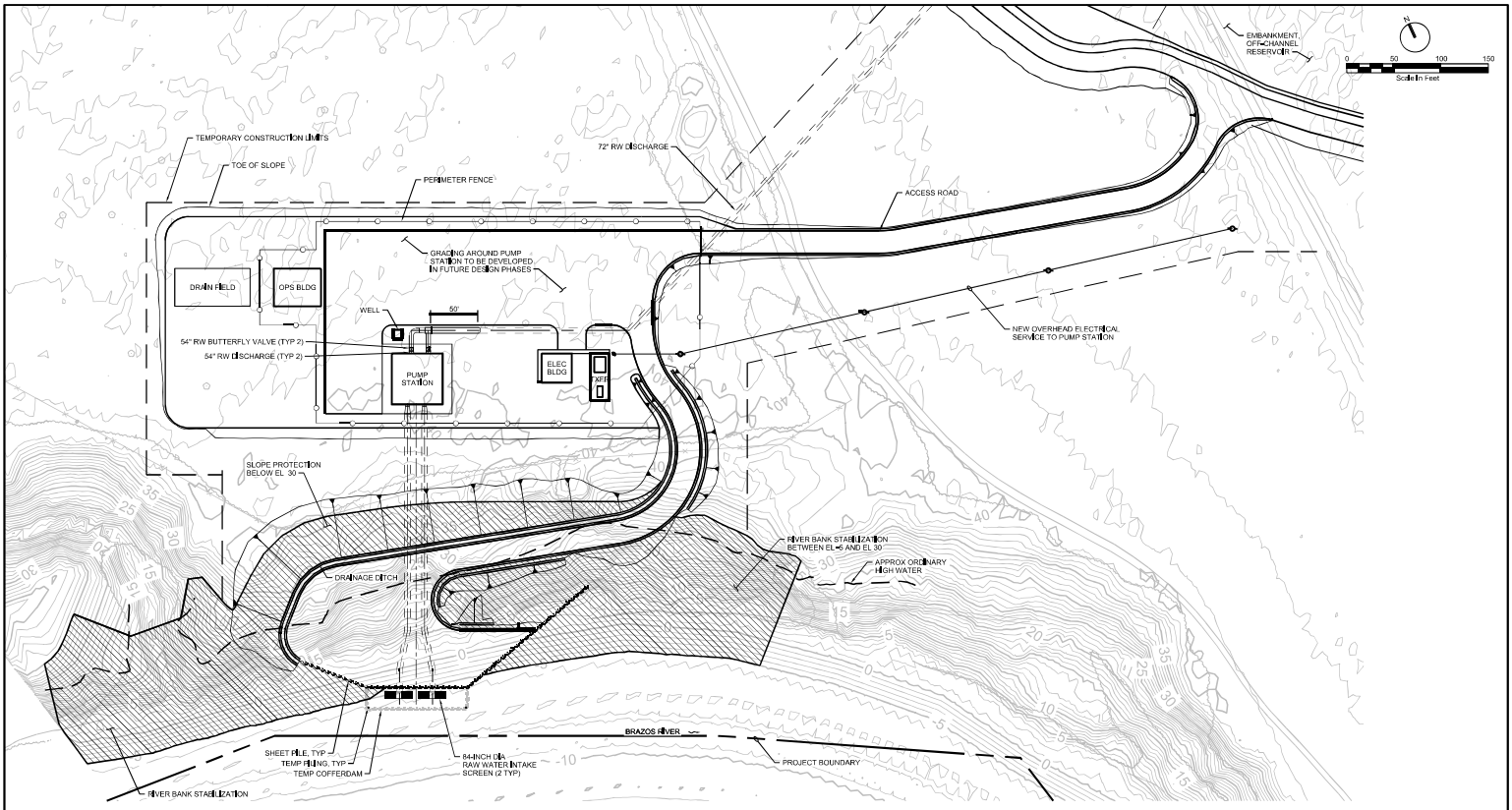

FIGURE 8
INTAKE AND PUMP STATION - SITE PLAN

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

672534

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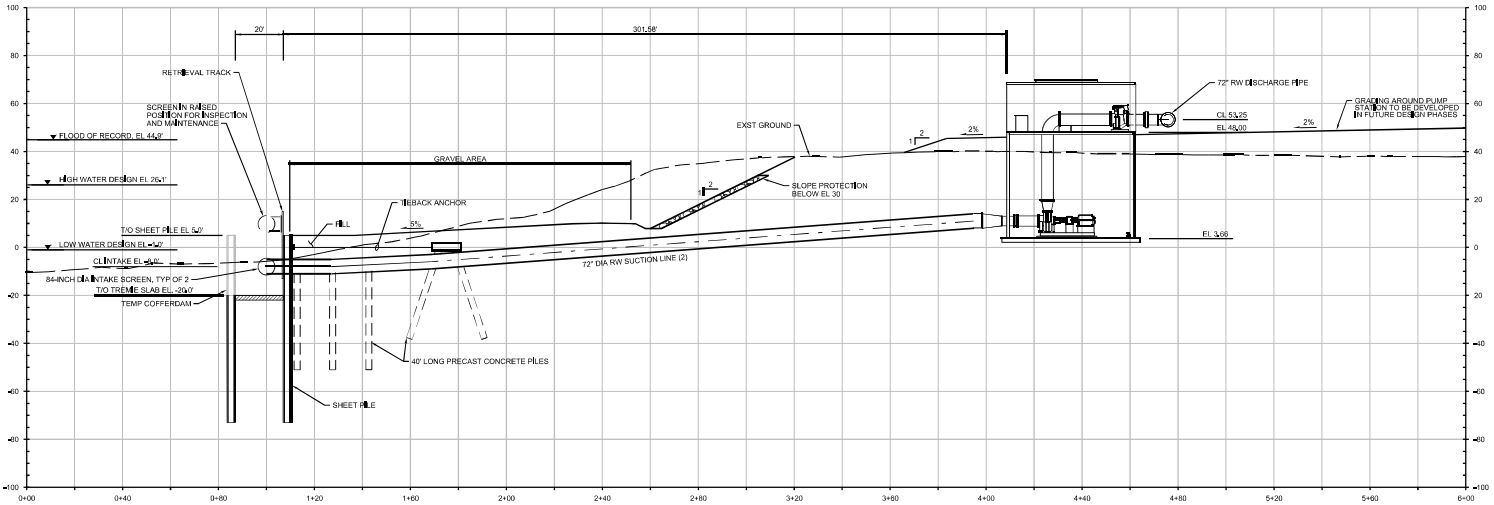

INTAKE SECTION
1"=20'

0 20 40 60
Scale In Feet

FIGURE 9
INTAKE AND PUMP STATION - SECTION

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

672534

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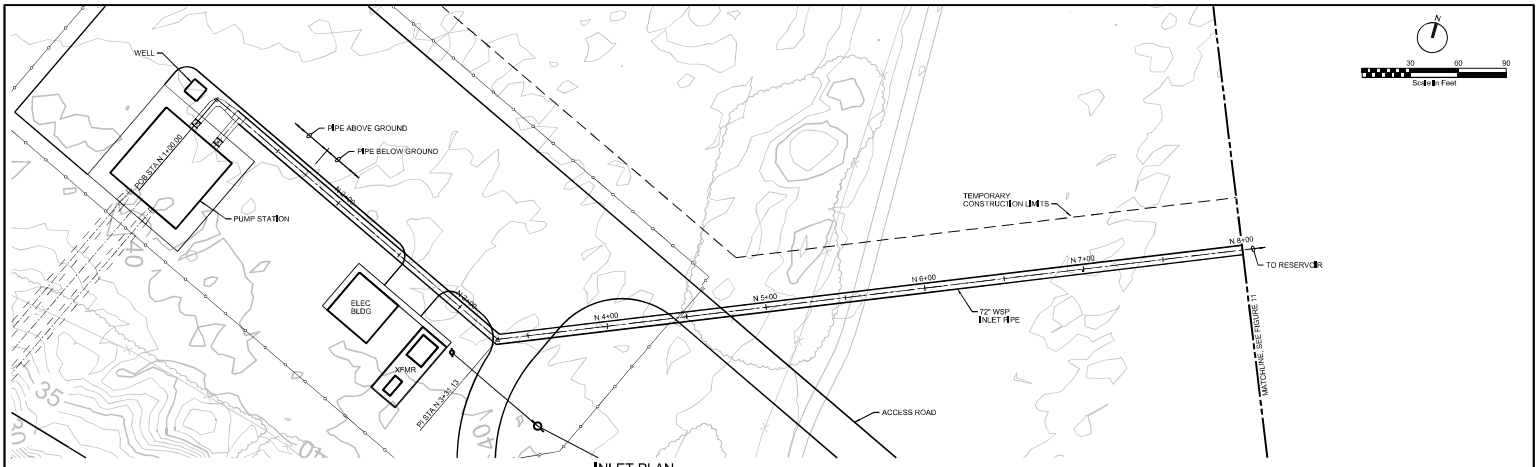
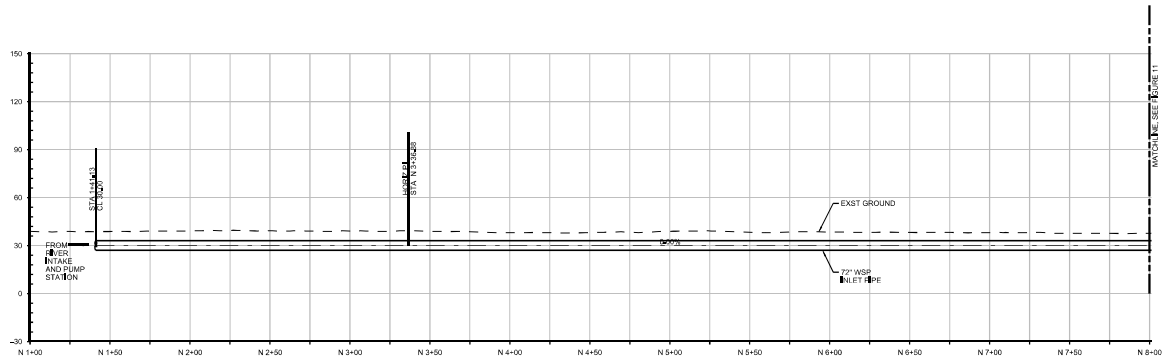


INLET PLAN
1"=30'



INLET PROFILE
1"=30'

FIGURE 10
RESERVOIR INLET - PLAN AND PROFILE

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

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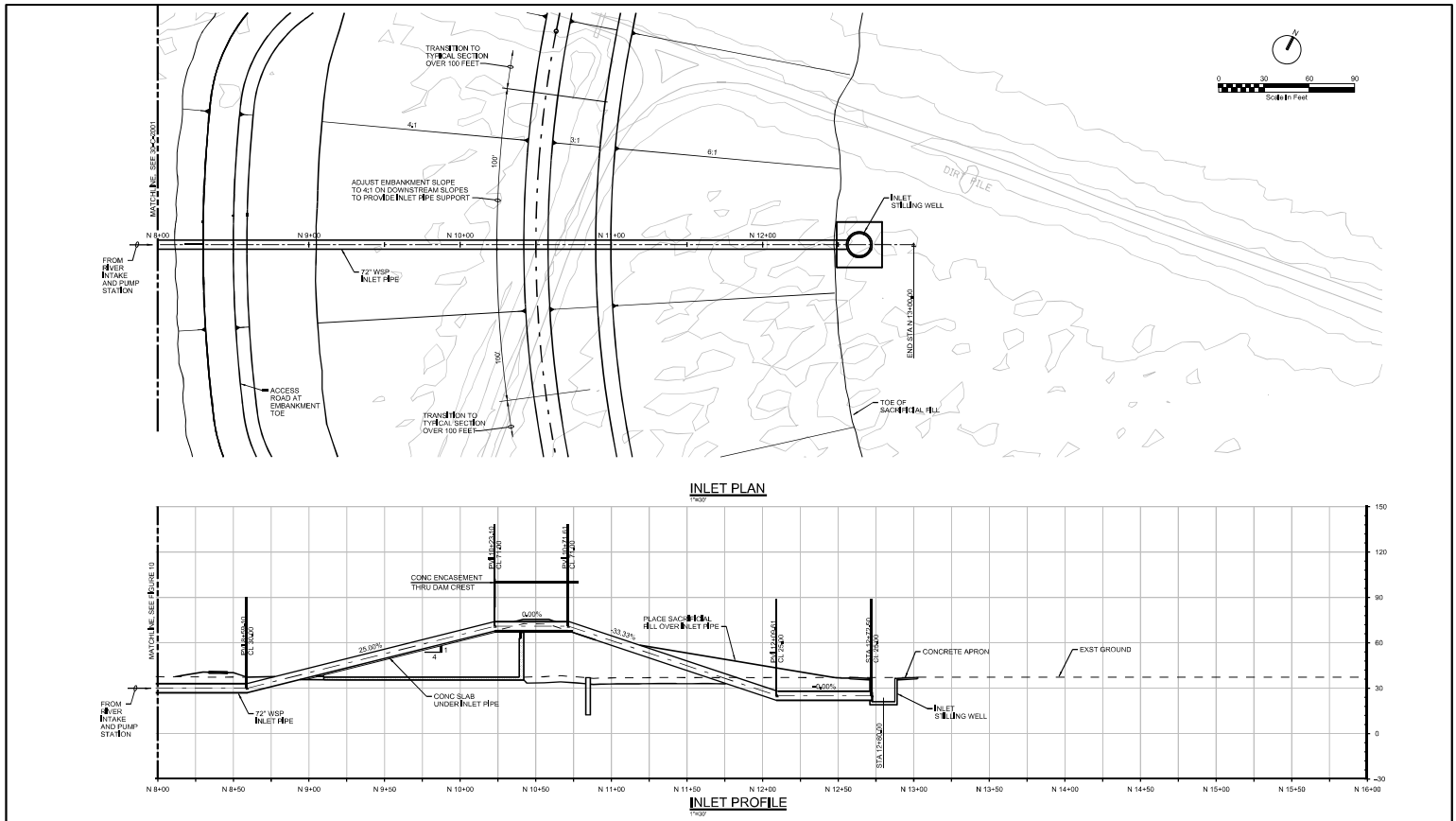

INLET PLAN
1"=30'

INLET PROFILE
1"=30'

FIGURE 11
RESERVOIR INLET AT EMBANKMENT

HARRIS EXPANSION PROJECT
404 PERMIT APPLICATION

672534

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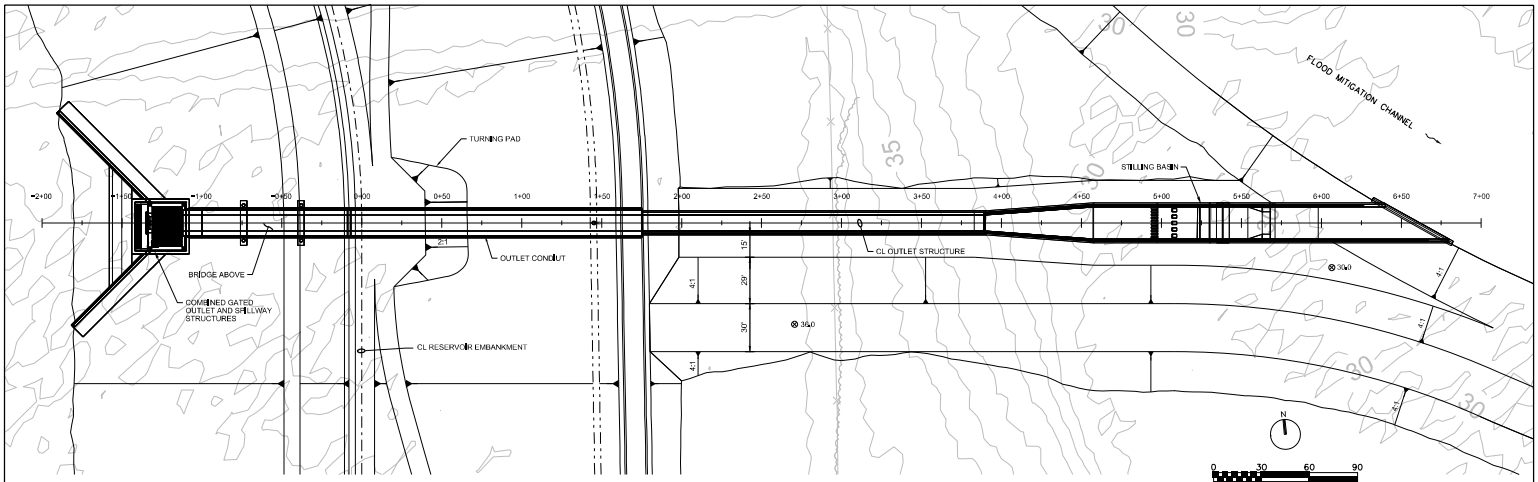
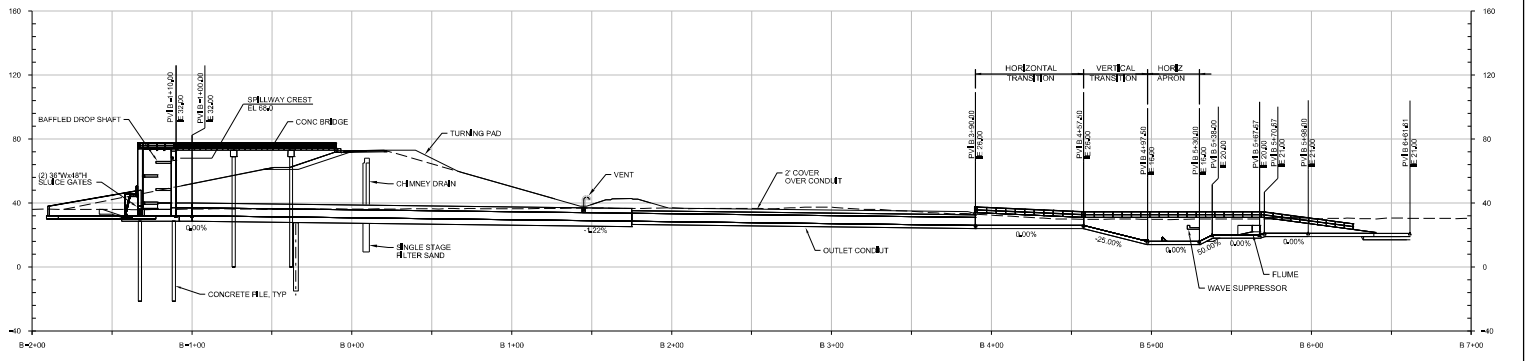


PLAN
1"=30'



PROFILE
1"=30'

FIGURE 12
RESERVOIR OUTLET - PLAN AND PROFILE
HARRIS EXPANSION PROJECT

699038

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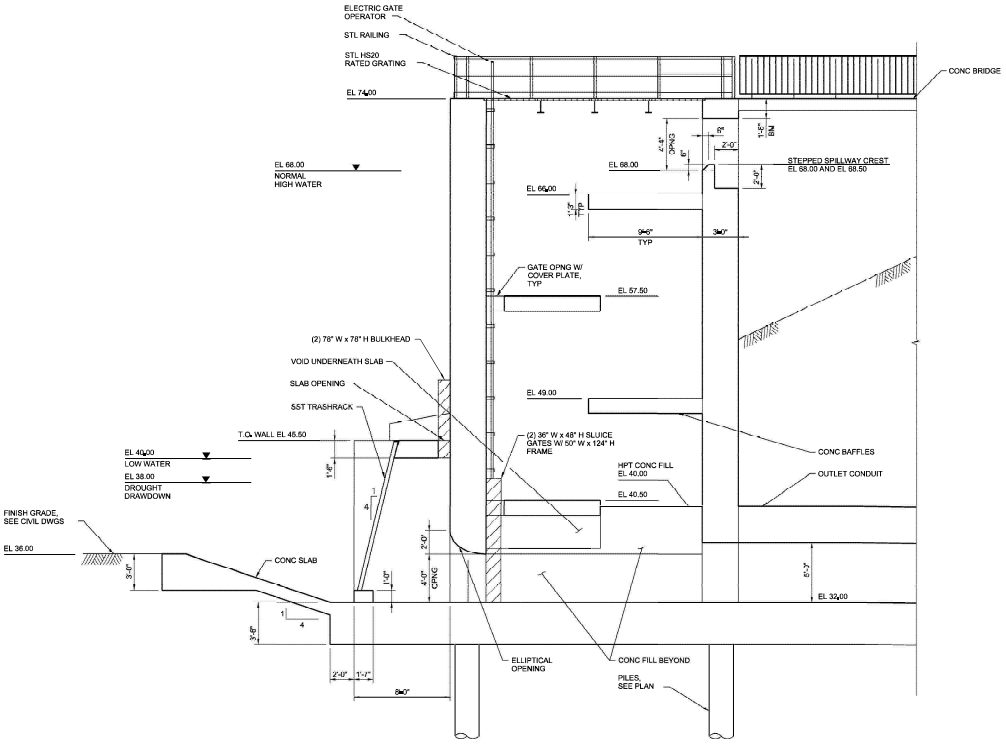

BAFFLED DROP SHAFT SECTION

1/4"=1'-0"

FIGURE 13
RESERVOIR OUTLET - COMBINED STRUCTURE
The Dow Chemical Company
HARRIS EXPANSION PROJECT
Brazoria County, Texas

699038

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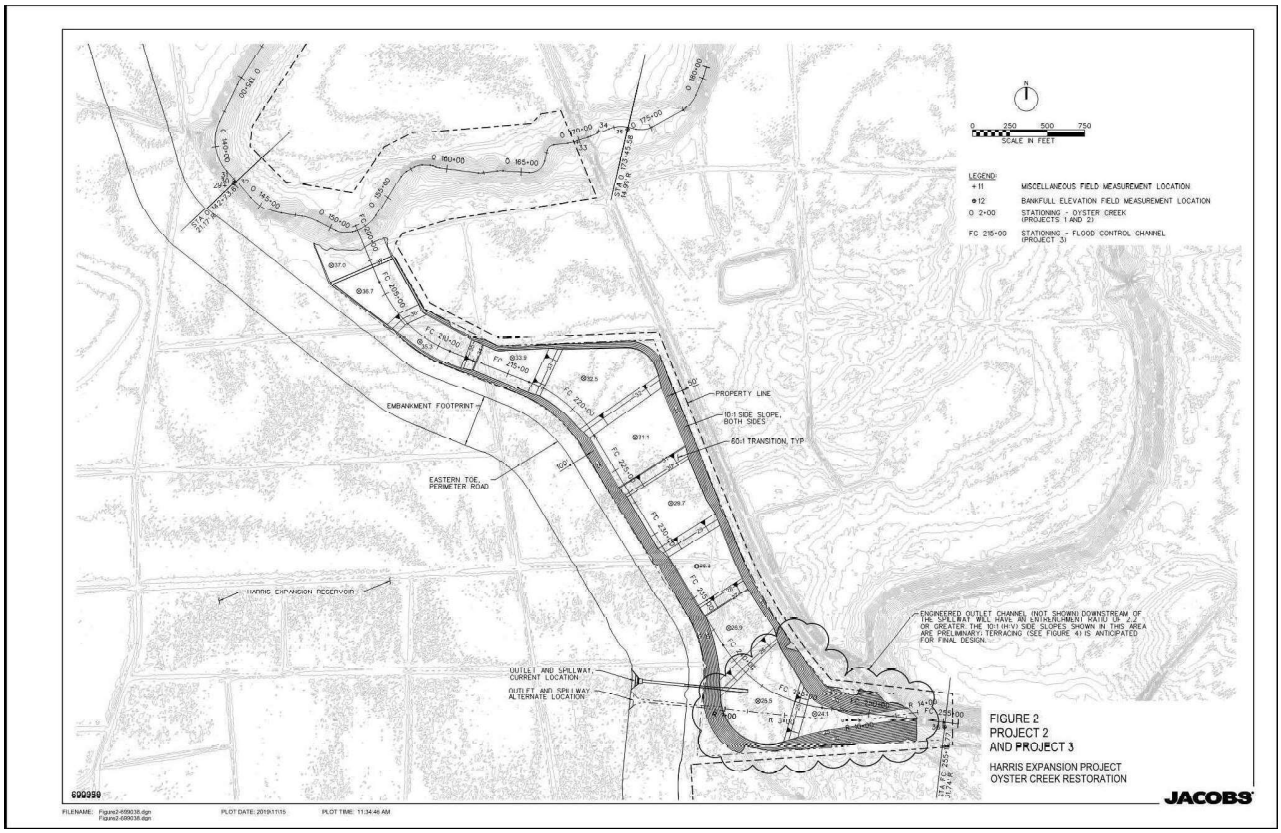


FIGURE 14
Harris Expansion Project
The Dow Chemical Company
Brazoria County, TX

Appendix Q: MCC Operation Procedure

MCC Operation Procedure

Pre-Task Analysis

Complete the Pre-Task Analysis prior to initiating the work.

Check the potential hazards that apply:

☐ **Thermal Burns**	☐ **Lighting**	☐ **Fall/Trip/Slip Hazards**
☐ **Pinch Points**	☐ **Heat Stress**	☐ **Electricity/High Voltage**
☐ **Sharp Edges**	☐ **Overhead Work**	☐ **Crowded Work Space**
☐ **Weather Conditions**	☐ **Ergo Issues**	☐ **Other**_____

List how potential hazards will be addressed:

1. …
2. …
3. …

Is the procedure adequate for the job?	**Yes** ☐	**No** ☐
Does the procedure need to be modified?	**Yes** ☐	**No** ☐

Scope

This procedure is used by Reservoir Technician to operate the river water pumps at the Harris Expansion Pumping Station.

There are 2 pumps, and both have similar controls.

Equipment involved:

- MP-BM29-A
- MP-BM29-B

Categories and Attributes

_____Categories_____ / Attributes (Operating/Other)

☐ Critical ☐ Emergency ☑ Operating ☐ Other / ☑ Routine ☐ Non-Routine

Hazards and Precautions

The table below lists job hazards and the precautions that should be taken for safety, environmental, quality, ergonomics, Good Manufacturing Practices, etc… before beginning this procedure.

Hazard	Precaution
Wildlife in area	Watch for venomous snakes, stinging insects, and aggressive animals
Weather extremes	Take appropriate steps to protect yourself from the elements, lightning, or slip/trip hazards
Insufficient lighting in some areas	During night visits, ensure you have a flashlight

Continued on next page

MCC Operation Procedure, Continued

If any physical contact or exposure occurs, report and seek medical treatment immediately!

Tools and equipment

The tools and equipment listed below are needed to do this job.

Other than your standard departmental PPE, include other safety equipment here.

Tools and/or Equipment	**Use** (if explanation is needed)
Radio, cellphone	
Flashlight	
Normal PPE for this area with ear protection	

Before you begin…

Before beginning this procedure, be sure to read it all the way through to the end. If any part of it is unclear, consult with an experienced person, supervision, or the SME.

- Basic controls apply to these pumps; control power selector switch (ON and OFF), remote field control spring-return switch (STOP-RUN-START), controlling a combination starter, containing power fuses and motor overload protection.
- Local indicator lights on the motor starters (RED for RUNNING, GREEN for STOPPED) are mimicked by indicators in the Water Distribution control room, which enables remote monitoring of run and stop conditions.
- Instrumentation consists of the manual control items above, a level indication, motor run indication, low power cut-off function, and user enabled alarms, all of which are observable at the control room.

Safe Operating Limits

*List general operating limits here **if they apply**.*

N/A

Consequences of Deviation

*List consequences of deviation from the procedure steps or general operating limits **if they apply.***

Type of Deviation	**Consequences and How to Avoid**
Continuing to operate a noisy or malfunctioning pump	Equipment damage or possible personal injury; immediately shut down the pump, tag it, and report the problem
Operating a piece of equipment without being familiar with it	Same consequences as above; receive thorough training on the equipment before use.

Continued on next page

MCC Operation Procedure, Continued

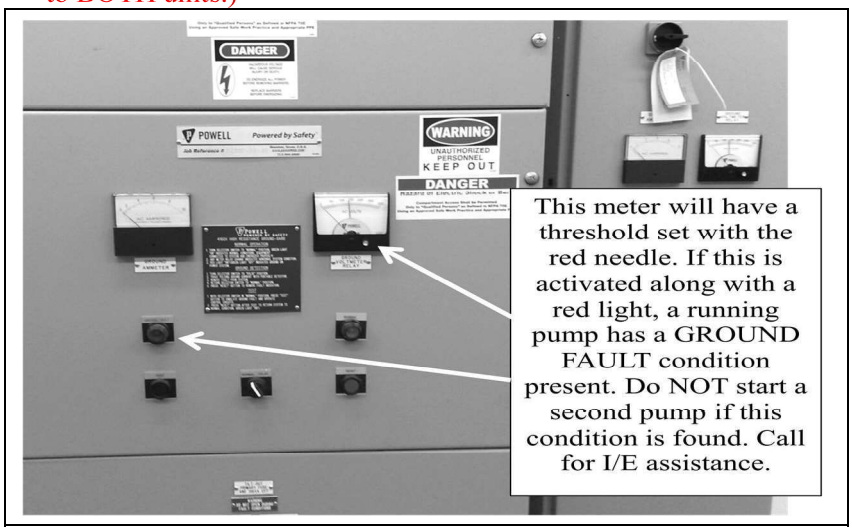
Consequences of Deviation (continued)

*List consequences of deviation from the procedure steps or general operating limits **if they apply.***

Type of Deviation	Consequences and How to Avoid
Neglecting to report a problem, or leaving a piece of equipment in a disabled or unsafe condition	Equipment damage, inadequate pumping capacity, possible personal injury; always communicate an existing issue to management
Incomplete pre-start checks	Same as above

Procedure

These steps will be followed in order unless stated otherwise:

Step	Action
1	Upon arrival at pump station, assess conditions for a safe commencement and completion of task: • Verify that motor greasing mechanism is active. • Report any obvious abnormal conditions when found. • Report presence of any hazardous wildlife. • Check Ground Fault Detectors. (Note sample photo below; this applies to BOTH units.)  • Make a brief visual inspection of motor/pump assembly and physical condition of controls before using.

Continued on next page

MCC Operation Procedure Continued

Procedure (continued)

These steps will be followed in order unless stated otherwise:

Step	Action
2	• Ensure that the disconnect handle on starter can is UP (ON) • GREEN light should be on indicating available control voltage; turn door switch to ON • Verify Multilin (motor circuit protector) is on and there are no alarms displayed.
3	At field START/STOP station: • Turn selector switch to START and release when pump starts (the switch will return to center position RUN on its own). • Note any unusual noise or vibration (or switch malfunction); if so, shut pump down immediately and use the alternate unit.
4	To STOP pump normally, turn the field control switch to STOP. • In the event that the field control switch fails, use the door switch.

Continued on next page

Minor Troubleshooting Procedure

If pump won't start or shuts down for no obvious reason, these steps will be followed in order unless stated otherwise:

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>
<table>
<tr><td>IF pump does not start and gear is on with green light…</td><td>THEN turn off door switch (green light out) and check Multilin microprocessor for an indication.
• Because of the voltage level, request help from I/E</td></tr>
<tr><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>2</td><td>
<table>
<tr><td>IF pump starts, but shuts down again…</td><td>THEN check Multilin microprocessor as in Step 1 above and note what it says as far as alarms.</td></tr>
<tr><td>IF pump won't restart…</td><td>THEN request I/E help</td></tr>
<tr><td></td><td></td></tr>
<tr><td>IF pump restarts and shuts down again with no obvious cause…</td><td>THEN do not attempt a FOURTH start; motors of this voltage are restricted to no more than 2 starts per hour. (Only supervision can overrule this.)
• Motor may have separated from pump.</td></tr>
</table>
</td></tr>
</table>

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MCC Operation Procedure, Continued

Related Documents

These related documents should be considered when performing this task:

Document and Records Management

The current procedure is filed in the Document Management System, Electronic component, under Procedures.

A hardcopy of this procedure is located in: N/A

Review history

The following information documents at least the last 3 reviews to this document.

Date	Reviewed By	Comments

Revision history

The following information documents at least the last 3 changes to this document, with all the changes listed for the last 6 months.

Date	Revised By	Changes