Flood Infrastructure Assessment

Classification Guidance & Toolkit Overview

MARCH 2025

TEXAS WATER DEVELOPMENT BOARD

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APPENDIX A: FLOOD INFRASTRUCTURE CLASSIFICATION METHODOLOGY

Outlines guidance for populating the condition, functionality, and confidence rating for each asset as required by Task 1 of the Regional Flood Planning Scope of Work. The methodology utilizes empirical and approximate data sources as the basis for the classification guidance. A three-tier data confidence rating system was developed that allows the confidence to be assigned based on the available data.

APPENDIX B: TOOLKIT USER GUIDE

Documents the spreadsheet-based tool developed to provide communities without GIS a resource to manage their flood infrastructure and provide an aggregated summary for inclusion into the regional flood planning process.

LINK TO DOWNLOAD SPREADSHEET: FLOOD INFRASTRUCTURE ASSESSMENT TOOLKIT

1 EXECUTIVE SUMMARY

In 2024, the Texas Water Development Board (TWDB) delivered the first comprehensive State Flood Plan, as mandated by Senate Bill 8[1] during the 86th Texas Legislative session.[2] This initiative is a significant step in reducing the risk and impact of flooding across the State of Texas – a coordinated statewide effort focusing on identifying and mitigating flood risks. As required by statute, the first State Flood Plan included an inventory of constructed and natural flood infrastructure but had very limited information about the condition or functionality of the flood infrastructure assets.

The second cycle of regional flood planning is now underway, and this infrastructure toolkit has been prepared by the TWDB to improve the assessment of flood infrastructure condition and functionality. This toolkit provides guidance on classifying the condition, functionality and data confidence rating of constructed and natural flood infrastructure based on the following:

CONDITION

- Deficient: The infrastructure or natural feature is in poor structural or non-structural condition and needs replacement, restoration, or rehabilitation.
- Non-Deficient: The infrastructure or natural feature is in good structural or non-structural condition and does not require replacement, restoration, or rehabilitation.
- Unknown**:** The condition of infrastructure or natural feature is unknown.

FUNCTIONALITY

- Functional: The infrastructure is serving its intended design level of service.
- Non-Functional: The infrastructure is not serving its intended or design level of service.
- Unknown: The functionality or capacity for infrastructure is unknown.

**Note: Level of Service will vary depending on local criteria and flood infrastructure type.*

CONFIDENCE

- High: Data used for classification came from the asset owner through findings of a study or analysis.
- Low: Data used for classification is based on asset attributes and assumptions.
- None: No data is available to determine data confidence classification.

[1] https://capitol.texas.gov/tlodocs/86R/billtext/pdf/SB00008F.pdf

[2] https://www.twdb.texas.gov/flood/planning/sfp/doc/2024_State_Flood_Plan_Volume_I.pdf

This document outlines the resources funded by the TWDB to assist communities with the development and classification of major flood infrastructure inventory:

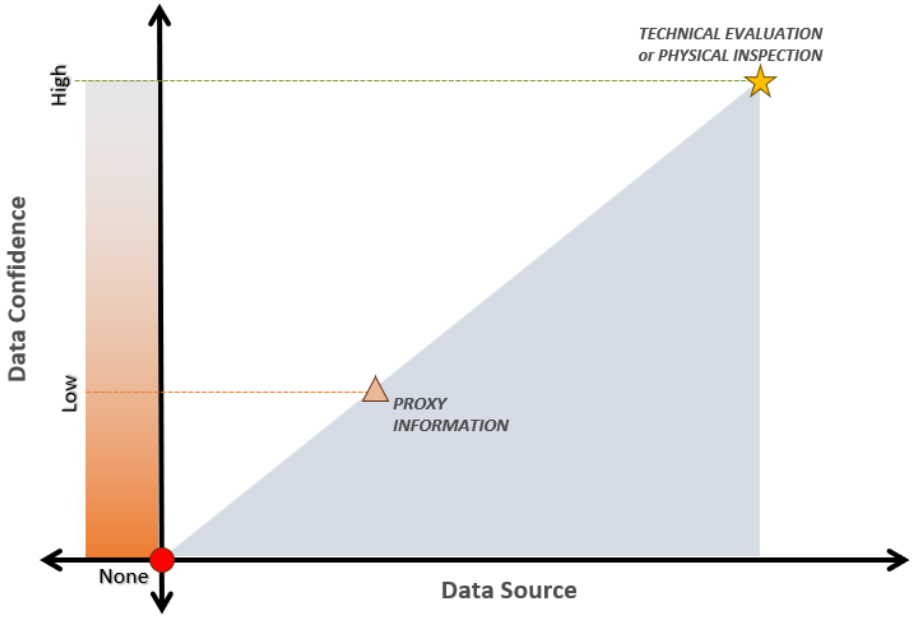
- **APPENDIX A: FLOOD INFRASTRUCTURE CLASSIFICATION METHODOLOGY**
  Outlines guidance for populating the condition, functionality, and confidence rating for each asset. A three-tier data confidence rating system was developed that allows the confidence to be assigned based on the available data.

- **APPENDIX B: TOOLKIT USER GUIDE**
  Describes how to use the spreadsheet tool that was created for communities lacking a GIS-based inventory, to streamline data collection and management. Documents the spreadsheet-based tool developed to provide communities without GIS a resource to manage their flood infrastructure and provide an aggregated summary for inclusion into the regional flood planning process.

- **FLOOD INFRASTRUCTURE ASSESSMENT TOOLKIT**
  This is a spreadsheet-based resource designed for communities without a GIS-based inventory.

A data confidence rating system was developed that categorizes data sources as *high*, *low*, or *none*, as shown in **Figure 1-1**. The rating system aims to highlight when approximate data is used instead of empirical data. The infrastructure assessment methodology allows lower-confidence data sources to be used in the flood infrastructure classification. Higher-confidence data sources such as recent (since 2018) Hydrologic and Hydraulic (H&H) studies and field inspections are preferred.

Figure 1-1: Data Confidence Rating System (FNI, 2023)



This figure illustrates the three-tier classification (high, low, or none) used to rate the reliability of data sources in flood infrastructure assessments. High-confidence sources (e.g., recent H&H studies and field inspections) are preferred, while lower-confidence or proxy information can still be utilized when technical evaluations and empirical data are not available.

2 OVERVIEW OF FLOOD INFRASTRUCTURE CLASSIFICATION GUIDANCE

A defined classification methodology was developed and documented in **Appendix A**: Flood Infrastructure Classification Methodology**. Appendix A** outlines criteria to evaluate various flood infrastructure assets to populate the condition (deficient, non-deficient, unknown), functionality (functional, non-functional, unknown), and data confidence rating (high, low, none) for the state flood infrastructure inventory.

Table 2-1 outlines a summary of the flood infrastructure guidance provided. Natural flood infrastructure features do not have a designed level of service, so no guidance is provided to assess natural infrastructure functionality. These fields should be reported as unknown and description as "n/a."

Table 2-1: Flood Infrastructure Classification Guidance Summary

Flood Infrastructure Type	Functionality	Condition
Dams, Reservoirs, and Weirs	Y	Y
Levees	Y	Y
Roadway Stream Crossings, Culverts, and Bridges	Y	Y
Low Water Crossings	Y	Y
Storm Drain Systems, Inlets, Channels, Tunnels, and Ponds	Y	Y
Revetments and Coastal Constructed (Sea Barriers, Sea Walls, and Tidal Barriers)	Y	Y
Rivers and Tributaries	N	Y
Wetlands and Estuaries	N	Y
Playas	N	Y
Dunes	N	Y
Fans	N	N
Parks or Open Spaces	N	N
Coastal Natural	N	N
Sinkholes	N	N
Gauges	N	N

A variety of industry resources were consulted in the development of this toolkit. See Appendix A for publicly available resources, grouped together by asset classification type.

3 TOOLKIT USER GUIDE OVERVIEW

The **Flood Infrastructure Assessment Toolkit (Toolkit)** is a spreadsheet-based resource designed for communities without a GIS-based inventory to assess and classify the condition, functionality, and confidence rating for their flood infrastructure. Once populated, the Toolkit can be incorporated into the regional flood planning process by providing the inventory data to RFPG Consultants.

Appendix B provides a step-by-step user guide for the Toolkit, including:

- How to collect and enter relevant asset data into the Toolkit
- Management of detailed or aggregated flood infrastructure inventory
- Enabling macros
- Prioritization of data collection
- Additional resources

The Toolkit uses a three-tiered data confidence rating system (high, low, or none) to document how each classification (condition and functionality) is determined based on available data sources and institutional knowledge. Its primary functions are to:

- Expand the Texas flood infrastructure inventory
- Assist with classification of the infrastructure condition, functionality, and confidence rating
- Provide standardized guidance for infrastructure assessments

To support communities lacking a GIS-based inventory, the Toolkit is available as a resource through RFPGs. When communities submit completed spreadsheets with locational data (latitude/longitude or address), that information can be integrated into the TWDB flood planning database. Otherwise, a tabular summary of each community's infrastructure and classification will be linked to its jurisdictional boundary within the database.

APPENDIX A

FLOOD INFRASTRUCTURE CLASSIFICATION METHODOLOGY

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Flood Infrastructure Assessment

Classification Methodology

MARCH 2025

TEXAS WATER DEVELOPMENT BOARD

Contents

1 SUMMARY

The full flood infrastructure classification methodology is included below as a reference for communities. Communities can utilize this methodology to override the automatic classification in the Toolkit (see **Appendix B: Toolkit User Guide**). Regional Flood Planning Group (RFPG) Consultants will utilize information provided by communities and leverage the comprehensive classification guidance to make a final determination regarding infrastructure classification. Condition, functionality, and data confidence ratings should be assigned based on the following definitions:

CONDITION

- **Deficient:** The infrastructure or natural feature is in poor structural or non-structural condition and needs replacement, restoration, or rehabilitation.
- **Non-Deficient:** The infrastructure or natural feature is in good structural or non-structural condition and does not require replacement, restoration, or rehabilitation.
- **Unknown:** The condition of infrastructure or natural feature is unknown.

FUNCTIONALITY

- **Functional:** The infrastructure is serving its intended design level of service.
- **Non-Functional:** The infrastructure is not serving its intended design level of service.
- **Unknown**: The functionality or capacity for infrastructure is unknown.

**Note: Level of Service will vary depending on local criteria and flood infrastructure type.*

DATA CONFIDENCE LEVEL

- **High:** Official studies have been performed by a reputable agency to confirm the condition or functionality rating.
- **Low:** No studies, reports, or analysis are available to confirm or deny condition or functionality rating.
- **None:** No known data is available to confirm the condition or functionality rating of the asset.

2 CONSTRUCTED FLOOD ASSET GUIDANCE

The following criteria can be applied to classify each constructed asset type according to condition, functionality, and the data confidence rating related to each category. Constructed assets must be evaluated individually for condition and functionality, as well as the respective data confidence ratings.

Condition and functionality classification guidance was developed for most constructed flood infrastructure, as described in further detail in the sections below.

2.1 DAMS, RESERVOIRS, AND WEIRS

Dams are man-made structures constructed across a waterway to impound water for flood control, water supply, power generation, or recreation. **Reservoirs** are man-made lakes often created by installing dams across rivers or tributaries to capture and store water for a variety of purposes, including water supply.[1] **Weirs** are low-lying barriers built across waterways that gauge the volume of water flowing through a canal and can serve as flood management infrastructure by capturing water upstream and slowing its downstream flow during times of peak discharge.

Table 2-1 and **Table 2-2** summarize the condition and functionality classification guidance for **dams**, **reservoirs**, and **weirs** by data confidence rating. Documentation of the condition or functionality based on a study performed in the last 10 years or from available data in the National Inventory of Dams (NID) is considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as age, institutional knowledge, ownership, and purpose can be utilized with engineering judgment to assign a classification with *low* confidence. If no information from **Table 2-1** or **Table 2-2** is available, the classification is *unknown* with a confidence rating of *none*. If information from the NID or TCEQ Dam inventory is used, include inventory number in *Notes* field of the infrastructure assessment Toolkit.

Table 2-1: Dams, Reservoirs, and Weirs Condition Classification Guidance

	DEFICIENT	NON-DEFICIENT
HIGH	• Documented as deficient in a report or study performed in the last 10 years ***OR*** • A condition rating of "Poor" or "Unsatisfactory" in the National Inventory of Dams (NID)	• Documented as non-deficient in a report or study performed in the last 10 years ***OR*** • A condition rating of "Fair" or "Satisfactory" in the National Inventory of Dams (NID) ***OR*** • Owned by a federal entity ***OR*** • Utilized for power or water supply
LOW*	• Age is greater than 50 years ***OR*** • Not owned by a federal entity (USACE or USBR) ***OR*** • Not utilized for power or water supply ***OR*** • Institutional knowledge of deficiency	• Age is less than 50 years ***AND*** • No institutional knowledge of deficiency

*Use engineering judgment to assess whether the following characteristics can inform, with a low confidence level, the condition classification.

Dam functionality is based on the ability of a dam to pass the required percentage of the probable maximum flood as defined by the TCEQ state dam safety criteria depending on the size and hazard classification of the dam. Regions could consider using publicly available tools such as the FEMA Spillway Capacity and Extreme Discharge Estimator Tool (currently under development by FEMA and in beta-

testing) to generate a rough PMF estimate and compare it to spillway capacity data contained within the NID if budget allows. Such an analysis would give an indication of the capacity but would still be considered *low* confidence given the high-level nature of the tool and should only be used if no other dam-specific hydrology information is available.

Table 2-2: Dams, Reservoirs, and Weirs Functionality Classification Guidance

	FUNCTIONAL	NON-FUNCTIONAL
HIGH	Documented as functional (passes the required % PMF based on hazard classification and size as defined by TCEQ dam safety criteria) in a report or study performed in the last 10 years	Documented as non-functional in report or study performed in past 10 years
LOW*	• Owned by a federal entity (USACE or USBR) ***OR*** • Utilized for power or water supply	• Not owned by a federal entity ***OR*** • Utilized for power or water supply

*Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the functionality classification.

2.2 LEVEES

Levees are man-made structures constructed parallel to a waterway for flood control. **Table 2-3** summarizes the condition classification guidance for **levees** by data confidence rating. Documentation of the condition or FEMA accreditation status referenced in the National Levee Database (NLD) and the National Flood Hazard Layer (NFHL) are considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as age, institutional knowledge, and engineering judgment can be used to assign a classification with *low* confidence. If none of the information summarized in **Table 2-3** is available, then the condition should be classified as *unknown* with a confidence rating of *none*.

Table 2-3: Levees Condition Classification Guidance

	DEFICIENT	NON-DEFICIENT
HIGH	Documented as deficient in a report or study performed in the last 10 years	• Documented as non-deficient in a report or study performed in the last 10 years ***OR*** • FEMA accredited based on NLD and NFHL records with accreditation date more recent than 2018 (Atlas 14 publication date)
LOW*	• Age is greater than 50 years ***OR*** • Is not FEMA accredited based on NLD and NFHL records • Institutional knowledge of deficiency	• FEMA accredited based on NLD and NFHL records with accreditation date older than 2018 (Atlas 14 publication date) ***OR*** • Age is less than 50 years ***AND*** • No institutional knowledge of deficiency

*Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the condition classification.

Table 2-4 summarizes the functionality classification guidance for levees by data confidence rating. Documentation of the functionality from a study published or FEMA accreditation status obtained since 2018 (NOAA Atlas 14 publication date) are considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as ownership, purpose, FEMA accreditation status obtained before 2018, and engineering judgment can be used to assign a classification with *low* confidence. If none of the information summarized in **Table 2-4** is available, then the functionality should be classified as unknown with a confidence rating of none.

Table 2-4: Levees Functionality Classification Guidance

	FUNCTIONAL	NON-FUNCTIONAL
HIGH	• Documented functional in a report or study performed since 2018 (NOAA Atlas 14 publication date) ***OR*** • Based on NLD and NFHL records, FEMA accreditation date is after 2018	Documented non-functional in a report or study performed since 2018 (NOAA Atlas 14 publication date)
LOW*	Based on NLD and NFHL records, FEMA accreditation date is before 2018	Based on NLD and NFHL records, the levee is not FEMA accredited

*Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the functionality classification.

2.3 ROADWAY STREAM CROSSINGS, CULVERTS, AND BRIDGES

Table 2-5 summarizes the condition classification guidance for **roadway stream crossings, culverts,** and **bridges** by data confidence rating. Documentation of the condition is considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as age, institutional knowledge, and engineering judgment can be used to assign a classification with *low* confidence. If none of the information summarized in **Table 2-5** is available, then the condition should be classified as *unknown* with a confidence rating of *none*.

Table 2-5: Roadway Stream Crossings, Culverts, and Bridges Condition Classification Guidance

	DEFICIENT	NON-DEFICIENT
HIGH	Documented as deficient in a report or study performed in the last 10 years	Documented as non-deficient in a report or study performed in the last 10 years
LOW*	• Age is greater than 50 years ***OR*** • Institutional knowledge of structural deficiency ***OR*** • There is limited O&M budget relative to the amount of infrastructure managed by the asset owner	• Age is less than 50 years ***AND*** • No institutional knowledge of deficiency

*Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the condition classification.

Table 2-6 summarizes the functionality classification guidance for roadway stream crossings, culverts, and bridges by data confidence rating. Documentation of the functionality from a study published since 2018 (NOAA Atlas 14 publication date) is considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as institutional knowledge and engineering judgment of *Task 2: Existing Flood Risk Exposure* findings can be used to assign a classification with *low* confidence. If none of the information summarized in **Table 2-6** is available, then the functionality should be classified as *unknown* with a confidence rating of *None*.

Table 2-6: Roadway Stream Crossings, Culverts, and Bridges Functionality Classification Guidance

	FUNCTIONAL	NON-FUNCTIONAL
HIGH	Documented as functional in a report or study performed since 2018 (NOAA Atlas 14 publication date)	Documented as non-functional in a report or study performed since 2018 (NOAA Atlas 14 publication date)
LOW*	• Based on *Task 2 Existing Flood Risk Exposure*, there appears to be capacity to pass the 100-year event ***OR*** • No institutional knowledge of capacity concerns	Institutional knowledge of capacity concerns

*Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the functionality classification.

*If Task 2 Analysis indicates less than 100-year capacity for the crossing, but the design level of service is unknown, the functionality should be classified as unknown with Low data confidence.

2.4 LOW WATER CROSSINGS

Low water crossings are roadway creek crossings that are subject to frequent inundation during storm events during a 50% (2-year) annual chance storm event. They are designed to allow vehicles and pedestrians to cross creek beds during periods of low water flow. **Table 2-7** summarizes the condition classification guidance for low water crossings by data confidence rating. Documentation of the condition is considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as age, institutional knowledge, and engineering judgment can be used to assign a classification with *low* confidence. If none of the information summarized in **Table 2-7** is available, then the condition should be classified as *unknown* with a confidence rating of *none*.

Table 2-7: Low Water Crossings Condition Classification Guidance

	DEFICIENT	NON-DEFICIENT
HIGH	Documented as deficient in a report or study performed in the last 10 years	Documented as non-deficient in a report or study performed in the last 10 years
LOW*	• Age is greater than 50 years ***OR*** • There is limited O&M budget relative to the amount of infrastructure managed by the asset owner ***OR*** • Institutional knowledge of deficiency	• Age is less than 50 years ***AND*** • No institutional knowledge of deficiency

*Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the condition classification.

Low Water Crossings Functionality Classification Guidance: Low water crossings are considered to have no design capacity or level of service and therefore, should be classified as *non-functional* with a data confidence rating of *low*.

2.5 STORM DRAIN SYSTEMS, INLETS, CHANNELS, TUNNELS, AND PONDS

Storm drain systems, channels, tunnels, and **ponds** are designed to manage the excess water generated during rainfall events to prevent flooding, erosion, and water pollution. **Table 2-8** and **Table 2-9** summarize the condition and functionality classification guidance for storm drain systems, channels, tunnels, and ponds by data confidence rating. Documentation of the condition is considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as age and institutional knowledge can be used to assign a classification with *low* confidence. County parcel and the National Structure Inventory (NSI) datasets include the year of building construction. If the infrastructure age is unavailable, parcel and NSI data can be used to estimate when nearby flood infrastructure may have been constructed. A comparison of the construction year to the applicable Design Criteria Manual (DCM) and NOAA Atlas 14 publication date can be used to assign a functionality classification. Classification using

these datasets and engineering judgment should be assigned a *low* confidence rating. If none of the information summarized in **Table 2-8** and **Table 2-9** is available, then the condition should be classified as *unknown* with a confidence rating of *none*.

Table 2-8: Storm Drain Systems, Inlets, Channels, Tunnels & Ponds Condition Classification Guidance

	DEFICIENT	NON-DEFICIENT
HIGH	Documented as deficient in a report or study performed in the last 10 years	Documented as non-deficient in a report or study performed in the last 10 years
LOW*	• Age is greater than 50 years ***OR*** • There is limited O&M budget relative to the amount of infrastructure managed by the asset owner ***OR*** • Institutional knowledge of deficiency	• Age is less than 50 years ***AND*** • No institutional knowledge of deficiency

*Note: Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the condition classification.

Table 2-9: Storm Drain Systems, Inlets, Channels, Tunnels & Ponds Functionality Classification Guidance

	FUNCTIONAL	NON-FUNCTIONAL
HIGH	Documented as functional in a report or study performed since 2018 (NOAA Atlas 14 publication date)	Documented as non-functional in a report or study performed since 2018 (NOAA Atlas 14 publication date)
LOW*	• Construction year (known or estimated) was after the applicable DCM or Atlas 14 adoption date ***AND*** • No institutional knowledge of capacity concerns	• Institutional knowledge of capacity concerns ***OR*** • Construction year (known or estimated) was before the applicable DCM or Atlas 14 adoption date

*Note: Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the functionality classification.

2.6 REVETMENTS AND COASTAL CONSTRUCTED (SEA BARRIERS, SEA WALLS, AND TIDAL GATES)

Revetments and **coastal constructed** components of flood protection infrastructure in Texas are strategically incorporated along riverbanks and coastal areas prone to flooding. They are designed to reduce flood risk by preventing erosion and stabilizing the water's edge.

Table 2-10 and **Table 2-11** summarize the condition and functionality classification guidance for revetments and coastal constructed flood infrastructure by data confidence rating. Documentation of the condition and functionality is considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as age and institutional knowledge can be used to assign a classification with *low*

confidence. If none of the information summarized in **Table 2-10** and **Table 2-11** is available, then the classification is *unknown* with a confidence rating of *none*.

Table 2-10: Revetments and Coastal Constructed Condition Classification Guidance

	DEFICIENT	NON-DEFICIENT
HIGH	Documented as deficient in a report or study performed in the last 10 years	Documented as non-deficient in a report or study performed in the last 10 years
LOW*	• Age is greater than 50 years ***OR*** • Institutional knowledge of structural deficiency ***OR*** • There is limited O&M budget relative to the amount of infrastructure managed by the asset owner	• Age is less than 50 years ***AND*** • No institutional knowledge of deficiency

*Note: Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the condition classification.

Table 2-11: Revetments and Coastal Constructed Functionality Classification Guidance

	FUNCTIONAL	NON-FUNCTIONAL
HIGH	Documented as functional in a report or study performed since 2018 (NOAA Atlas 14 publication date)	Documented as not functional in a report or study performed since 2018 (NOAA Atlas 14 publication date)
LOW*	• Construction year (known or estimated) was after the applicable DCM or Atlas 14 adoption date ***AND*** • No institutional knowledge of capacity concerns	• Institutional knowledge of capacity concerns ***OR*** • Construction year (known or estimated) was before the applicable DCM or Atlas 14 adoption date or sea level considerations

*Note: Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the functionality classification.

3 NATURAL FLOOD INFRASTRUCTURE GUIDANCE

Natural flood infrastructure features do not have a designed level of service, so, no guidance is provided to classify the functionality. These fields should be reported as *unknown* and description as "n/a". Assessing the condition of the natural asset relies heavily on institutional knowledge of deficiencies and engineering judgment based on the classification methodology and criteria provided. Guidance for determining deficiencies and the data confidence rating related to the condition of the natural flood infrastructure was developed as described further in the sections below.

3.1 RIVERS AND TRIBUTARIES

Rivers are naturally occurring waterways that convey rainfall runoff from a definable area to the ocean. **Tributaries** are rivers or streams that flow into a larger river or lake. **Table 3-1** summarizes the condition classification guidance for rivers and tributaries by data confidence rating. Documentation of condition is considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as institutional knowledge, location (urban or rural), bank slope, and engineering judgment can be used to assign a classification with *low* confidence. If none of the information summarized in **Table 3-1** is available, then the condition should be classified as *unknown* with a confidence rating of *none*. River and tributary reaches can be considered urban if the reach is within a city-limit jurisdictional boundary or rural otherwise. The visual indicators for condition (bank erosion or undercutting, felled trees, exposed tree roots) naturally occur in a river or tributary, reestablishing geomorphological equilibrium. Therefore, if these indicators are observed along a rural reach, it should be classified as *non-deficient*.

Table 3-1: Rivers and Tributaries Condition Classification Guidance

	DEFICIENT	NON-DEFICIENT
HIGH	Documented as deficient in a report or study performed in the last 10 years	Documented as non-deficient in a report or study performed in the last 10 years
LOW*	• Urban reaches only: Institutional knowledge of severe bank erosion, including trees falling into the waterway due to bank undercutting, exposed tree roots, or other visible deficiencies ***OR*** • A reach with unstable slopes (steeper than 2:1)	• Any reach located in a rural area ***OR*** • An urban reach with no institutional knowledge of deficiency ***OR*** • An urban reach with stable slopes (flatter than 2:1)

*Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the condition classification.

3.2 WETLANDS AND ESTUARIES

Wetlands and **estuaries** are natural systems found near lakes, rivers, and oceans that are often inundated by water, either permanently or seasonally during rainy seasons.

Table 3-2 summarizes the condition classification guidance for wetlands and estuaries by data confidence rating. Documentation of condition is considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as institutional knowledge, presence of vegetation, trails or pathways, change in the area of time, and engineering judgment can be used to assign a classification with *low* confidence. NOAA Wetland Impact and Migration data, historical aerial imagery and LIDAR data to determine the wetland/estuary area is changing over time. If none of the information summarized in **Table 3-2** is available, then the condition should be classified as *unknown* with a confidence rating of *none*.

Table 3-1: Wetlands and Estuaries Condition Classification Guidance

	DEFICIENT	NON-DEFICIENT
HIGH	Documented as deficient in a report or study performed in the last 10 years	Documented as non-deficient in a report or study performed in the last 10 years
LOW*	• Institutional knowledge ***OR*** • Evidence of lack of vegetation, vegetation loss, modification or damage caused by humans or livestock, flow obstruction, or other deficiencies ***OR*** • Evidence of recession based on NOAA Wetland Impact and Migration or historical aerial imagery review	• Institutional knowledge ***OR*** • No evidence of lack of vegetation, vegetation loss, modification or damage caused by humans or livestock, flow obstruction, or other deficiencies ***OR*** • No evidence of recession based on NOAA Wetland Impact and Migration or historical aerial imagery review

*Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the condition classification.

3.3 PLAYAS

Playas are naturally occurring shallow, clay-lined depressions in otherwise flat landscapes that temporarily store rainwater before it is evaporated or drained into the groundwater aquifer**.**

Table 3-3 summarizes the condition classification guidance for playas by data confidence rating. Documentation of condition is considered *high* confidence and should be utilized if available. Otherwise, proxy indicators such as institutional knowledge, presence of sediment accumulation, presence of drainage ditches or pipes, health rating from the Playa Lakes Joint Venture dataset, and engineering judgment can be used to assign a classification with *low* confidence. If none of the information

summarized in **Table 3-3** is available, then the condition should be classified as *unknown* with a confidence rating of *none*.

Table 3-2: **Playas Condition Classification Guidance**

	DEFICIENT	NON-DEFICIENT
HIGH	Documented as deficient in a report or study performed in the last 10 years	Documented as non-deficient in a report or study performed in the last 10 years
LOW*	• Institutional knowledge of deficiency ***OR*** • Presence of sediment accumulation, sediment plumes, drainage ditches or pipes, or other deficiencies ***OR*** • Considered not healthy in the Playa Lakes Joint Venture dataset	• No institutional knowledge of deficiency ***OR*** • No evidence of sediment accumulation, sediment plumes, drainage ditches or pipes, or other deficiencies ***OR*** • Considered healthy in the Playa Lakes Joint Venture dataset

*Use engineering judgment to assess whether the characteristics can inform, with a low confidence level, the condition classification.

3.4 DUNES

Dunes are naturally occurring mounds of sand and vegetation along the coastline absorb the impact of storm surges and prevent beach erosion. **Table 3-4** summarizes the condition classification guidance for wetlands and estuaries by data confidence rating. Documentation of condition is considered high confidence and should be utilized if available. Otherwise, proxy indicators such as institutional knowledge, presence of vegetation, trails or pathways across the dune, washover channels, and engineering judgment can be used to assign a classification with *low* confidence. If none of the information summarized in **Table 3-4** is available, then the condition should be classified as *unknown* with a confidence rating of *none*.

Table 3-3: Dunes Condition Classification Guidance

	DEFICIENT	NON-DEFICIENT
HIGH	Documented as deficient in a report or study performed in the last 10 years	Documented as non-deficient in a report or study performed in the last 10 years
LOW*	• Institutional knowledge ***OR*** • Lack of vegetation, vegetation loss over time, presence of trails or pathways across the dune, presence of washover channels, or other deficiencies	• Institutional knowledge ***OR*** • Presence of vegetation, no vegetation loss over time, no trails or pathways across the dune, no washover channels

*Use engineering judgment to assess whether the following characteristics can inform, with a low confidence level, the condition classification.

4 ADDITIONAL RESOURCES

Publicly available resources are outlined below, grouped together by asset classification type.

4.1 DAMS, RESERVOIRS, AND WEIRS

- United States Army Corps of Engineers (USACE): National Inventory of Dams (NID)
- Texas Commission of Environmental Quality (TCEQ): Dam Safety Program
- TCEQ: Guidelines for Operation and Maintenance of Dams in Texas
- Texas State Soil & Water Conservation Board (TSSWCB): 10-Year Flood Plan

4.2 LEVEES

- United States Army Corps of Engineers (USACE): National Levee Database
- United States Army Corps of Engineers (USACE): National Levee Safety Program
- United States Army Corps of Engineers (USACE): Levee Safety Action Classification (LSC)
- United States Army Corps of Engineers (USACE): Levee Safety Program
- United States Army Corps of Engineers (USACE): Risk Management Center

4.3 LOW WATER CROSSINGS, ROADWAY STREAM CROSSINGS, AND BRIDGES

- Texas Department of Transportation (TxDOT), Safety Improvements at Low Water Crossings
- Texas Geographic Information Office (TxGIO): Low Water Crossings
- United States Geological Survey (USGS): USGS WaterWatch -- Streamflow conditions
- Texas Department of Transportation (TxDOT): Hydraulic Design Manual
- Federal Highway Administration (FHWA): Bridge Inspector's Manual
- Texas Natural Resources Information System (TNRIS): TxGIO DataHub (tnris.org)

4.4 STORM DRAIN SYSTEMS, INLETS, CHANNELS, TUNNELS, AND PONDS

- Texas Department of Transportation TxDOT: Storm Drain Manual & Hydraulic Design Manual
- Federal Highway Administration (FHWA): Culvert and Storm Drain System Inspection Manual
- National Association of Sewer Service Companies (NASSCO): Certification Program
- FHWA: Tunnel Operations, Maintenance, Inspection, and Evaluation (TOMIE) Manual (dot.gov)
- U.S. Environmental Protection Agency (USEPA): Pond & Wetland Mgmt Guidebook
- USEPA: Stormwater Best Management Practice – Dry Detention Ponds

4.5 REVETMENTS AND COASTAL CONSTRUCTED (SEA BARRIERS, SEA WALLS, AND TIDAL GATES)

- Protection, Inspection, and Maintenance of Marine Structures by Pile Buck, Inc., 1990
- Association of State Dam Safety Officials (ASDSO): Dam Safety Inspection Checklist

4.6 RIVERS AND TRIBUTARIES

- Statewide floodplain quilt data: Texas Floodplain Quilt
- Bank Erosion Hazard Index (BEHI) Assessment Methodology: BEHI Methodology
- U.S Dept of Agriculture Forest Service: General Tech Report RM-245 Stream Channel Ref Sites
- State of Indiana Multi-Hazard Mitigation Plan: Fluvial Erosion Hazard Mitigation Manual
- TNRIS: TNRIS DataHub

4.7 WETLANDS AND ESTUARIES

- U.S. EPA: National Wetland Condition Assessment
- U.S. Fish & Wildlife Service: National Wetlands Inventory (usgs.gov)

4.8 PLAYA

- Playa Lakes Joint Venture: Playa Maps and Tools | Playa Lakes Joint Venture (pljv.org)
- Texas Playa Conservation Initiative: Restoring & Maintaining Healthy Playas
- TWDB: Playa Lakes | Texas Water Development Board

4.9 DUNE

- Texas General Land Office (GLO): Dune Protection and Improvement Manual
- Texas A&M Coastal Erosion Planning & Response Act (CEPRA) Program: CEPRA

4.10 GENERAL RESOURCES

- Interactive State Flood Plan Viewer: Texas Flood (texasstatefloodplan.org)
- TWDB 2024 State Flood Plan: State Flood Planning | Texas Water Development Board
- TWDB 2023 Amended Regional Flood Plans: Amended Regional Flood Plans
- Find your RWPG: Regional Water Planning Groups | Texas Water Development Board
- State-Wide RFPG Map: State-Wide RFPG Map
- RWPG Map: Regional Water Planning Group Locator (arcgis.com)
- GIS Data Resources: GIS Data HUB
- Environmental Protection Agency (EPA): U.S. Environmental Protection Agency | US EPA

- National Highway Traffic Safety Admin (NHSTA): National Highway Traffic Safety Administration
- National Park Service (NPS): NPS.gov Homepage (U.S. National Park Service)
- National Resource Conservation Service (NRCS): Natural Resources Conservation Service
- Texas Floodplain Mgmt Association: TFMA Regions Map
- Texas General Land Office (GLO): Home | Texas Geographic Information Office
- U.S. Fish and Wildlife (USFWS): U.S. Fish and Wildlife Service (fws.gov)
- USGS Stream Stats: StreamStats (usgs.gov) | USGS WaterWatch -- Streamflow conditions

5 REFERENCES

1. TWDB 2024 State Flood Plan: State Flood Planning | Texas Water Development Board
2. United States Army Corps of Engineers (USACE): National Inventory of Dams (NID)
3. United States Army Corps of Engineers (USACE): National Levee Database
4. Texas Department of Transportation (TxDOT): Safety Improvements at Low Water Crossings
5. Association of State Floodplain Managers (ASFPM): Association of State Floodplain Managers

6 DEFINITIONS

Dams are man-made structures constructed across a waterway to impound water for flood control, water supply, power generation, or recreation.

Dunes are naturally occurring mounds of sand and vegetation along the coastline absorb the impact of storm surges and prevent beach erosion.

Levees are man-made structures constructed parallel to a waterway for flood control.

Low water crossings are roadway creek crossings that are subject to frequent inundation during storm events during a 50 percent (2-year) annual chance storm event. They are designed to allow vehicles and pedestrians to cross creek beds during periods of low water flow.

Playas are naturally occurring shallow, clay-lined depressions in otherwise flat landscape that temporarily store rainwater before it is evaporated or drained into the groundwater aquifer**.**

Revetments and **coastal constructed** components of flood protection infrastructure in Texas are strategically incorporated along riverbanks and coastal areas prone to flooding. They are designed to reduce flood risk by preventing erosion and stabilizing the water's edge.

Rivers are naturally occurring waterways that convey rainfall runoff from a definable area to the ocean. **Tributaries** are rivers or streams that flow into a larger river or lake.

Reservoirs are man-made lakes often created by installing dams across rivers or tributaries to capture and store water for a variety of purposes, including water supply.

Weirs are low-lying barriers built across waterways that gauge the volume of water flowing through a canal and can serve as flood management infrastructure by capturing water upstream and slowing its downstream flow during times of peak discharge.

Wetlands and **estuaries** are natural systems found near lakes, rivers, and oceans that are often inundated by water, either permanently or seasonally during rainy seasons.

APPENDIX B

TOOLKIT USER GUIDE

TEXAS WATER DEVELOPMENT BOARD

USER GUIDE

Flood Infrastructure Assessment Toolkit

MARCH 2025

TEXAS WATER DEVELOPMENT BOARD

Contents

1 TOOLKIT OVERVIEW

The Flood Infrastructure Assessment Toolkit (Toolkit) is a spreadsheet-based tool that provides a solution to assess and classify flood infrastructure in communities lacking a GIS-based inventory. Once populated, the Toolkit can be used by Regional Flood Planning Group (RFPG) Consultants and incorporated into the regional flood planning process. This document summarizes a step-by-step process for using the Toolkit, including the methodology for classification and prioritization of inventory by flood asset type, the Toolkit functionality, and additional data resources. The primary functions of the Toolkit are to:

- Further develop the Texas flood infrastructure inventory
- Classify the flood infrastructure functionality (capacity) and condition
- Provide guidance for the assessment of flood infrastructure classification

The Toolkit allows users to create a detailed inventory of individual assets and an aggregated summary by infrastructure type. This will allow communities to submit an inventory based on available data and improve overtime as more data is collected. The Toolkit uses simplified logic based on user-provided information to automatically assign classification. RFPG Consultants will utilize information provided by communities and leverage the more comprehensive classification guidance to make a final determination regarding infrastructure classification. Within the Toolkit flood infrastructure is classified by:

CONDITION

- Deficient: The infrastructure or natural feature is in **poor** structural or non-structural condition and needs replacement, restoration or rehabilitation.
- Non-Deficient: The infrastructure or natural feature is in **good** structural or non-structural condition and does not require replacement, restoration, or rehabilitation.
- Unknown: The condition or deficiency of infrastructure or natural feature is unknown.

FUNCTIONALITY

- Functional: The infrastructure **is** serving its intended design level of service.
- Non-Functional: The infrastructure **does not** provide its intended design level of service.
- Unknown**:** The functionality or capacity for infrastructure is unknown.

**Note: Level of Service will vary depending on local criteria and flood infrastructure type.*

CONFIDENCE

- High: Data used for classification came from the entity through findings of a study or analysis
- Low: Data used for classification is based on asset attributes and assumptions
- None**:** No data is available to determine data confidence classification

The approach utilizes empirical and approximate data sources, in addition to institutional knowledge, as the basis for the classification guidance. As part of the methodology, a three-tiered data confidence rating system (*high* confidence, *low* confidence, or *none*) was developed. This allows the data confidence level of each condition and capacity designation to be documented based on the data source utilized.

2 TOOLKIT USER GUIDE

This section provides an overview of the data required for the statewide flood asset inventory, including relevant asset inventory categories, a prioritization methodology, data collection considerations, an overview of the spreadsheet tabs, and guidance on entering an asset record into the detailed data entry form.

2.1 DATA COLLECTION AND PRIORITIZATION

The first step in developing a flood infrastructure inventory is to identify data sources that provide information such as installation date, constructed material, and dimensions of individual infrastructure assets. Potential data sources include hard-copy maps, engineering reports, design drawings, and staff institutional knowledge. An interactive web map of the flood infrastructure collected as part of the previous cycle of the state flood plan can be found on the TWDB website *Texas Flood (texasstatefloodplan.org).* A flood infrastructure assessment prioritization ranking was developed to assist in focusing these activities, as shown in **Table 2-1**. The prioritization may vary based on the infrastructure most impactful to each community.

Table 2-1: Flood Inventory Prioritization

Priority Group A	Priority Group B	Priority Group C
• Dam • Levee • River • Sea Wall • Sea Barrier • Low Water Crossing • Roadway Stream Crossing • Coastal-Constructed	• Storm Drain System • Stormwater Channel • Weir • Reservoir • Revetment • Tributary • Pond	• Tidal Barrier • Tidal Gate • Wetland • Dune • Sinkhole • Other-Natural • Other-Constructed • Coastal-Natural

*Note: Collect inventory for Bridge along with Priority Group A. Culvert, Inlet, Gauge, and Stormwater Tunnel is included with Storm Drain System in Priority Group B. Estuary, Fan, Playa, Park, Beach, and Nature Preserve or Reserve inventory is to be prioritized along with Group C.

Each type of flood infrastructure was assigned a priority group based on the potential risk to a community, with assets of similar consequence of failure grouped together. Assets within Priority Group A have the highest consequence of failure and should be prioritized for assessment, followed by Priority Group B and then Priority Group C. Flood asset inventory should be progressively developed based on the priority group and in the order

listed. If the community does not own or is not responsible for a type of flood infrastructure, then it does not have to be included in the inventory. This will reduce duplication of records and increase the data quality statewide.

2.2 FLOOD INFRASTRUCTURE SPREADSHEET

STEP 1: RENAME THE TOOLKIT FILE AND ENABLE MACROS

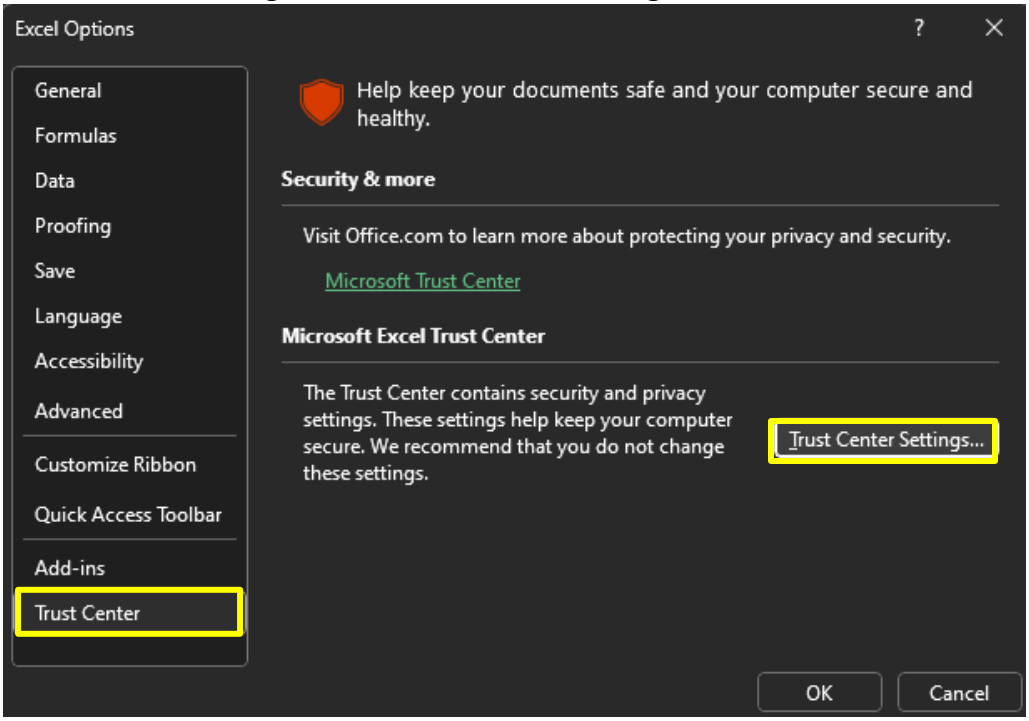
Open the provided *TXFloodInfrastructureAssessmentToolkit.xlsm* spreadsheet and save a copy of the file. Rename the new file by adding the current year and community name to the end of the file name. For example, the City of Alvin would name the new flood asset inventory file *TXFloodInfrastructureToolkit_2024_Alvin.xlsm*. If available, save the file to a regularly backed-up computer or use a cloud storage service to reduce the risk of losing the inventory data.

The Toolkit utilizes macros to automate certain inventory functions. If macros are not enabled in Excel, the security warning message shown in **Figure 2-1** will appear when the file is opened. If the security warning message does appear, click **Enable Content**, as shown in **Figure 2-1**.

Figure 2-1: Excel Macro Warning Message

If the security warning does not show, open the **Options** in Excel, select **Trust Center** at the bottom of the list on the left of the menu, then click **Trust Center Settings**, as outlined in yellow in **Figure 2-2**.

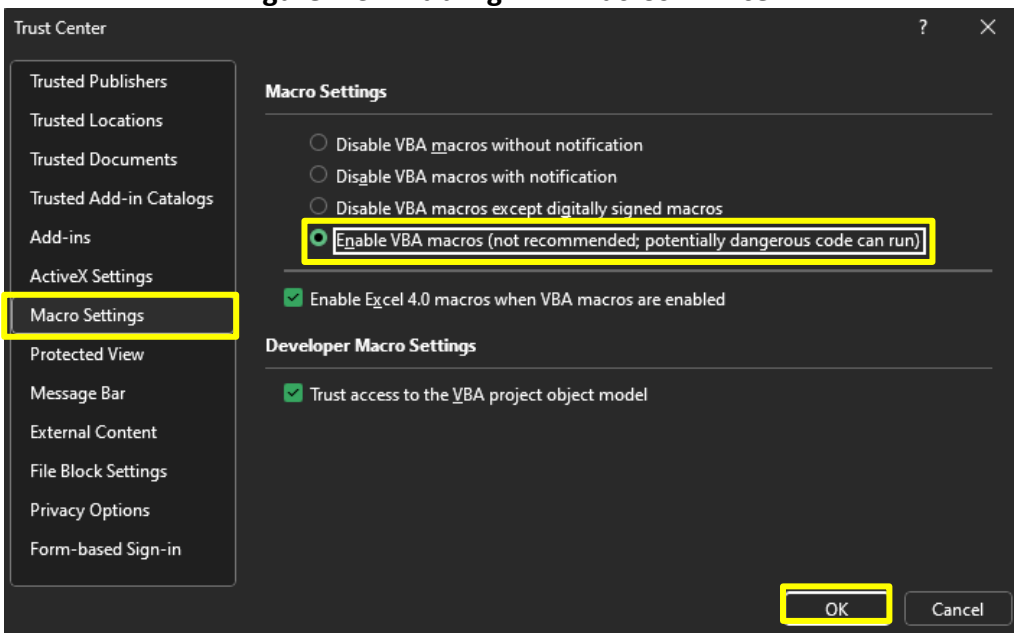
Figure 2-2: Trust Center Settings in Excel



In the **Trust Center** pop-up menu, navigate to the list on the left and select **Macro Settings**. Then, choose the **Enable VBA Macros** option below Macro Settings, as outlined in yellow in **Figure 2-3**. Click **OK** at the bottom of the menu to save the setting and return to the Toolkit.

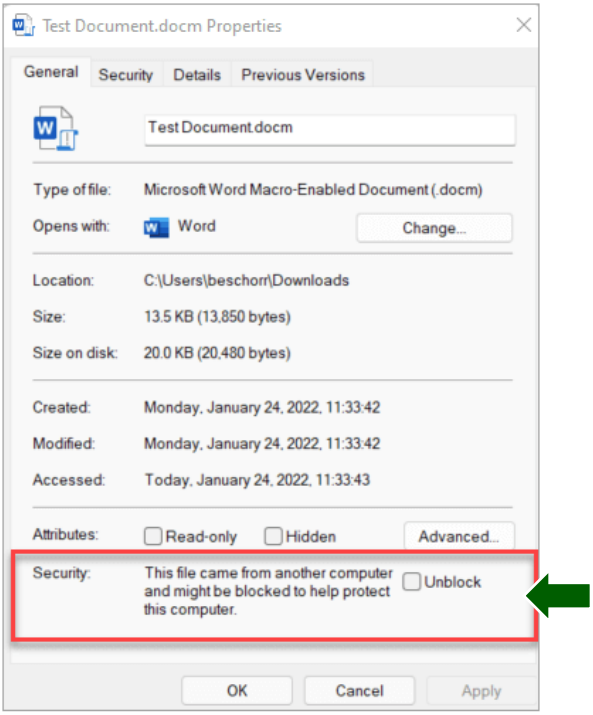
Note: After enabling macros in the **Trust Center**, save and close the file and reopen to apply the new settings.

Figure 2-3: Enabling VBA Macros in Excel



To enable macros for a single file – navigate to the file in Windows File Explorer, right-click on the file and select **Properties**. At the bottom of the General tab, select the **Unblock** checkbox and click **OK**, as shown in **Figure 2-4**.

Figure 2-4: Enabling Macros for Single File[6]



STEP 2: REVIEW TOOLKIT LAYOUT

The Toolkit is organized into four worksheets within a single Excel file, as summarized in **Table 2-2**:

Table 2-2: Overview of Spreadsheet Tabs

Worksheet No.	Worksheet Name	Description
1	Instructions	Provides instructions for using the Toolkit, including the worksheet cell color coding system.
2	Detailed Inventory Entry	The primary worksheet used to enter and maintain a detailed flood infrastructure inventory if asset information is available.
3	Aggregated Inventory	An alternative worksheet used to enter and maintain a flood infrastructure summary if asset information is unavailable.
4	REFERENCES	Provides additional resources and reference links.

[6] Microsoft Macro Support: A potentially dangerous macro has been blocked - Microsoft Support

If flood infrastructure data exists to populate an inventory for individual features , the *Detailed Inventory Entry* worksheet can be used to create a flood infrastructure inventory. Otherwise, the *Aggregated Inventory* sheet can be used to create a flood infrastructure summary. As additional infrastructure information is collected, the asset should be entered into the detailed inventory and removed from the aggregated table. The following steps provide additional guidance for each worksheet.

STEP 3: REVIEW INSTRUCTIONS

The first worksheet tab is *Instructions*, as shown in **Figure 2-5: Spreadsheet Toolkit Instructions Tab.** This provides general instructions for using the Toolkit and the cell color coding system utilized in the *Detailed Inventory Entry* worksheet.

Figure 2-5: Spreadsheet Toolkit Instructions Tab

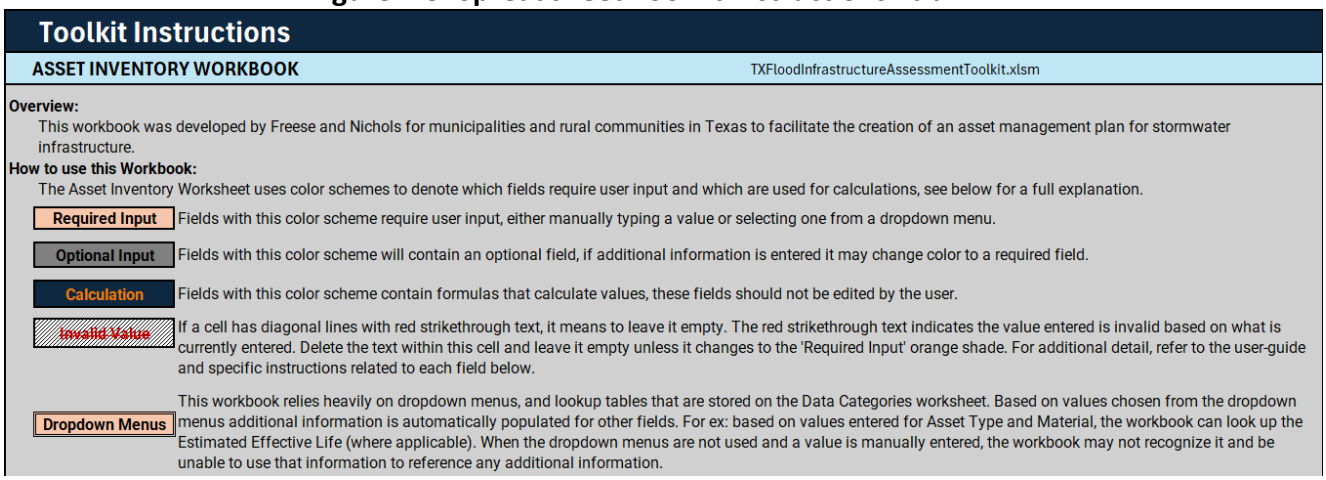


Table 2-3 summarizes the cell color coding system used to denote required, optional, calculated, invalid, and dropdown menus:

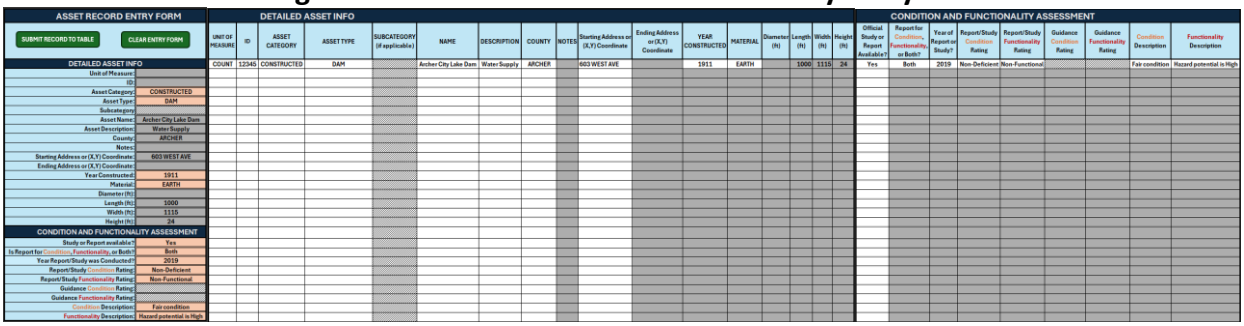
Table 2-3: Cell Color Coding System Summary

Worksheet Name	Description
Required Input	Requires input – either manually typing a value or selecting from a dropdown menu.
Optional Input	Optional input – typically manual entry. If additional information is entered, this may change color to a required field
Calculation	Calculated value – do not edit fields that are dark blue with bold orange text.
Invalid Value	Invalid value – if a cell has diagonal lines, it means the entry is invalid. Delete the contents from the cell and leave it blank.

STEP 4: OVERVIEW OF DETAILED ASSET ENTRY WORKSHEET

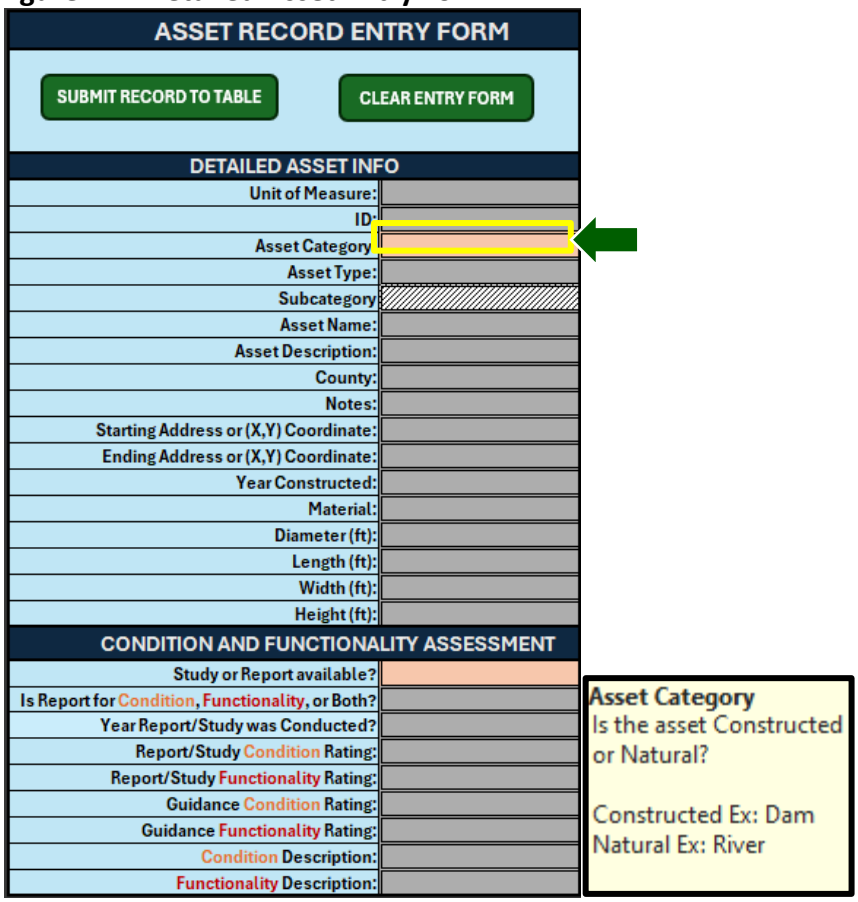
An overview of the *Detailed Inventory Entry* tab is illustrated below in **Figure 2-6**.

Figure 2-6: Overview of Detailed Inventory Entry Tab



The detailed asset entry from the left side of **Figure 2-6** is shown in greater detail on **Figure 2-7.** Enter data working from the top of the form to the bottom. As you click on each cell, a reference pop-up note will appear on the screen with additional guidance, as shown on **Figure 2-7**. Click on the orange drop-down box next to Asset Category to view the asset entry guidance note and select *Natural* or *Constructed*.

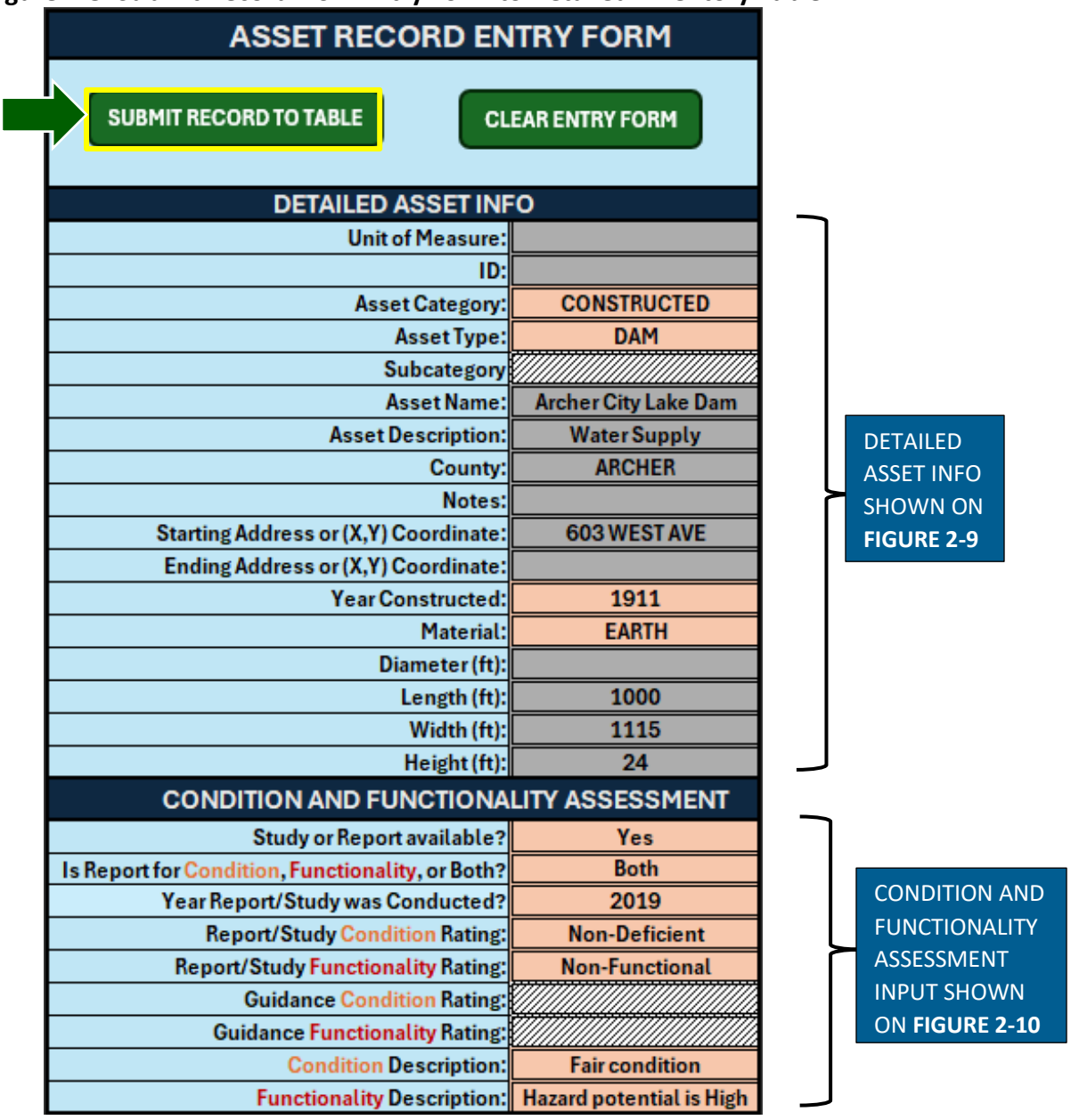
Figure 2-7: Detailed Asset Entry Form



STEP 5: SUBMIT DETAILED ENTRY TO DETAILED ASSET TABLE

Continue working through the asset record entry form, entering data from the top to bottom. After all flood asset details have been captured, click **SUBMIT RECORD TO TABLE** button as shown in **Figure 2-8**:

Figure 2-8: Submit Record from Entry Form to Detailed Inventory Table



The data from above is now in the detailed inventory table shown in **Figure 2-9** and aggregated in the PivotTable illustrated on **Figure 2-13** (click **refresh** button). Data can be adjusted after submitting the detailed asset entry to the table shown in **Figure 2-9** and **Figure 2-10** by selecting drop-down menus or revising text.

Figure 2-9: Detailed Asset Info Table

DETAILED ASSET INFO																
UNIT OF MEASURE	ID	ASSET CATEGORY	ASSET TYPE	SUBCATEGORY (if applicable)	NAME	DESCRIPTION	COUNTY	NOTES	Starting Address or (X,Y) Coordinate	Ending Address or (X,Y) Coordinate	YEAR CONSTRUCTED	MATERIAL	Diameter (ft)	Length (ft)	Width (ft)	Height (ft)
COUNT	12345	CONSTRUCTED	DAM		Archer City Lake Dam	Water Supply	ARCHER		603 WEST AVE		1911	EARTH		1000	1115	24

Values entered from the Detailed Asset Entry Form related to the asset characteristics are reflected on **Figure 2-9**. Data related to condition and functionality assessment of the asset are shown in **Figure 2-10**. The condition, functionality, and confidence ratings are determined based on the entered flood asset information. To refresh the aggregated PivotTable, navigate to the next tab (*Aggregated Inventory*) and click the **Refresh Table** button.

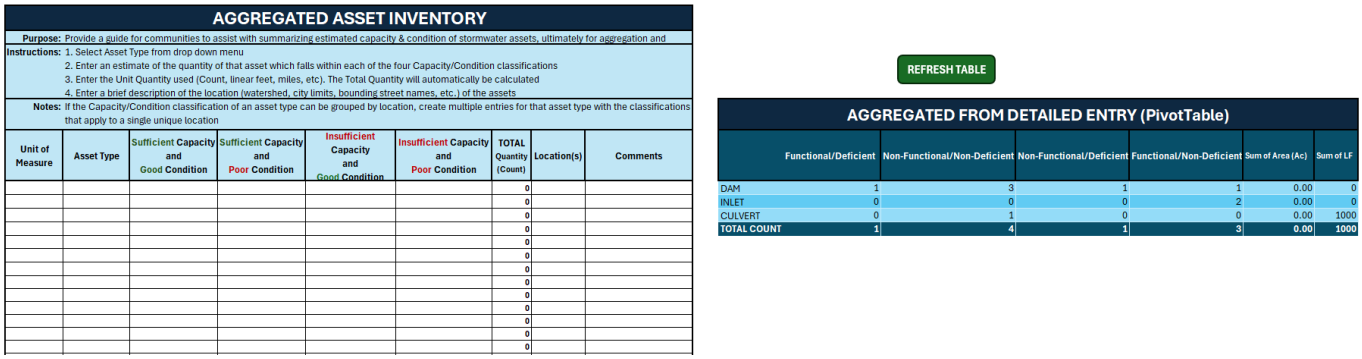
Figure 2-10: Asset Condition and Functionality Assessment Table

CONDITION AND FUNCTIONALITY ASSESSMENT								
Official Study or Report Available?	Report for Condition, Functionality, or Both?	Year of Report or Study?	Report/Study Condition Rating	Report/Study Functionality Rating	Guidance Condition Rating	Guidance Functionality Rating	Condition Description	Functionality Description
Yes	Both	2019	Non-Deficient	Non-Functional			Fair condition	Hazard potential is High

STEP 6 : OVERVIEW OF AGGREGATED INVENTORY WORKSHEET

An overview of the *Aggregated Inventory* tab is illustrated below in **Figure 2-11**, which includes two tables. Communities can manually summarize the flood infrastructure inventory in the *Aggregated Asset Inventory* table. Alternatively, if a detailed inventory was created in the previous worksheet, the *Aggregated from Detailed Entry Tabl*e can be used to automatically generate a summary, click the **Refresh Table** button to add records from the detailed entry into the PivotTable.

Figure 2-11: Aggregated Asset Entry Tab



AGGREGATED ASSET INVENTORY

Purpose: Provide a guide for communities to assist with summarizing estimated capacity & condition of stormwater assets, ultimately for aggregation and

Instructions: 1. Select Asset Type from drop down menu
2. Enter an estimate of the quantity of that asset which falls within each of the four Capacity/Condition classifications
3. Enter the Unit Quantity used (Count, linear feet, miles, etc). The Total Quantity will automatically be calculated
4. Enter a brief description of the location (watershed, city limits, bounding street names, etc.) of the assets

Notes: If the Capacity/Condition classification of an asset type can be grouped by location, create multiple entries for that asset type with the classifications that apply to a single unique location

Unit of Measure	Asset Type	Sufficient Capacity and Good Condition	Sufficient Capacity and Poor Condition	Insufficient Capacity and Good Condition	Insufficient Capacity and Poor Condition	TOTAL Quantity (Count)	Location(s)	Comments
						0		
						0		
						0		
						0		
						0		
						0		
						0		
						0		
						0		
						0		
						0		
						0		

REFRESH TABLE

AGGREGATED FROM DETAILED ENTRY (PivotTable)

Functional/Deficient	Non-Functional/Non-Deficient	Non-Functional/Deficient	Functional/Non-Deficient	Sum of Area (Ac)	Sum of LF
DAM	1	3	1	1	0.00	0
INLET	0	0	0	2	0.00	0
CULVERT	0	1	0	0	0.00	1000
TOTAL COUNT	1	4	1	3	0.00	1000

In lieu of utilizing the detailed asset inventory sheet, the user can classify flood inventory by asset type through institutional knowledge if the asset type and quantity is known. The classification of the condition and capacity is estimated based on guidance provided in Appendix A, specific to the asset type. The user has the option to enter all detailed asset information, as mentioned in previous steps and allow the spreadsheet to aggregate the count into a PivotTable (shown on right side of **Figure 2-11**), or can enter data manually on the *Aggregated Inventory* tab, as illustrated below in **Figure 2-12.**

Figure 2-12: Aggregated Asset Entry Form

AGGREGATED ASSET INVENTORY

Purpose: Provide a guide for communities to assist with summarizing estimated capacity & condition of stormwater assets, ultimately for aggregation and submission to the Regional Flood Planning Team.

Instructions: 1. Select Asset Type from drop down menu
2. Enter an estimate of the quantity of that asset which falls within each of the four Capacity/Condition classifications
3. Enter the Unit Quantity used (Count, linear feet, miles, etc). The Total Quantity will automatically be calculated
4. Enter a brief description of the location (watershed, city limits, bounding street names, etc.) of the assets

Notes: If the Capacity/Condition classification of an asset type can be grouped by location, create multiple entries for that asset type with the classifications that apply to a single unique location

Unit of Measure	Asset Type	Sufficient Capacity and Good Condition	Sufficient Capacity and Poor Condition	Insufficient Capacity and Good Condition	Insufficient Capacity and Poor Condition	TOTAL Quantity (Count)	Location(s)	Comments
Count	DAM	3	2	4	1	10		
Count	LEVEE	1	4	2	1	8		
						0		
						0		
						0		

If there is specific information related to the asset, the preferred methodology is to utilize the detailed asset inventory entry. Otherwise, use the aggregated inventory entry table as a starting point to document the flood infrastructure. As additional information is acquired, the asset should be documented in the detailed entry table and removed from the aggregated entry table (to accurately assess flood infrastructure quantities without duplication). After the asset is entered into the detailed inventory sheet, refresh the PivotTable and the new entry will be included in the Aggregated Inventory PivotTable as shown on **Figure 2-13**.

Note: It is important to remove data from the aggregated inventory shown on **Figure 2-12** if it is entered into the detailed inventory, as the PivotTable automatically aggregates assets from the detailed inventory sheet.

Figure 2-13: Aggregated PivotTable from Detailed Inventory

REFRESH TABLE

AGGREGATED FROM DETAILED ENTRY (PivotTable)						
	Functional/Deficient	Non-Functional/Non-Deficient	Non-Functional/Deficient	Functional/Non-Deficient	Sum of Area (Ac)	Sum of LF
DAM	1	3	1	1	0.00	0
INLET	0	0	0	2	0.00	0
CULVERT	0	1	0	0	0.00	1000
TOTAL COUNT	1	4	1	3	0.00	1000

STEP 7: REVIEW REFERENCES TAB

Review additional resources and links available in the *REFERENCES* tab for more information and guidance.

Figure 2-14: References & Data Sources Tab

References & Data Sources		
A	Dam	National Inventory of Dams (NID)
	Levee	National Levee Database (army.mil)
	River	TPWD:Texas River Guide: River Authority Webpages
	Sea Wall	TCRMP Technical Report (texas.gov)
	Sea Barrier	2023-tcrmp-overview.pdf (texas.gov)
	Low Water Crossing	Low Water Crossings
	Roadway Stream Crossing	USGS WaterWatch -- Streamflow conditions
B	Storm Drain System	http://onlinemanuals.txdot.gov/txdotmanuals/hyd/index.htm
	Stormwater Channel	Culvert and Storm Drain System Inspection Manual
	Weir	Science & Tools Library | Texas Flood
	Reservoir	Hydraulic Design Manual: Reservoirs (txdot.gov)
	Revetment	Pile Buck
	Tributary	Flood Hazard Quilt | Hub: GIS Resources, Flooding Planning, Texas (arcgis.com)
	Pond	Stormwater Wet Pond and Wetland Management Guidebook, February 2009 (epa.gov)
C	Tidal Barrier	Executive Summary (txdot.gov)
	Tidal Gate	Coastal Texas Project
	Wetland	National Wetland Condition Assessment
	Dune	Dune Protection and Improvement Manual
	Sinkhole	Coastal Habitat Restoration GIS
	Other-Natural	Playa Lakes | Texas Water Development Board
	Other-Constructed	Hydraulic Design Manual