

Technical Memorandum No. 2

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DATE: March 6, 2022
~~January 31~~ February 17,
 2022 draft

THROUGH: Lauren Graber
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PROJECT: LCRA Contract No. 5809
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SUBJECT: **Lower Colorado-Lavaca Regional Flood Plan (Region 10)
 Task 4C – Technical Memorandum No. 2 (Addendum)**

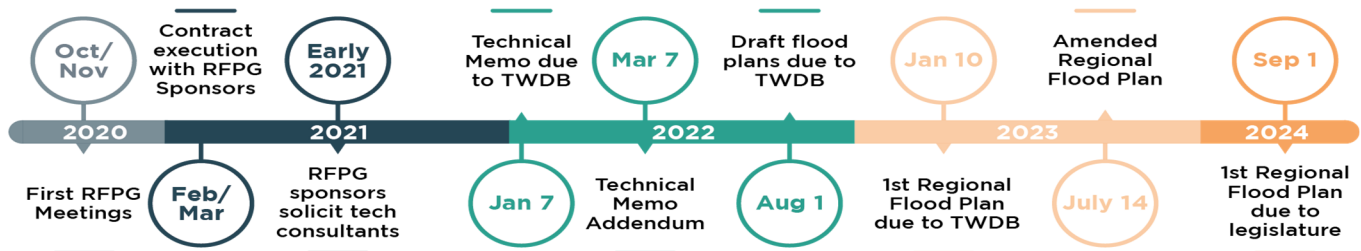
[Technical Memorandum No. 2 is being submitted to TWDB in accordance with Section 1 Article 1 of the project contract. Per TWDB requirements the contents of this Technical Memorandum were approved for submittal to TWDB by the Lower Colorado-Lavaca Regional Flood Planning Group \(RFPG\) at their meeting on February 17, 2022. This meeting was noticed and conducted in accordance with the requirements of 31 Texas Administrative Code \(TAC\) §361.21\(h\) and the bylaws of the RFPG. It should be noted the RFPG approved submittal of the draft Technical Memorandum subject to non-substantive changes and refinements. The content of the Technical Memorandum, as approved by the RFPG for submittal, is compliant with the requirements of Task 4C.](#)

Process Overview

As outlined in the TWDB Extension of Time to Complete Technical Memorandum (dated August 17, 2021) and associated Technical Memorandum Data Deliverable Clarification (dated October 29, 2021), the TWDB extended the submittal deadline of Task 4C.1c-e deliverables to March 7, 2022. The extension of time was provided to accommodate the delayed release of the cursory floodplain dataset, also referred to as the Fathom dataset.

The Fathom dataset was provided to the Regional Flood Planning Group (RFPG) on October 29, 2021, for the incorporation of results into this Technical Memorandum Addendum. Results presented in this memorandum are considered interim due to ongoing incorporation of best available data into the floodplain quilt.

Figure 1: Regional Flood Planning Timeline



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Task 4C – Technical Memorandum No. 2 Deliverables

The following sections introduce the required Technical Memorandum No. 2 deliverables for the initial phase of the regional flood planning process for the Lower Colorado-Lavaca region.

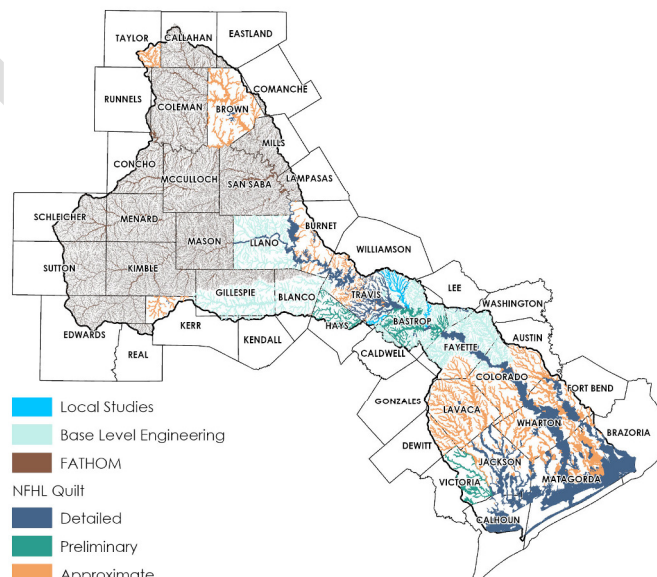
4C.1c – Maps and Geodatabase of Existing and Future Condition Flood Risk

While developing a comprehensive flood risk model of the region is beyond the scope of this planning effort, the TWDB “floodplain quilt” that is being used in the planning process is “stitched” together from various sources of data to provide comprehensive coverage of all known existing statewide flood hazard information. The Floodplain Quilt combines numerous data layers from FEMA, including effective floodplain maps, preliminary maps, and base level elevation (BLE) maps, as well as data from other federal agencies. Information drawn from local and regional flood studies was used to refine the region’s Floodplain Quilt “patches” derived from such sources. And finally, the remaining floodplain quilt gaps were filled using the Fathom dataset. Upon review of the various floodplain datasets, it was ultimately recommended that the draft existing condition floodplain quilt ~~be was~~ compiled using the hierarchy as outlined below.

1. Local Studies
2. National Flood Hazard Layer
 - Pending and Preliminary Data
 - Effective Data for Detailed Study Areas (Zone AE, AO, AH, and VE)
3. Base Level Engineering
4. National Flood Hazard Layer
 - Effective Data for Approximate Study Areas (Zone A and V)
5. Fathom

Observation of the Fathom dataset in relation to the First American Flood Data Service revealed the two datasets were similar and since the Fathom dataset better aligned to current topography it was decided to replace the First American Flood Data Service flood risk data with Fathom. The graphic below displays the spatial variation of data sources utilized to develop the draft existing condition floodplain quilt.

Figure 2: Draft Existing Condition Floodplain Quilt Data Sources



The draft existing condition flood hazard map was discussed during the RFPG meeting on January 31, 2022, and a web map ~~will be~~~~was~~ ~~employed~~ ~~utilized~~ to obtain community ~~stakeholder~~ and public comments ~~regarding~~~~on~~ the draft ~~flood hazard~~ maps. ~~The web map provides a tool for users to review and comment on the data presented in the maps and to identify and locate additional potential flood hazard areas. The web map was launched on February 10, 2022 and was accessible throughout the end of February.~~

~~Task 2B – Future Condition Flood Risk is a characterization of conditions for the planning area based on a "no-action" scenario of approximately 30 years of continued development and population growth under current development trends and patterns, and existing flood regulations and policies, as well as antipated climate and land changes. As outlined in the guidance documents, TWDB suggested provided four options for estimation of potential future condition flood risk. For the Lower Colorado-Lavaca Region It is recommended that the potential future condition flood risk was is estimated using the following methods: outlined below.~~

- Utilize the existing condition 0.2% annual chance (500-year) floodplain as a proxy for the potential future condition 1% annual chance (100-year) floodplain.
- Estimate the potential future condition 0.2% annual chance (500-year) floodplain using a horizontal buffer based on the measured difference (delta) between the existing condition 1% annual chance (100-year) and existing 0.2% annual chance (500-year) floodplain.

Based on a sampling of 155 delta locations across the region, it was decided a uniform horizontal buffer would not be appropriate. Rather horizontal buffers were generated in six regions as shown *Figure 3* and outlined in *Table 1* below.

Figure 3: Draft Future Condition Buffer Regions

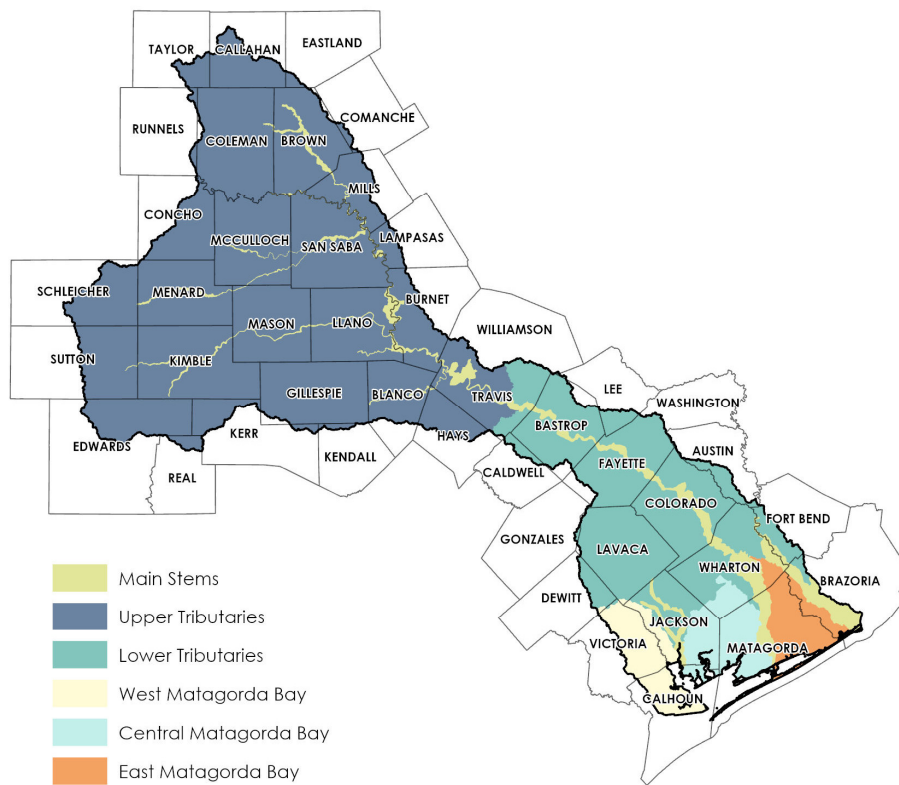
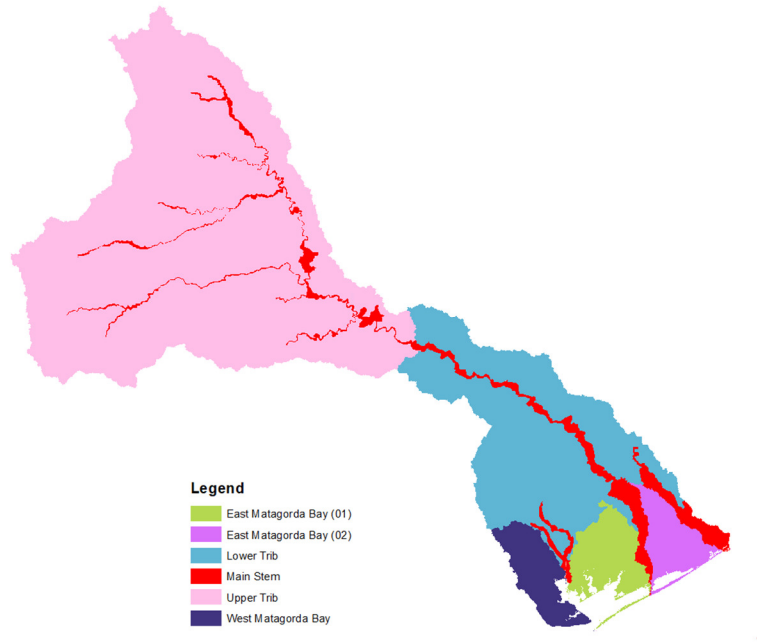


Table 1: Draft Future Condition Horizontal Buffers

Buffer Regions	Description	Buffer (feet)
River Main Stems	Main stem of rivers within each HUC	260
Tributaries Upper	Tributaries to the main stems north of Austin	15
Tributaries Lower	Tributaries to the main stems south of Austin	70
West Matagorda Bay	Tributaries west of the Lavaca River	75

Central Matagorda Bay	Tributaries between the Lavaca and Colorado Rivers	315
East Matagorda Bay	Tributaries between the Colorado and San Bernard Rivers	405

It should be noted that the potential future condition flood hazard [maps, as is the case with existing conditions maps, are for planning purposes only and are ~~areas are~~ not to be used for floodplain regulation. ~~regulatory maps.~~](#) Rather, these flood hazards represent the potential future flood risk in 30 years if no mitigation actions are implemented.

Due to the varying ecoregions and topography, the Lower Colorado-Lavaca region experiences various types of flood risk. The flood risk identified through this planning process, throughout the region, is primarily associated with riverine systems. Coastal flood risk as identified by the National Flood Hazard Layer is present across Calhoun, Matagorda and Brazoria County. Local (urban) flood risk is incorporated in the areas where the Fathom datasets were used to fill prior flood risk gaps within the region. This local (urban) flood risk better defines where water will gather and flow once rain hits the ground.

On December 1, 2021, TWDB supplied the RFPG with the final buildings dataset to be used for the existing and future conditions flood exposure analysis. The draft results of the exposure analysis presents an estimation of the number of at-risk structures (buildings, roadways, critical facilities, etc.), population estimates, the length of impacted roadways and area of agricultural land contained within the existing condition and potential future condition flood hazard boundary. *Table 2* below provides a summary of the region’s flood exposure results.

Table 2: Draft Flood Exposure Analysis Results

Flood Risk Condition	Number of At-Risk Buildings	Number of At-Risk Critical Facilities	Number of At-Risk Roadway Crossings (low water crossings)	Estimated At-Risk Daytime Population (based on building populations)	Impacted Agricultural Land (percent square miles of at-risk land cover)
Existing Condition 1% Annual Chance (100-year)	6968,000	8074	TBD1,100	110109,000	78%3,500
Future Condition 1% Annual Chance (100-year)	TBD102,000	TBD135	TBD1,120	TBD188,000	TBD4,200

Following the exposure analysis, a vulnerability analysis was performed for both existing condition and potential future conditions using the Social Vulnerability Index (SVI) associated with exposed structures. The SVI uses 15 different census variables to help identify communities that may need support before, during, and after a disaster. In this first planning cycle, the SVI is used to represent resilience abilities across the region. SVI values between 0.75 and 1 denote populations with high vulnerability.

Maps displaying draft existing condition and potential future condition flood risk, risk analysis and vulnerability analysis are provided in *Attachment 1*. Please note the maps are identified as outlined in the TWDB’s guidance documents and therefore do not appear in sequential order for this memorandum.

- Map 4: Existing Condition Flood Hazard
- Map 6: Existing Condition Flood Exposure
- Map 7: Existing Condition Vulnerability and Critical Infrastructure

~~(The following maps will be provided in the February draft.)~~

- Map 8: Future Condition Flood Hazard
- Map 10: Extent of Increase of Flood Hazard Compared to Existing Condition
- Map 11: Future Condition Flood Exposure
- Map 12: Future Condition Vulnerability and Critical Infrastructure

The following charts display the draft existing condition exposure analysis and vulnerability analysis results by county. These charts will be further refined and explained in Chapter 2 of the Regional Flood Plan.

Figure 4: Existing Condition Exposure Analysis Results for Buildings in the Floodplain

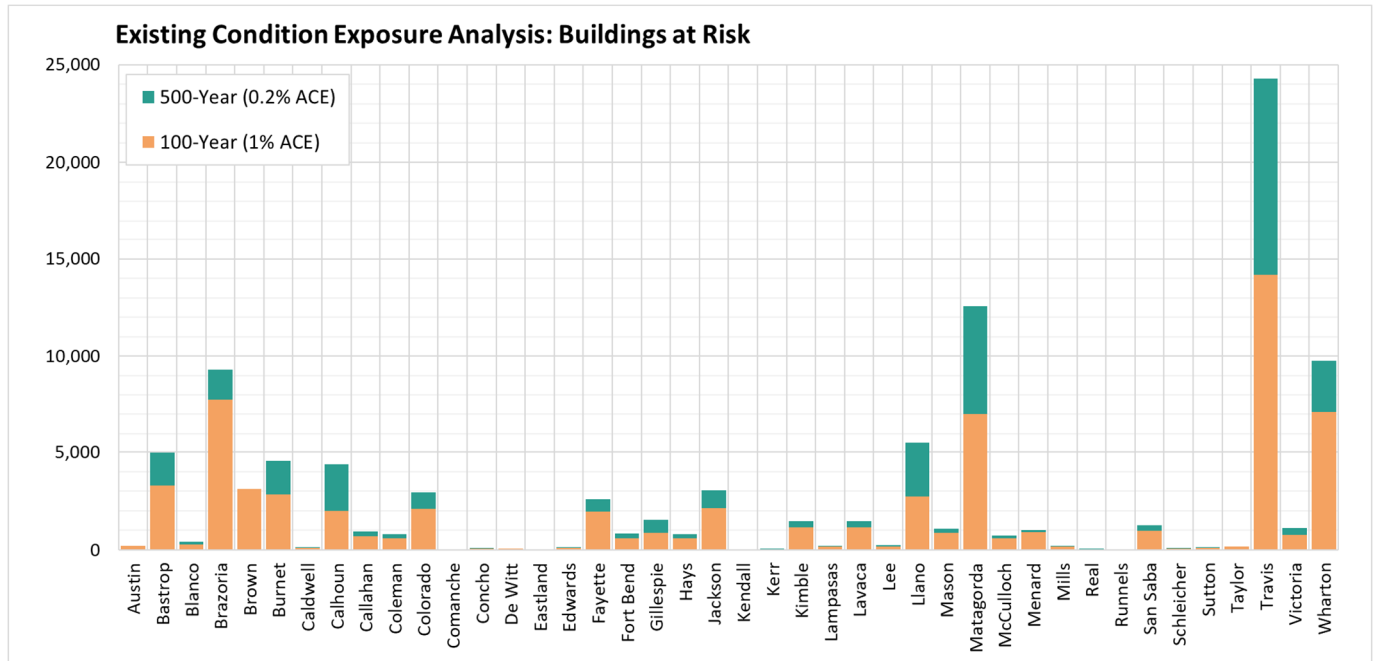


Figure 5: Existing Condition Exposure Analysis Results for Populations in the Floodplain

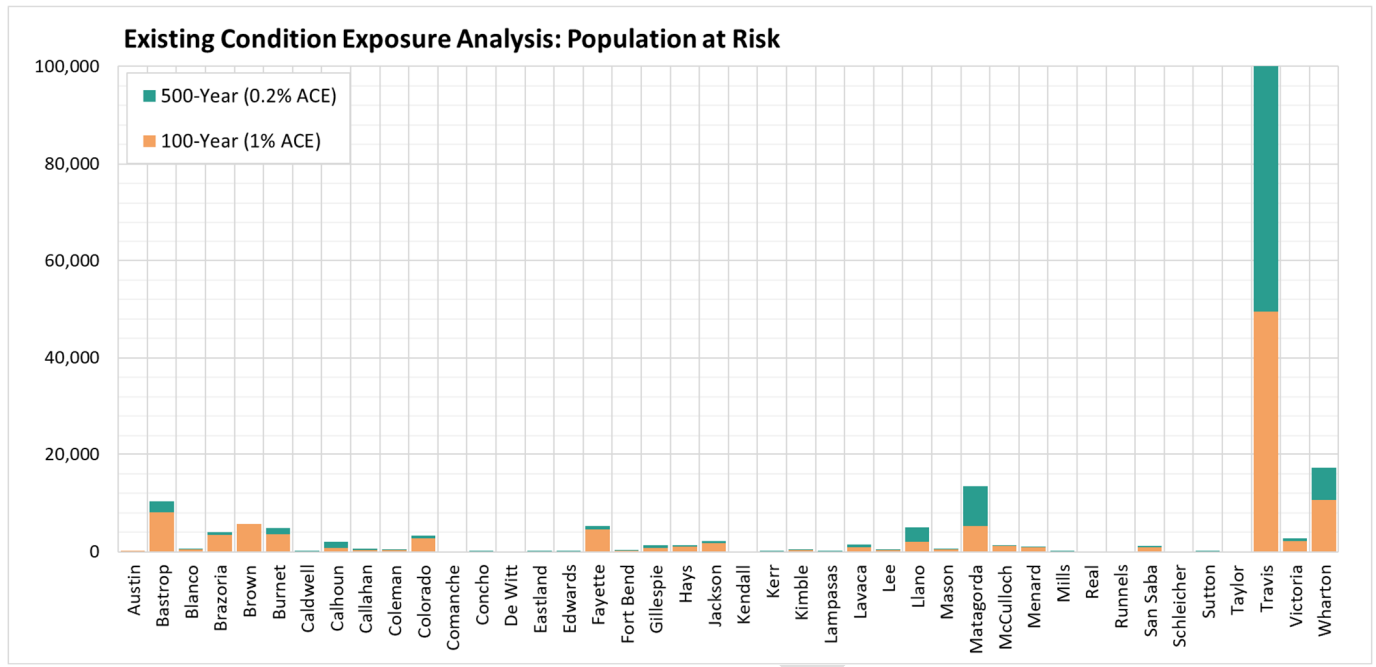


Figure 6: Existing Condition Exposure Analysis Results for Critical Facilities in the Floodplain

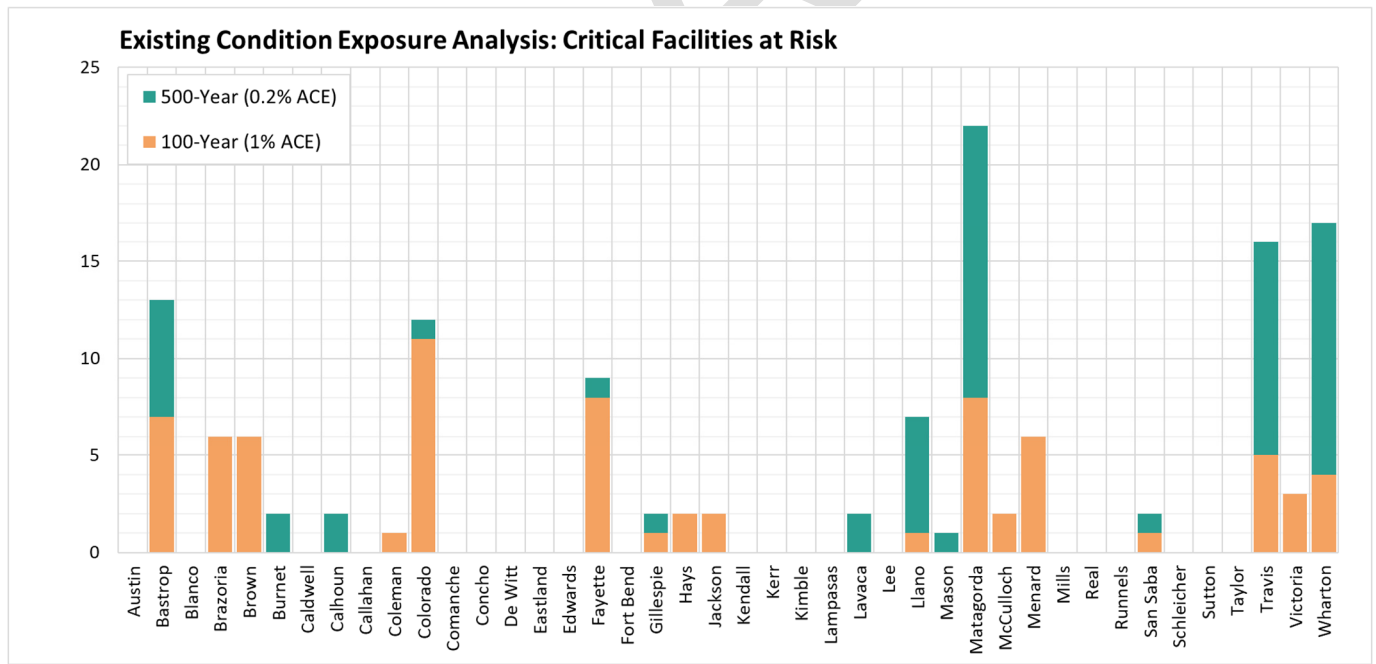


Figure 7: Existing Condition Exposure Analysis Results for Low Water Crossings in the Floodplain

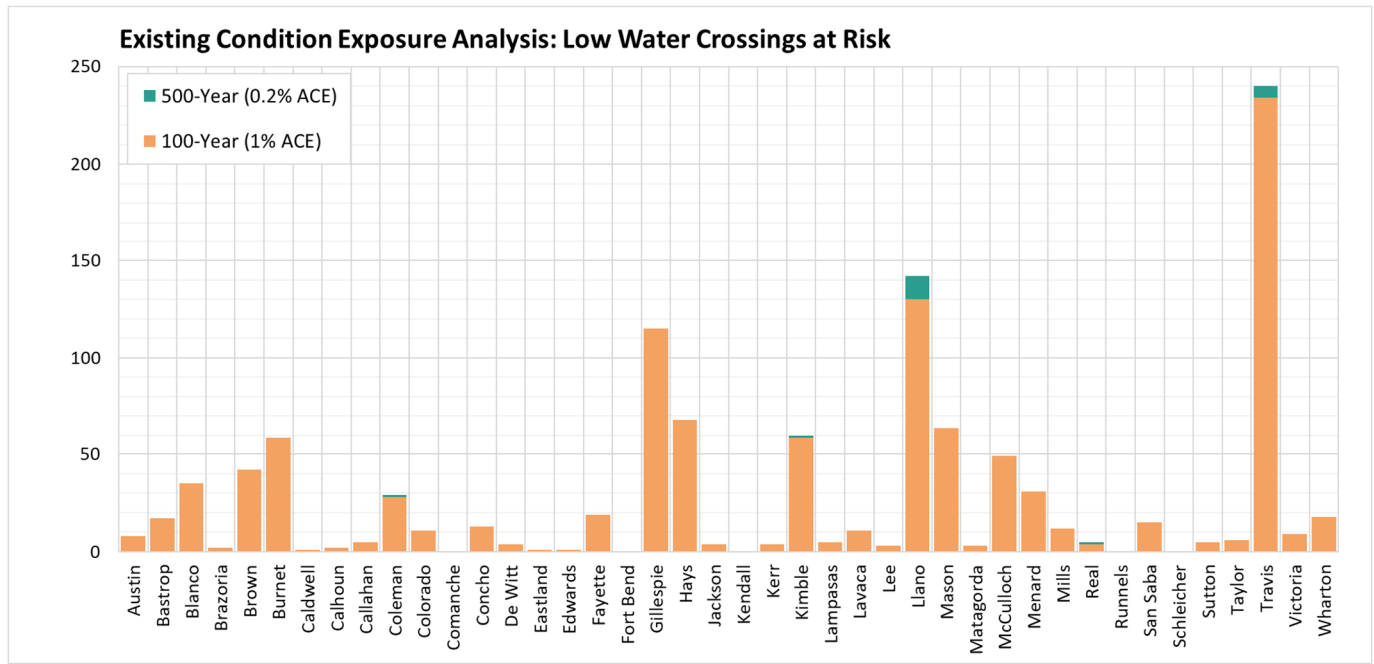


Figure 8: Existing Condition Exposure Analysis Results for Agricultural Land Area (square miles) in the Floodplain

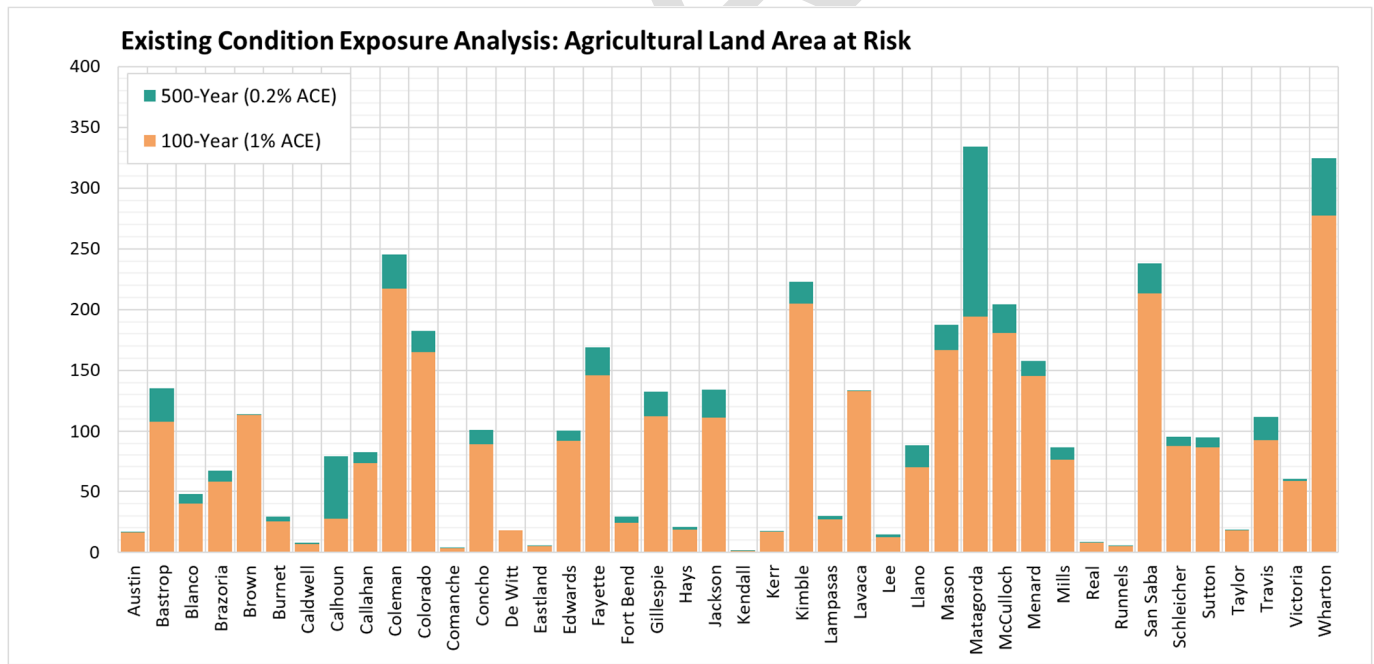
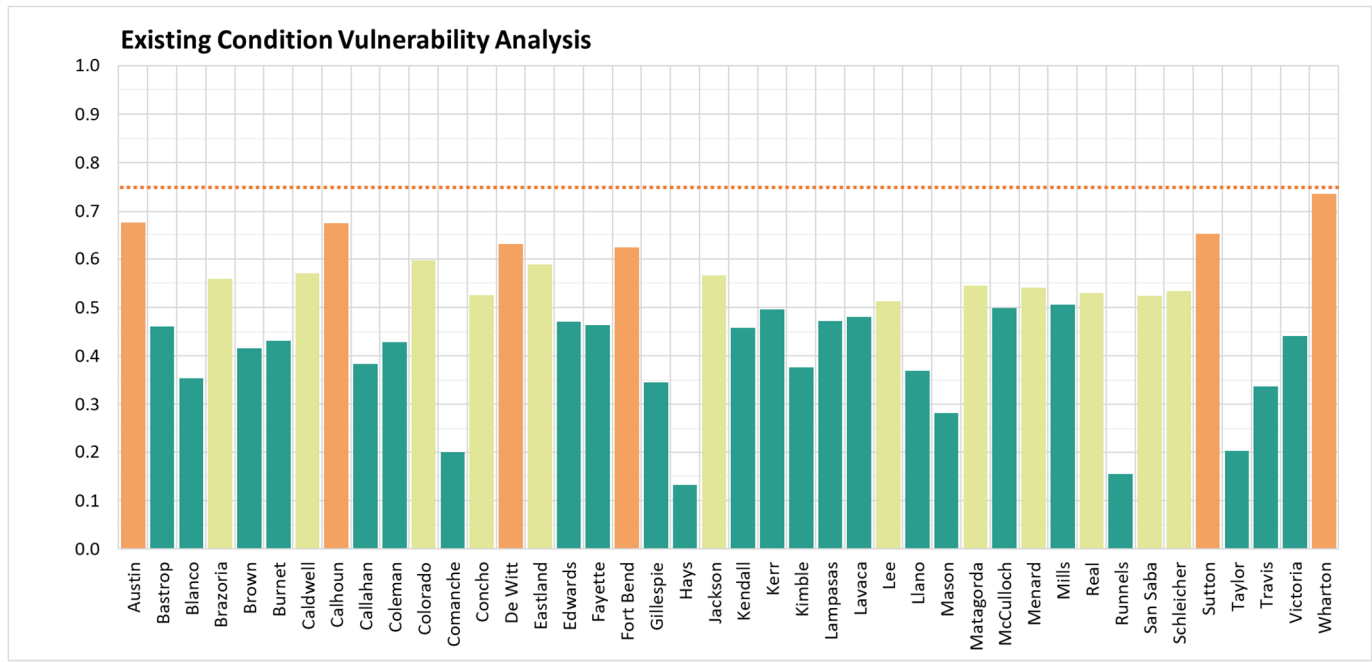


Figure 9: Existing Condition Vulnerability Analysis Results for Exposed Buildings and Critical Facilities in the Floodplain



Associated geospatial files are provided in *Attachment 4*. The geodatabase feature classes titled ‘ExFldHazard’, ‘ExFldExpPol’, ‘ExFldExpLn’, ‘ExFldExpPt’, ‘ExFldExpAll’, ‘FutFldHazard’, ‘FutFldExpPol’, ‘FutFldExpLn’, ‘FutFldExpPt’, and ‘FutFldExpAll’ provide a spatial representation of existing condition and potential future condition flood risk, risk analysis and vulnerability analysis.

4C.1d – Maps and Geodatabase of Existing and Future Condition Flood Gaps

Following the compilation of the draft floodplain quilt, a flood hazard gap analysis was performed to identify known or “apparent” flood-prone areas that lack models and maps, or have existing models and maps that are outdated or otherwise not considered reliable. The existing condition gap analysis identifies the following: [gap areas across the region.](#)

- Absence of hydrologic and hydraulic models where the Fathom mapping is utilized
- Outdated National Flood Hazard Layer data greater than 10 years old
- Absence of 0.2% annual chance (500-year) flood risk data
- More than 50% absence of 0.2% annual chance (500-year) flood risk data
- Absence of modeling and mapping utilizing NOAA Atlas 14 rainfall data

Due to the absence of future condition analysis, the entire region is considered a gap lacking future condition modeling and mapping. The City of Austin and other entities in the region are in the process of updating hydrologic and hydraulic models to incorporate NOAA Atlas 14 rainfall data. These updated models, and the resultant map products, are expected to be available for [use in](#) the next regional flood planning cycle.

Maps displaying draft results of existing condition and potential future condition flood gaps are provided in *Attachment 2*.

- Map 5: Existing Condition Flood Hazard - Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas

- Map 9: Future Condition Flood Hazard - Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas

Associated geospatial files are provided in *Attachment 4*. The geodatabase feature classes titled ‘Fld_Map_Gaps’ provides a spatial representation of mapping gaps in the Lower Colorado-Lavaca region.

4C.1e – Map and Geodatabase that identifies where Models are Available to Evaluate FMSs and FMPs

A list of previous studies containing modeling data was submitted as part of the January 7, 2022, Technical Memorandum No. 1. These studies were added to the geodatabase to provide a geospatial representation of model-backed study areas for use when conducting FMS and FMP evaluations. Also provided in the database are areas where Base Level Engineering and FEMA National Flood Hazard Layer modeling are available. It should be noted that for use in developing an FMS or FMP, these models will likely require some level of enhancement. As the planning process continues, the list of available studies and associated models will be enhanced to document sources of information relevant to plan development within the Lower Colorado-Lavaca region. It is expected that modeling and mapping needs will be the subject of numerous potential Flood Management Evaluations. A map displaying model availability is provided in *Attachment 3*.

- Map: Locations where Hydrologic and Hydraulic Models are Available

An associated geospatial file is provided in *Attachment 4*. The geodatabase feature classes titled ‘AvailableModels’ provides a spatial representation of available models in the Lower Colorado-Lavaca region.

4C – Technical Memorandum No. 1 Geodatabase

As outlined in the TWDB Extension of Time to Complete Technical Memorandum dated August 17, 2021, and associated Technical Memorandum Data Deliverable Clarification dated October 29, 2021, the following table outlines geodatabase deliverables included with this Technical Memorandum. Specific data deliverables and formatting are in alignment with the TWDB’s Exhibit D: -Data Submittal Guidelines for Regional Flood Planning. The digital geodatabase is located in *Attachment 4*.

Table 3: Task 4C Geodatabase

File No.	Item Name	Description	Submittal Milestone	Feature Class Name	Submittal Deadline Notes
1	Entities	Entities with flood-related authority and whether they are actively engaged in flood planning, floodplain management and flood mitigation activities.	Technical Memo (limited fields)	Entities	Submitted on January 7, 2022.
2	Watersheds	The spatial layer for watersheds with associated FMEs, FMSs and FMPs.	Technical Memo	Watersheds	Submitted initial data on January 7, 2022, with limited fields as these will be refined as FMEs, FMSs and FMPs are advanced.
3	Existing Infrastructure	A general description of the location, condition and functionality of existing natural flood mitigation features and constructed major flood infrastructure within the Flood Planning Region (FPR).	Technical Memo	ExFldInfraPol	Submitted on January 7, 2022.
4			Technical Memo	ExFldInfraLn	Submitted on January 7, 2022.
5			Technical Memo	ExFldInfraPt	Submitted on January 7, 2022.

File No.	Item Name	Description	Submittal Milestone	Feature Class Name	Submittal Deadline Notes
6	Proposed or Ongoing Flood Mitigation Projects	Proposed or ongoing flood mitigation projects currently under construction, being implemented; and with dedicated funding to construct and the expected year of completion.	Technical Memo	ExFldProjs	Submitted on January 7, 2022.
7*	Existing Flood Hazard	Perform existing condition flood hazard analyses to determine the location and magnitude of both 1.0% annual chance and 0.2% annual chance flood events.	Technical Memo	ExFldHazard	Submit on March 7, 2022, along with Technical Memorandum No. 2.
8*	Flood Mapping Gaps	Gaps in inundation boundary mapping.	Technical Memo	Fld_Map_Gaps	Submit on March 7, 2022, along with Technical Memorandum No. 2.
9*	Existing Exposure	Develop high-level, region- wide, and largely GIS-based existing condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events.	Technical Memo	ExFldExpPol	Submit on March 7, 2022, along with Technical Memorandum No. 2.
10*			Technical Memo	ExFldExpLn	Submit on March 7, 2022, along with Technical Memorandum No. 2.
11*			Technical Memo	ExFldExpPt	Submit on March 7, 2022, along with Technical Memorandum No. 2.
12*			Technical Memo	ExFldExpAll	Submit on March 7, 2022, along with Technical Memorandum No. 2.
13*	Future Flood Hazard	Perform future condition flood hazard analyses to determine the location and magnitude of both 1.0% annual chance and 0.2% annual chance flood events.	Technical Memo	FutFldHazard	Submit on March 7, 2022, along with Technical Memorandum No. 2.
14*	Future Exposure	Perform future condition flood exposure analyses using the information identified in the flood hazard analysis to identify who and what might be harmed within the region for, at a minimum, both 1.0% annual chance and 0.2% annual chance flood events.	Technical Memo	FutFldExpPol	Submit on March 7, 2022, along with Technical Memorandum No. 2.
15*			Technical Memo	FutFldExpLn	Submit on March 7, 2022, along with Technical Memorandum No. 2.
16*			Technical Memo	FutFldExpPt	Submit on March 7, 2022, along with Technical Memorandum No. 2.
17*			Technical Memo	FutFldExpAll	Submit on March 7, 2022, along with Technical Memorandum No. 2.
18	Existing Floodplain Management Practices	Identify areas with existing floodplain management practices, identify common and compare contrasting practices within the region, and acknowledge locations that may lack floodplain management.	Technical Memo	ExFpMP	Submitted on January 7, 2022.
19	Goals	Identify specific and achievable flood mitigation and floodplain management goals along with target years by which to meet those goals.	Technical Memo (limited fields)	Goals	Submitted on January 7, 2022.
20	Streams	Shows the streams to be studied by FMEs, and those relevant to FMSs and FMPs, when applicable.	Technical Memo	Streams	Submitted on January 7, 2022.
21	Flood Management Evaluations	Flood Management Evaluations will identify areas requiring flood risk evaluation.	Technical Memo	FME	Submitted initial data on January 7, 2022 with limited fields as these will

File No.	Item Name	Description	Submittal Milestone	Feature Class Name	Submittal Deadline Notes
			(limited fields)		be refined as the planning process advances.
22	Flood Mitigation Projects	Flood Mitigation Projects reduce flood risk through a variety of approaches. The service area is the region impacted by the project.	Technical Memo (limited fields)	FMP	Submitted initial data on January 7, 2022 with limited fields as these will be refined as the planning process advances.
23	Post-project Hazard	Project specific features showing an updated hazard area that accounts for the impact of the project.	Draft Plan	FMP_HazPost	Not required in Tech Memo, so will be a deliverable on August 1, 2022.
24	Project Details	A table included in the .gdb but built using the Project Details Excel template. The table includes more detailed analysis of the project.	Draft Plan	FMP_Details	Not required in Tech Memo, so will be a deliverable on August 1, 2022.
25	Flood Management Strategies	Flood Management Strategies can be a broad array of policies or other strategies that aid in flood management.	Technical Memo (limited fields)	FMS	Submitted initial data on January 7, 2022 with limited fields as these will be refined as the planning process advances.

**These features are included in this Technical Memorandum No. 2 deliverables.*

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Technical Memorandum Attachments

Attachment 1. 4C.1c – Maps and geodatabase of existing and future condition flood risk

- Map 4: Existing Condition Flood Hazard
- Map 6: Existing Condition Flood Exposure
- Map 7: Existing Condition Vulnerability and Critical Infrastructure
- Map 8: Future Condition Flood Hazard
- Map 10: Extent of Increase of Flood Hazard Compared to Existing Condition
- Map 11: Future Condition Flood Exposure
- Map 12: Future Condition Vulnerability and Critical Infrastructure

Attachment 2. 4C.1d – Maps and geodatabase of existing and future condition flood gaps

- Map 5: Existing Condition Flood Hazard - Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas
- Map 9: Future Condition Flood Hazard - Gaps in Inundation Boundary Mapping and Identify Known Flood-Prone Areas

Attachment 3. 4C.1e – Map and geodatabase that identifies where models are available to evaluate FMSs and FMPs

- Map: Locations where Hydrologic and Hydraulic Models are Available

~~Attachment 2.~~ Attachment 4. 4C – Geodatabase

