

Update from Consultant Team


Neches Regional Flood Planning Group

February 25, 2022

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Agenda

- March 7th Technical Memorandum
- Exhibit D – Spatial Data
 - Deliverable Components
 - GIS Dashboard



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Task 4C – Technical Memorandum 5

- Draft, mid-point, work-in-progress deliverable to demonstrate progress towards development of the RFP.
- Scope of work items are “interim dataset”
- Content of the draft and final version of the RFP will supersede previous content

Deliverables	Deadline
a. List of political subdivisions and flood-related authorities	January 7 th , 2022
b. List of relevant previous flood studies	January 7 th , 2022
c. Maps and geospatial data representing the 100-year and 500-year flood events	March 7 th , 2022
d. Maps and geospatial data representing flood prone areas	March 7 th , 2022
e. Maps and geospatial data identifying where existing hydrologic and hydraulic models are available to evaluate FMSs and FMPs	March 7 th , 2022
f. List of available flood-related models	January 7 th , 2022
g. Flood mitigation and floodplain management goals adopted by the RFPG	January 7 th , 2022
h. Documented process used by the RFPG to identify potentially feasible FMSs and FMPs	January 7 th , 2022
i. List of FMEs and potentially feasible FMSs and FMPs identified	January 7 th , 2022
j. List of FMSs and FMPs that were identified but determined to be infeasible	January 7 th , 2022

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Task 4C – Map Deliverables 5

- Map 4 – Existing Condition Flood Hazard
- Map 5 – Existing Condition Flood Hazard Gaps & Flood Prone Areas
- Map 6 – Existing Condition Flood Exposure
- Map 7 – Existing Condition Vulnerability & Critical Infrastructure
- Map 8 – Future Condition Flood Hazard
- Map 9 – Future Condition Flood Hazard Gaps & Flood Prone Areas
- Map 10 – Extent of Increase of Flood Hazard
- Map 11 – Future Condition Flood Exposure
- Map 12 – Future Condition Vulnerability & Critical Infrastructure

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Task 4C – Spatial Data Deliverables

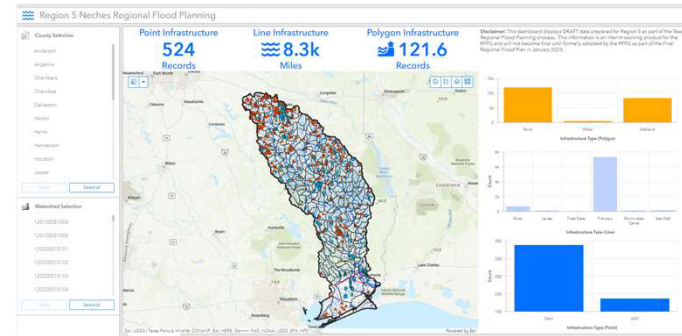
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- Existing & Future Flood Hazard
 - Location and magnitude of 1.0% (100-yr) and 0.2% (500-yr)
- Flood Mapping Gaps
 - Gaps in inundation mapping
- Existing & Future Exposure
 - High-level, region-wide, flood exposure analysis
 - Who & what might be harmed in the 1.0% (100-yr) and 0.2% (500-yr) flood events
- Existing Hydrologic & Hydraulic models needed to evaluate FMSs and FMPs

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GIS Dashboard

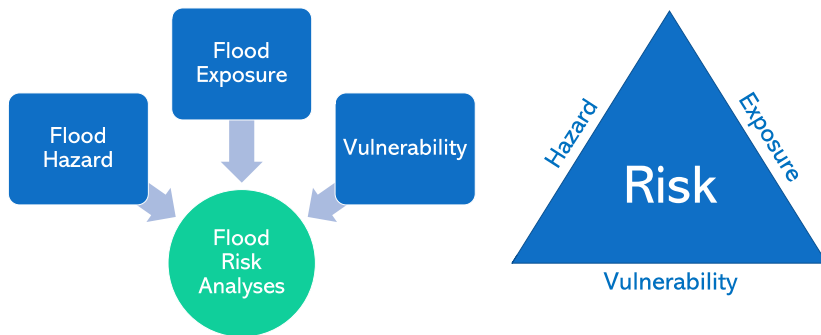
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Task 2A – Existing Flood Exposure

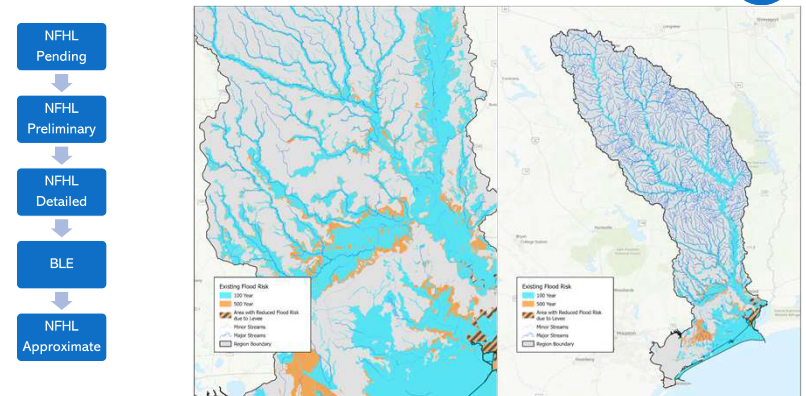
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Task 2A – Existing Flood Hazard

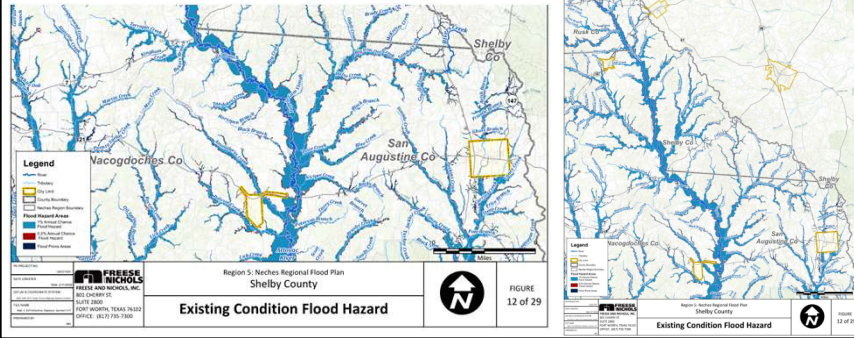
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Task 2A – Existing Flood Hazard

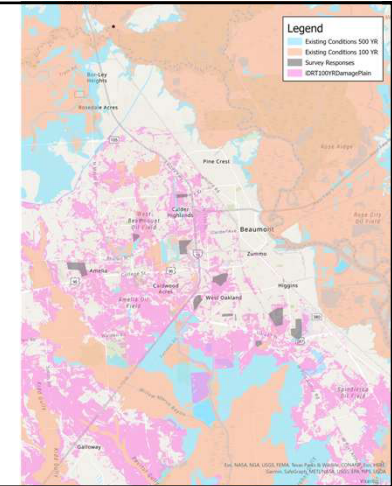
Map 4 – Existing Condition Flood Hazard



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Task 2A - Additional Flood Prone Areas

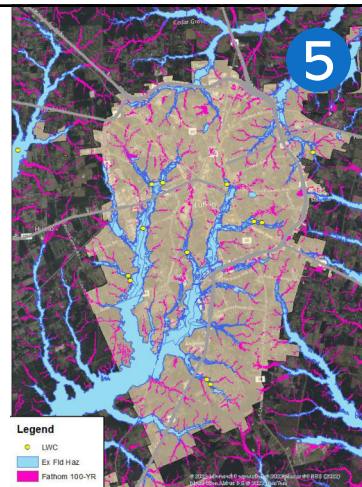
- Areas that have not been previously identified as mapped flood hazard areas
- Identified by local knowledge and public input
- Leveraged Fathom and iDRT data



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Task 2A - Additional Flood Prone Areas

- Additional Flood Prone Areas added based on proximity to:
 - Location of identified Low Water Crossings
 - Drainage crossings along Major Roadways
 - (US Highways, Interstate Highways, State Highways)
 - Communities within the region
 - TxDOT City boundaries from TWDB Data Hub



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Task 2A – Gaps in Inundation

- “Gap” defined by lack of data, outdated modeling and mapping, change in rainfall, etc.
 - Gap Priority 1 – Atlas 14 Updates
 - Chambers, Jefferson, Liberty, Hardin, Orange, Polk, Tyler, Jasper
 - 1.2% No data
 - Gap Priority 2 – Outdated NFHL Mapping
 - 14.8% Detailed > 10 years
 - 1.5% Detailed ≤ 10 years
 - Gap Priority 3 – BLE Approximate Information
 - 82.5% Approximate Information

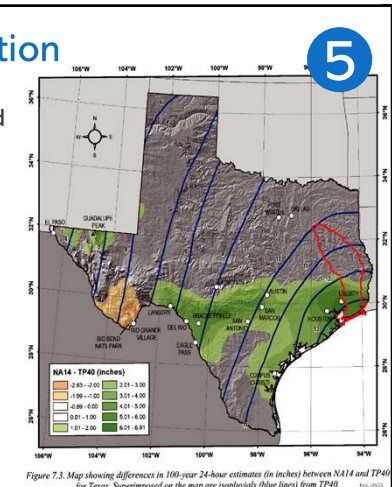


Figure 7.3. Map showing differences in 100-year 24-hour estimates (in inches) between NA14 and TP48 for Texas. Superimposed on the map are inundation (blue lines) from TP48.

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Task 2A – NFHL Mapping Dates

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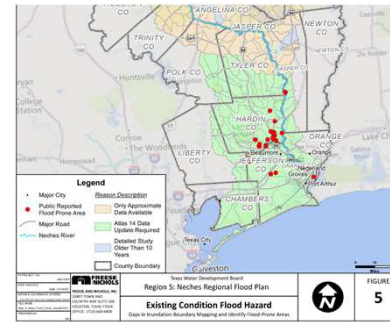
County	Community	Hydrology	Hydraulics	Date
Anderson County	City of Palestine		HEC-2	1984
Angelina County	Angelina County	NUDALLAS/HEC-1	HEC-2/RAS	2008
Chambers County	Chambers County	Regression Equations, HEC-1	HEC-2/RAS	1981 - 2014
Cherokee County	Cherokee County	HEC-1	HEC-2	1993/1995
Hardin County	Hardin County	HEC-1	RAS	2008
Henderson County	Forney	HMS		2006
Henderson County	Forney		RAS	2009
Henderson County	Kemp		HEC-2	1980
Houston County	Houston County	Regression Equations	HEC-2	1978
Jasper County	Jasper County	HEC-1	HEC-2	1984
Jefferson County	City of Beaumont	HEC-1	HEC-2	1980
Jefferson County	Jefferson County	HEC-1	HEC-2	1980
Liberty County	Liberty County	Regression Equations, HEC-1	HEC-2/RAS	1985 - 2014
Nacogdoches County	City of Nacogdoches	HEC-1	HEC-2	1978
Newton County	Newton County	Regression Equations	HEC-2/RAS	1998 - 2015
Orange County	Orange County	Regression Equations, HEC-2	HEC-2/RAS	1980 - 2014
Polk County	Polk County			N/A, no detailed study
Rusk County	City of Henderson		HEC-2	1989
Rusk County	Rusk County		HEC-2	1989
Sabine County	Sabine County			N/A, no FIS report available
San Augustine County	City of San Augustine			N/A, no FIS report available
Shelby County	Shelby County			No FIS report available for Neches extent
Smith County	Smith County	HMS	RAS	2014
Smith County	Tyler	HEC-1	RAS	2008
Trinity County	City of Groveton			N/A, no FIS report available
Tyler County	Tyler County			N/A, no detailed study
Van Zandt County	Van Zandt County	NUDALLAS	HEC-2	1984

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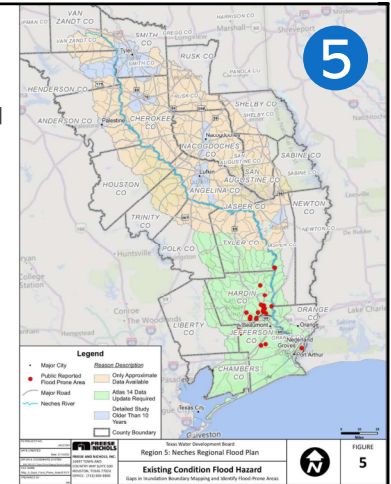
Task 2A – Gaps & Flood Prone Areas

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Map 5 – Existing Condition Flood Hazard Gaps & Flood Prone Areas



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Task 2A – Flood Exposure

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RFP will consider flood risk to:

Structures

Population

Roadways

Agricultural

Critical Facilities

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Task 2A – Existing Flood Exposure

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COUNTY	Area in Floodplain (sqmi)			Number of Structures in Floodplain			Residential Structures in Floodplain		
	100-Year	500-Year	Flood Prone	100-Year	500-Year	Flood Prone	100-Year	500-Year	Flood Prone
Anderson	70.7	4.0	4.0	69	29	246	28	17	178
Angelina	228.1	10.5	8.7	1202	217	808	751	141	544
Chambers	264.6	106.8	12.3	1176	911	408	459	271	208
Cherokee	171.4	9.5	11.1	673	130	216	302	94	115
Galveston	53.8	1.0	0.4	4949	31	2	4483	21	2
Hardin	306.4	49.1	22.5	3680	2002	777	2639	1305	544
Henderson	74.6	3.9	2.7	240	75	132	108	49	79
Houston	61.4	4.7	4.0	17	2	25	3	0	16
Jasper	197.0	15.4	2.0	757	183	149	367	93	70
Jefferson	604.8	90.1	122.9	12889	32715	20632	9741	27445	17506
Liberty	74.0	11.7	31.8	116	39	117	57	22	89
Nacogdoches	170.6	7.8	7.9	586	109	324	239	62	201
Newton	0.7	0.1	0.0	0	0	0	0	0	0
Orange	102.6	19.0	1.4	5008	5821	507	4274	5196	404
Polk	100.7	5.3	1.5	84	32	35	45	16	20
Rusk	72.4	4.5	7.8	91	25	179	45	10	105
Sabine	21.3	1.2	1.1	11	8	13	2	1	6
San Augustine	122.7	4.3	4.5	64	19	42	28	7	21
Shelby	21.6	1.1	1.2	15	14	3	0	0	0
Smith	69.1	4.4	7.0	2348	504	1698	1065	359	1292
Trinity	73.9	5.1	2.3	32	9	6	15	4	4
Tyler	186.0	12.7	2.1	546	102	137	378	69	119
Van Zandt	29.9	2.1	2.7	217	47	101	144	30	50

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Task 2A – Existing Flood Exposure

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COUNTY	Population (daytime)			Population (nighttime)			Roadway Stream Crossings (#)		
	100-Year	500-Year	Flood Prone	100-Year	500-Year	Flood Prone	100-Year	500-Year	Flood Prone
Anderson	22	37	599	61	34	493	147	17	43
Angelina	6718	947	5248	2570	458	1770	310	29	50
Chambers	617	334	541	1128	1226	657	161	126	19
Cherokee	989	140	1375	641	215	642	305	61	67
Galveston	668	11	0	1823	5	0	141	0	0
Hardin	5704	2561	976	7212	3278	1486	207	37	12
Henderson	162	997	545	156	89	153	117	36	26
Houston	5	0	16	16	0	21	112	15	13
Jasper	1388	161	560	1083	220	390	148	22	22
Jefferson	23057	66809	65464	26035	72399	45506	374	179	203
Liberty	51	18	76	140	52	214	18	2	3
Nacogdoches	4007	982	1755	2150	467	567	257	17	41
Newton	0	0	0	0	0	0	1	0	0
Orange	5973	8650	579	8740	10870	760	106	36	1
Polk	321	112	101	124	32	42	121	6	7
Rusk	104	23	989	149	37	515	186	28	43
Sabine	10	5	13	16	7	23	23	3	2
San Augustine	110	25	49	105	23	49	107	16	22
Shelby	3	6	0	7	7	1	38	3	10
Smith	6216	1035	9005	3308	1016	3949	311	35	82
Trinity	7	3	2	15	12	6	86	8	7
Tyler	164	86	116	282	71	154	177	17	19
Van Zandt	85	21	113	202	33	96	105	24	13

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Task 2A – Existing Flood Exposure

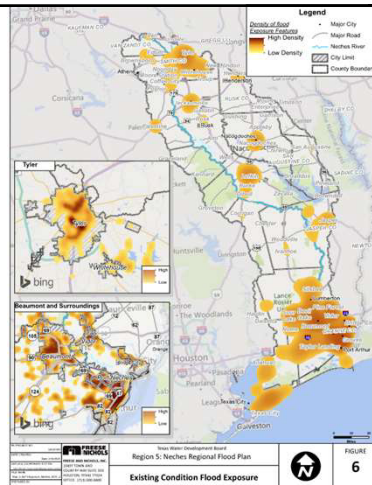
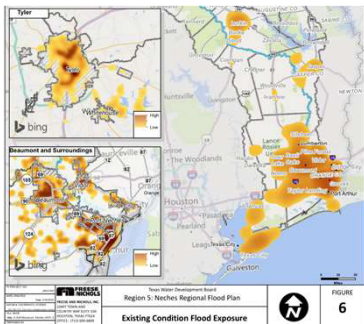
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COUNTY	Roadway Segments (miles)			Agricultural Areas (sqmi)			Critical Facilities (#)		
	100-Year	500-Year	Flood Prone	100-Year	500-Year	Flood Prone	100-Year	500-Year	Flood Prone
Anderson	22.2	5.3	22.2	0.5	0.0	0.0	0	0	1
Angelina	66.5	11.7	66.5	0.3	0.0	0.0	11	1	10
Chambers	161.6	122.4	161.6	57.7	41.9	3.8	0	0	0
Cherokee	49.3	15.4	49.3	1.4	0.1	0.2	1	0	3
Galveston	142.6	1.7	142.6	0.5	0.0	0.0	8	0	0
Hardin	135.8	70.4	135.8	1.2	0.3	0.6	25	4	5
Henderson	20.0	5.9	20.0	0.5	0.1	0.1	0	1	3
Houston	19.7	4.5	19.7	0.2	0.0	0.0	0	0	2
Jasper	45.7	13.0	45.7	0.2	0.0	0.0	7	2	6
Jefferson	473.8	528.7	473.8	51.6	5.0	34.4	316	1456	226
Liberty	7.1	3.6	7.1	2.4	0.2	2.4	1	1	0
Nacogdoches	38.4	9.4	38.4	0.4	0.0	0.0	1	0	6
Newton	0.2	0.0	0.2	0.0	0.0	0.0	0	0	0
Orange	136.1	112.5	136.1	0.5	0.2	0.0	36	83	3
Polk	16.8	3.5	16.8	0.1	0.0	0.0	0	0	0
Rusk	21.1	5.3	21.1	0.3	0.0	0.0	1	0	1
Sabine	2.7	0.8	2.7	0.0	0.0	0.0	0	0	3
San Augustine	13.2	3.5	13.2	0.1	0.0	0.0	0	0	0
Shelby	4.7	0.6	4.7	0.1	0.0	0.0	0	0	0
Smith	50.0	12.2	50.0	0.3	0.0	0.0	72	37	17
Trinity	22.4	5.0	22.4	0.1	0.0	0.0	0	0	0
Tyler	41.9	8.3	41.9	0.1	0.0	0.0	0	0	0
Van Zandt	13.6	4.7	13.6	0.4	0.0	0.0	0	0	0

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Task 2A – Existing Flood Exposure

Map 6 – Existing Condition Flood Exposure



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Task 2A – Vulnerability Analysis

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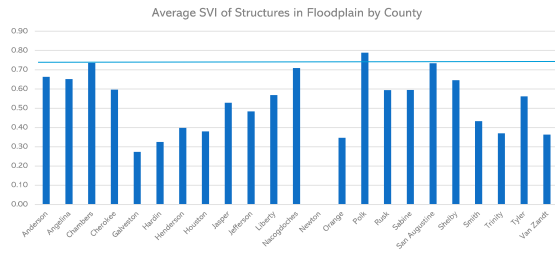
- Compute Social Vulnerability Index (SVI) for structures identified in flood exposure analysis
 - SVI is intended as the proxy for resilience for this planning cycle
- FEMA defines vulnerability as the measure of the capacity to weather, resist, or recover from the impacts of a hazard in the long term as well as the short term
- U.S. Centers for Disease Control and Prevention (CDC) SVI ranks each Census tract (subdivisions of counties) on 15 social factors that influence a community's ability to prepare for, respond to, and recover from a disaster.
 - Socioeconomic
 - Poverty, Unemployment, Per Capita Income, Education
 - Population
 - Children, Elderly, Disability, Single Parent, Minority, Limited English
 - Housing/Transportation
 - Large apartment buildings, Mobile homes, Crowding, No transportation access, group quarters

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Task 2A – Vulnerability Analysis

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- SVI used to identify communities that may need support before, during or after disasters
- Higher SVI indicates higher need for support
- **Polk County** with average SVI > 0.75

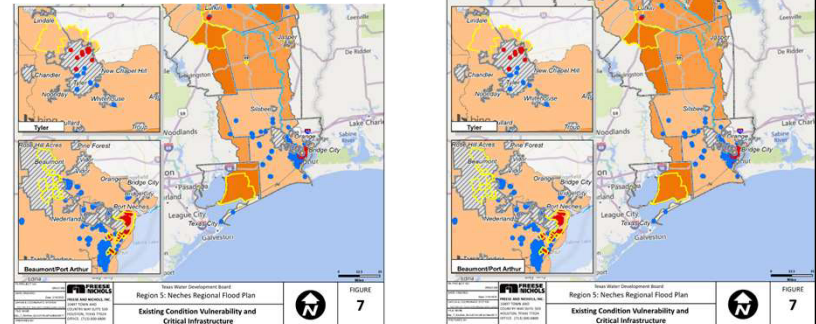


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Task 2A – Vulnerability Analysis

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Map 7 – Existing Condition Vulnerability & Critical Infrastructure



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Task 2B – Future Condition Flood Risk

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- “No-action” scenario for 30 years of continued trends, climate patterns, and current regulations
 - Continued population growth
 - Continued development increase
 - Current floodplain management regulations/policy
 - Future rainfall patterns
 - Anticipated land changes
 - Completion of currently-planned flood mitigation projects by 2050

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Task 2B – Future Condition Flood Risk

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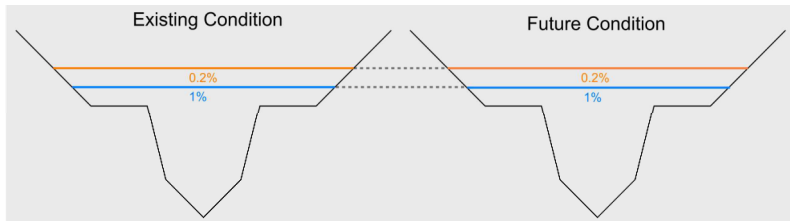
- Desktop Analysis to generate future condition flood hazard boundary
 - Use available information, no H&H modeling
 - Rely on existing conditions Flood Hazard Boundaries (Task 2A)
 - Four methods available to determine future flood hazard boundaries
 1. Change in WSEL based on change in population
 2. Existing 0.2% → Future 1%
 3. Combination of 1 & 2, or a RFPG proposed method
 4. Request TWDB for Desktop Analysis

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Task 2B – Future Condition Flood Risk

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- Approach for Large Rivers
 - For streams with large contributing drainage areas
 - Only recommended for Neches River downstream of Sam Rayburn
 - Maintain extent of existing condition flood hazard layer

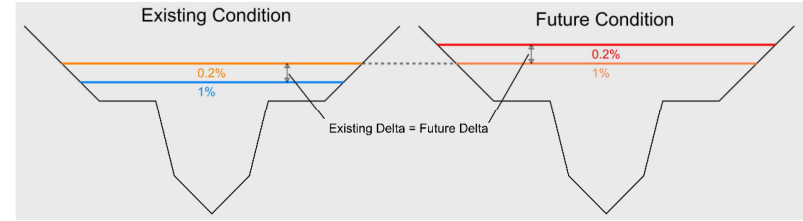


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Task 2B – Future Condition Flood Risk

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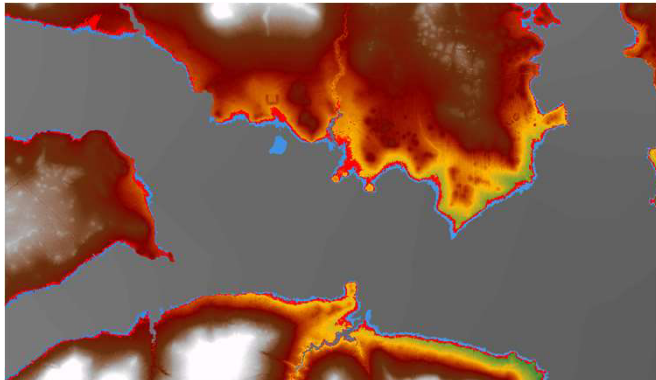
- Approach for rivers with smaller contributing area and tributaries
 - Existing 0.2% becomes Future 1%
 - Future .2% = Future 1% + Difference between existing 0.2% and 1%



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Task 2B – Future Condition Flood Risk

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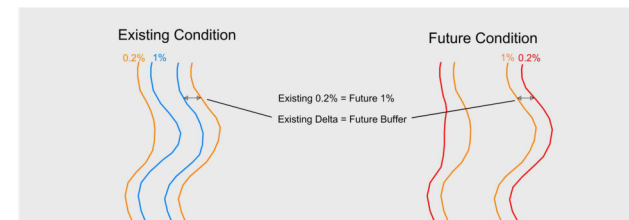


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Task 2B – Future Condition Flood Risk

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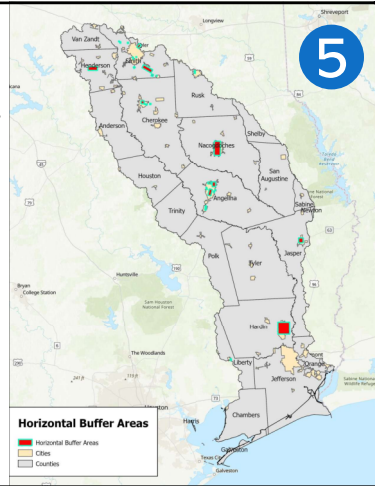
- Existing 0.2% becomes Future 1%
- 2 • Future 0.2% = Extents of Future 1% + horizontal buffer



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Task 2B – Future Condition Flood Risk

- Horizontal Buffers may be applied in the following areas
 - Angelina County: Cities of Lufkin and Diboll
 - Cherokee County: City of Jacksonville
 - Hardin County: City of Lumberton
 - Henderson County: Near county center
 - Jasper County: City of Jasper
 - Liberty County: City of Daisetta
 - Nacogdoches County: City of Nacogdoches
 - Rusk County: City of Henderson
 - Smith County: Cities of Tyler, Whitehouse, Troup



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Task 2B – Future Condition Flood Risk

Coastal Areas

- Relative Sea Level (RSL) Factors
 - Historical Observations
 - Rapid Ice Melt in Greenland and Antarctica
 - Future Greenhouse-Gas Emissions
 - Associated Ocean-Atmosphere Warming
- USGS and USACE Scenarios being considered

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Task 2B – Future Condition Flood Risk

Coastal Study Literature Review:

Study Report	Scope	SLR Projections	Includes Projects that could meet FMP requirements
USACE Sabine Pass to ¹ Galveston	Sabine Pass to Galveston Bay	2050 (20-year), 2080 (50-year, design selection) and 2130 (100 year).	Yes
Coastal Texas Study ¹ - Texas Gulf Coast Community Protection and Recovery District (GCCPRD)	Coastal Texas- Region 1, Brazoria County to Orange County	2035 (Year 0 of project) and 2085 (Year 50 of project)	Yes

¹ Use same model to estimate SLR. Developed by ERDC.

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Task 2B – Future Condition Flood Risk



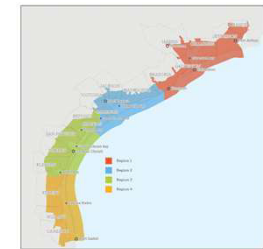
Sabine Pass to Galveston Bay Coastal Storm Risk Management Program



US Army Corps of Engineers®
Galveston District



USACE Sabine to Galveston Pass



Coastal Texas Study

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Task 2A – Future Flood Exposure

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COUNTY	Roadway Segments (miles)			Agricultural Areas (sqmi)			Critical Facilities (#)		
	100-Year	500-Year	Flood Prone	100-Year	500-Year	Flood Prone	100-Year	500-Year	Flood Prone
Anderson	27.50	34.40	14.37	0.58	0.62	0.05	0	0	1
Angelina	78.11	97.17	32.31	0.28	0.29	0.02	12	19	10
Chambers	284.05	399.90	32.69	99.62	141.29	3.81	0	0	0
Cherokee	64.68	105.56	18.60	1.55	1.74	0.16	1	22	2
Galveston	144.32	146.04	0.04	0.53	0.55	0.02	8	8	0
Hardin	206.22	272.39	18.65	1.43	1.78	0.38	29	51	2
Harris	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0
Henderson	25.89	34.36	7.02	0.60	0.65	0.06	1	2	3
Houston	24.24	28.35	3.61	0.20	0.21	0.02	0	0	2
Jasper	58.72	74.06	4.06	0.19	0.22	0.00	9	9	6
Jefferson	1,002.45	1,538.46	350.46	56.64	63.29	33.29	1,772	2,983	222
Liberty	10.75	19.30	9.81	2.55	2.99	2.21	2	3	0
Nacogdoches	47.75	62.98	13.82	0.40	0.43	0.04	1	1	6
Newton	0.18	0.31	0.00	0.00	0.00	0.00	0	0	0
Orange	248.64	286.39	2.89	0.71	0.84	0.01	119	131	1
Polk	20.32	24.40	1.67	0.10	0.11	0.00	0	0	0
Rusk	26.38	35.56	11.19	0.35	0.38	0.03	1	1	1
Sabine	3.49	4.17	0.40	0.01	0.01	0.00	0	0	3
San Augustine	16.75	20.53	4.64	0.07	0.08	0.01	0	0	0
Shelby	5.31	6.32	1.16	0.09	0.09	0.00	0	0	0
Smith	62.15	82.15	40.44	0.37	0.41	0.05	109	113	17
Trinity	27.38	32.65	2.01	0.12	0.13	0.00	0	0	0
Tyler	50.20	60.51	4.77	0.14	0.15	0.00	0	0	0
Van Zandt	18.33	23.20	5.56	0.40	0.47	0.05	0	0	0

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Task 2B – Gaps & Flood Prone Areas

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Map 9 – Future Condition Flood Hazard Gaps & Flood Prone Areas

- Atlas-14 Data Update Requirements are assumed to be fulfilled in the next 30 years
- Outdated Detailed Study and Approximate Data gaps assumed to be maintained

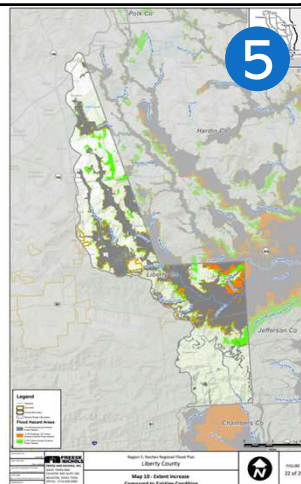
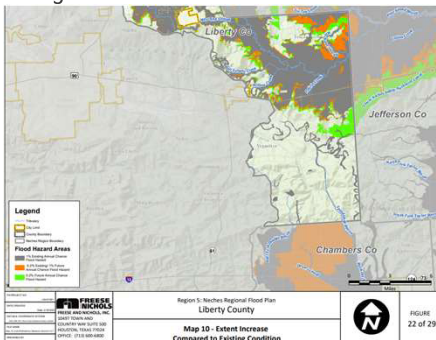


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Task 2B – Future/Existing Flood Hazard Comparison

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Map 10 – Extent of Increase of Flood Hazard Compared to Existing Condition



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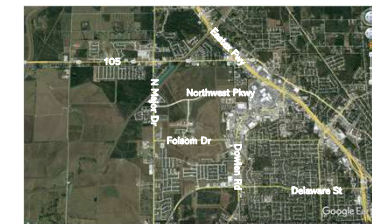
Task 2B – Future Condition Flood Risk

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- Define Future Developed Areas
 - Population projections
 - Potential areas to be developed in the future



Northwest Beaumont, 1998



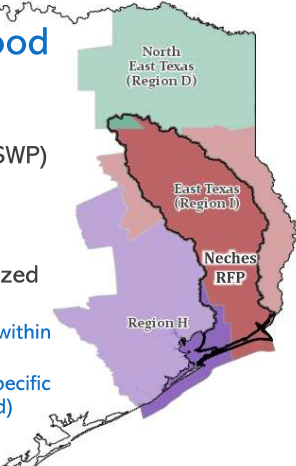
Northwest Beaumont, 2020

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Task 2B – Future Condition Flood Risk

Population Projects

- Growth projected in 2022 State Water Plan (SWP) through 2070.
 - By county
 - By water utility
- Regional Flood Plans assessing at more localized level through 2050.
 - SWP projections allocated to HUC10 watersheds within each county and water utility.
 - Projected growth in each decade distributed to specific locations within each (County x Utility x Watershed) area.



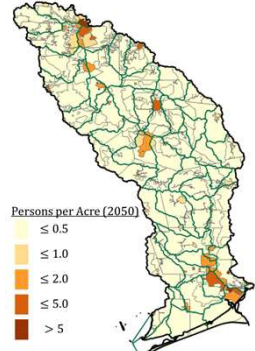
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Task 2B – Future Condition Flood Risk

Allocations of County/Utility Projections to Watersheds

Spatial Distribution of Growth Each Decade

- Realistic growth patterns based on:
 - Proximity to highways, existing development, and recent development
 - Discouraged growth within floodplains
 - No growth in parks, natural reserves, wetlands, floodways, right of way

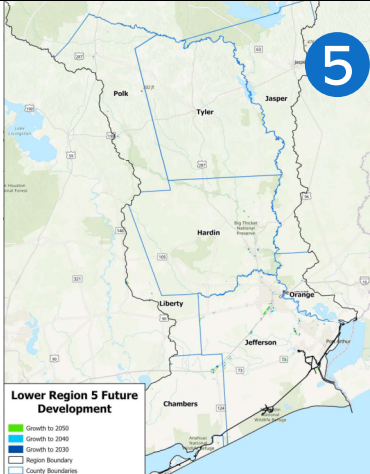


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Task 2B – Future Condition Flood Risk

Example of Potential Areas to Develop

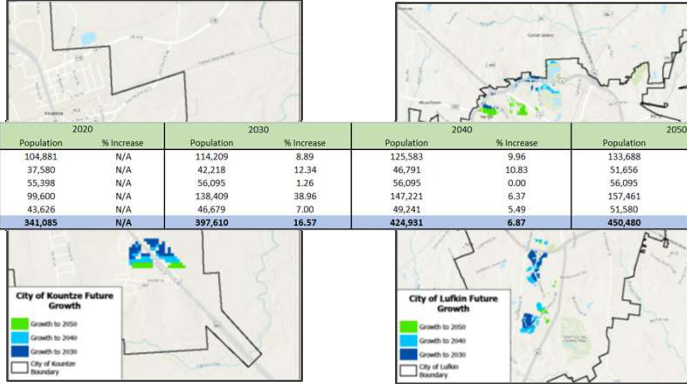
- Realistic growth patterns based on
 - Proximity to transportation, existing development, and recent development
 - Existing floodplains, wetlands
 - Areas of no development (floodways, lakes, parks, natural reserves)



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Task 2B Sample Analysis

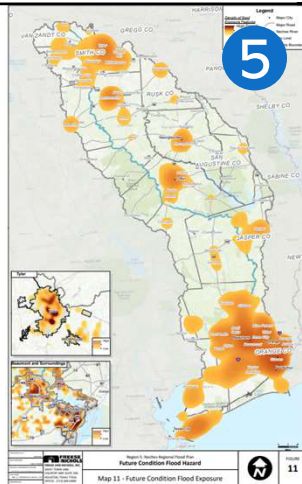
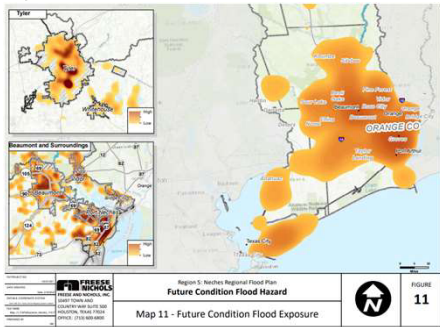
City	2020		2030		2040		2050	
	Population	% Increase	Population	% Increase	Population	% Increase	Population	% Increase
Tyler	104,881	N/A	114,209	8.89	125,583	9.96	133,688	6.45
Nacogdoches	37,580	N/A	42,218	12.34	46,791	10.83	51,656	10.40
Port Arthur	55,398	N/A	56,095	1.26	56,095	0.00	56,095	0.00
Beaumont	99,600	N/A	138,409	38.96	147,221	6.37	157,461	6.96
Lufkin	43,626	N/A	46,679	7.00	49,241	5.49	51,580	4.75
SUM	341,085	N/A	397,610	16.57	424,991	6.87	450,480	6.01



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Task 2B – Future Flood Exposure

Map 11 – Future Condition Flood Exposure

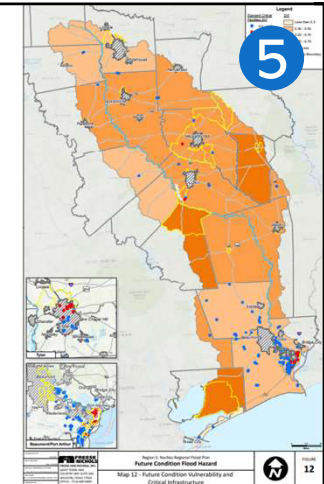
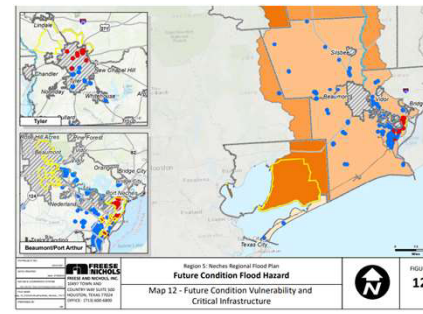


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Task 2B – Vulnerability Analysis

Map 7 – Future Condition Vulnerability & Critical Infrastructure

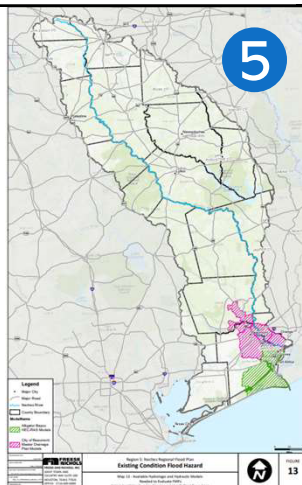
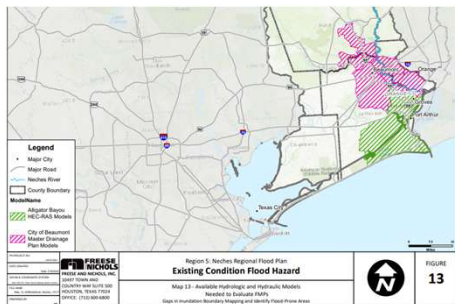


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Task 2A – Existing Hydrologic and Hydraulic Models

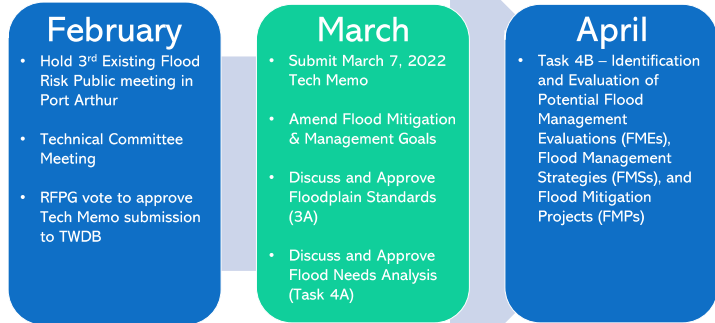
Map 13 – Available Hydrologic and Hydraulic Models Needed to Evaluate FMPs



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Planning Schedule



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