Hitchcock

Clean Coast Texas CHARM Workshop Report

September 18, 2024

Texas A&M AgriLife Extension | Disaster Assessment and Recovery

CHARM

Texas Community Watershed Partners

City of Hitchcock Texas — Community Meets Commerce

The Meadows Center for Water and the Environment, Texas State University

TXGLO

Texas Coastal Management Program

Executive Summary

On September 18, 2024, The Texas Community Watershed Partners (TCWP) project team conducted a Hitchcock CHARM Workshop supported by resources provided by the Texas General Land Office (GLO) through its Clean Coast Texas Collaborative program.

Sixteen attendees from the City of Hitchcock, City of La Marque, and State and Federal partners participated in the three-hour workshop to collaborate and enhance local understandings of risks to the community of Hitchcock and how planning can be linked to land use with long-term risk reduction strategies. The in-person workshop at the Council Chambers in Hitchcock included an overview of resilient practices, an introduction to the CHARM platform and approach, an overview of the Clean Coast Texas program, participatory mapping table-top exercises, and a group discussion on findings at the end.

The participatory mapping element consisted of three breakout tables, each set up with the CHARM platform, and face-to-face discussions around local risks and planning needs. One table was combined shortly after the start of the workshop into another table so most of what is included in this report is from conversations at the resulting two tables. The CHARM platform allows communities to understand where their risks are based on the best data available and assess potential impacts to future development based on current or future risks. Participants were able to use CHARM to determine where focused efforts could help mitigate risks for current conditions, as well as future development scenarios.

TCWP personnel worked closely with Hitchcock staff and the Clean Coast Texas Collaborative partners to coordinate the workshop and further develop community relationships.

Participants in the post-workshop survey showed their comprehension of CHARM and its capabilities, as well as a greater understanding of risk vulnerabilities within the community and how to link planning and land use to long-term risk reduction strategies.

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List of Acronyms

BFE	Base Flood Elevation
BLE	Base Level Engineering
CDBG-MIT	Community Development Block Grant Mitigation
CHARM	Community Health and Resource Management
CRS	Community Rating System
DAR	Disaster and Assessment Recovery
EPA	U.S. Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
GIFT	Green Infrastructure for Texas
GIS	Geographic Information System
GLO	Texas General Land Office
HGAC	Houston Galveston Area Council
LID	Low Impact Development
NFIP	National Flood Insurance Program
NGVD	National Geodetic Vertical Datum
RAPT	Resilience Analysis and Planning Tool
RCP	Resilient Communities Program
SoVI	Social Vulnerability Index
TCWP	Texas Community Watershed Partners
TxDOT	Texas Department of Transportation
USACE	U.S. Army Corps of Engineers

The CHARM Approach

The CHARM Resiliency Workshop

Introduction to CHARM, Education, and Partnerships

Kelsey Johnson, Texas Community Watershed Partners (TCWP) Associate Planning Program Director, introduced the workshop by conceptualizing the components of resiliency and risk such as hazards, vulnerability, and exposure. The introduction drew on characteristics of resilient strategies and institutions based on established hazard mitigation research, discussed case studies and initiatives to enhance community resilience, and offered an overview of the Community Health and Resource Management (CHARM) platform and workshop goals. Jason Pinchback, Water Resources Manager from the Texas General Land Office (GLO), provided information about the mission and activities of the Clean Coast Texas Program and how the Clean Coast Texas Collaborative can support communities, like Hitchcock, in their initiatives for a better tomorrow. The Community Development Director, Arnold Cross Jr., spoke about the importance of bringing people together to help plan for a more resilient community.

Figure 1: Jason Pinchback, Water Resources Manager, GLO

Figure 2: Arnold Cross Jr., Community Development Director, City of Hitchcock

Hands-On Application and Discussion

After the introduction, participants spent the remainder of the workshop engaging with the CHARM platform and discussing risks and concerns in the community. A Resilience Planner and a Geographic Information System (GIS) Specialist facilitated each table to help navigate the conversations and tools. Participants explored map data and development scenarios, identified potential mitigation opportunities, and discussed what they had learned with one another. At the end of the session, participants shared high-level takeaways and future strategies to explore.

Supporting Mitigation Action

Creating Relationships, Continuing Conversations

CHARM aims to bring together a variety of local stakeholders for conversations about community risk and future change. TCWP hopes that the conversations at CHARM workshops lead to opportunities for improved collaboration and coordination in participating communities.

Identifying Strategies and Technical Assistance Opportunities

CHARM exercises intend to assist communities assess their risk and identify opportunities to become more resilient. CHARM workshops enable preliminary identification of future planning needs and follow-up actions to improve short-, mid-, and long-term resiliency strategies and actions in the community.

The CHARM Platform

CHARM helps communities visualize how planning decisions made today will impact tomorrow's environment and community. With over three dozen indicators for assessing planning decisions, CHARM provides local officials, stakeholders, and citizens with the power to map and analyze hypothetical growth and real-time feedback.

CHARM Data Layer: CHARM integrates a variety of local, state, and federal datasets to provide curated and hyper-local analyses for communities.

ArcGIS and CommunityViz: These software packages visualize data and conduct analyses in real-time.

weTable: Off-the-shelf technology enables the easy display of CHARM on any surface, fostering in-person interactions and discussions conducive to collaborative planning.

CHARM Exercises

The basic unit of analysis in CHARM is the 2.5-acre grid cell. It enables the team to create focused indicators and scenarios, based on data collected from publicly available federal, state, and local sources. CHARM includes the following standardized and fully customizable exercises:

Social Vulnerability

Participants explore how, and where, risk impacts different population groups in their community, using Census (American Community Survey) demographic and socioeconomic data.

Flood Extent & Depth

Participants assess how flood and storm surge events could impact neighborhoods using recently modeled flood elevation data (such as FEMA's Base Level Engineering) and local housing and population data.

Dedicate/Elevate/Vacate Mitigation Exercises

Participants screen locations for open space preservation, structural elevation, and buy-outs of flood-prone properties using flood, open space, and housing data.

Discovery Flooding

Participants map local flooding issues not shown in other datasets, including overbank and backflow flooding, street flooding, and ponding.

Future Land Use Scenario Painting

Participants paint future development scenarios and assess their resulting risk and growth trends using thirteen development 'paints' corresponding with local land uses.

Critical Facilities

Participants assess how flood events could impact critical facilities and community 'lifelines' and identify opportunities for mitigation projects.

Participant Evaluations

Participants had an opportunity to fill out evaluations based on their experience at the workshop. Eight participants responded to the survey questions. Below is a summary of key takeaways.

- All survey participants agreed or strongly agreed that the workshop helped them understand what CHARM is, its capabilities, and how it can be utilized for their community.
- Ninety percent of survey participants walked away with excellent understanding of how to better understand risks in their community and how linking planning with future land strategies can aid long-term risk reduction.

Selected Comments

"Which aspect of this workshop was most useful to you?"

"It was eye opening. The models were informative for our future development."

"The information presented on the map gave a great visual of the condition of our area."

"Understanding the idea that the problems are regional, and it is going to take a coalition to resolve these issues."

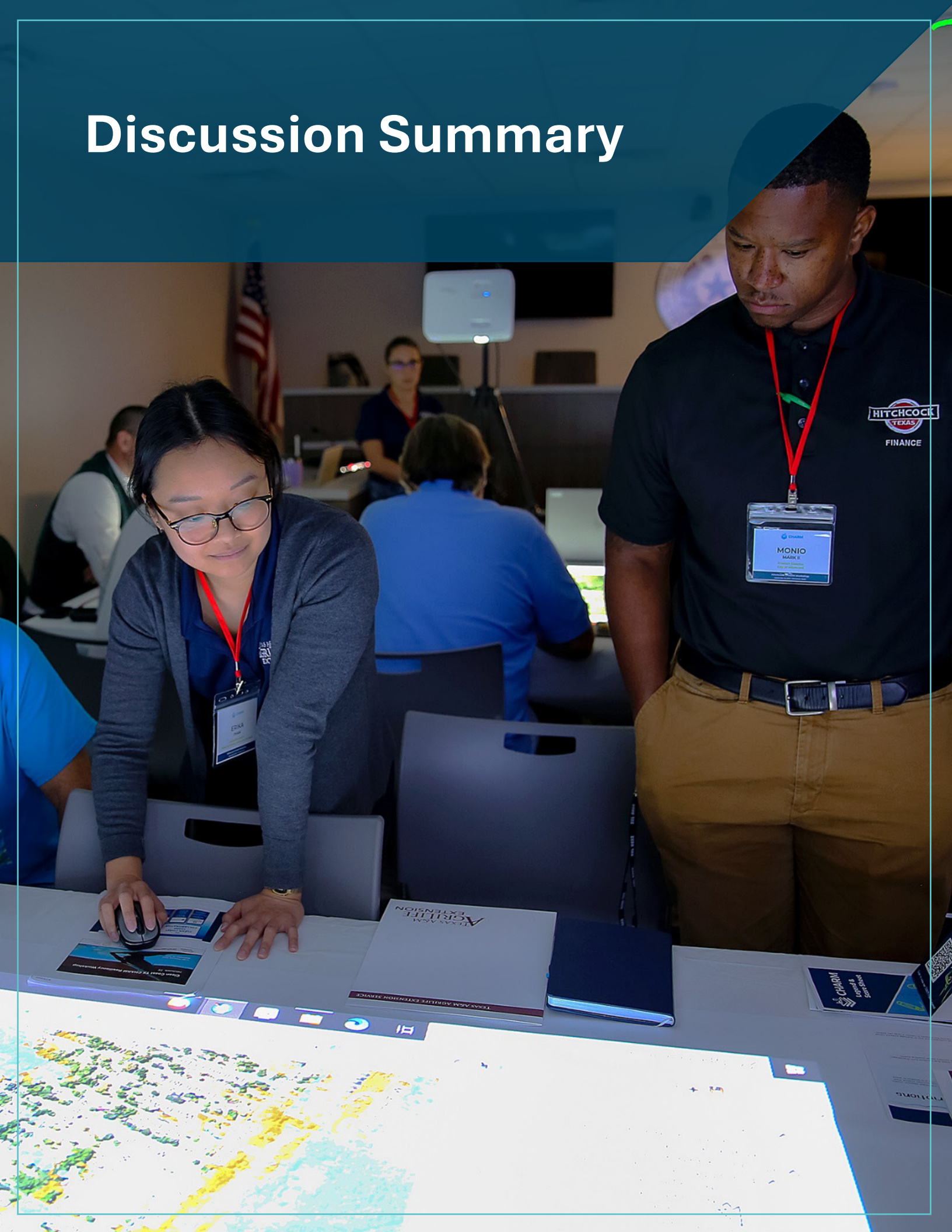
Recurring Themes

The Hitchcock CHARM Workshop provided a forum to help communities further understand their risk and make resilience development decisions. The workshop also provided a platform for members of different agencies and municipalities to identify critical needs within the community and region.

Common themes included:

- The most notable theme from the tables included conversations around Highland Bayou and the Highland Bayou Diversion Canal. The City has not been able to clearly determine what agency has jurisdiction on these waterways and this is causing a delay in addressing issues. Issues with these waterways include siltation, sediment plugs, and snagging from downed debris. These issues have attributed to flooding and water quality impacts.
- Inadequate drainage infrastructure and flow constrictions in various parts of the City are causing pinch points, lack of needed capacity, and concern for potential development in the future.
- There was significant discussion about the need for a regional approach to stormwater management in this area. Hitchcock is downstream from other jurisdictions and is considered "the last stop" before the water makes it way to the bay. Downstream areas are impacted by upstream decisions and issues and therefore, a regional approach is likely to have the best outcome and benefit for this area. By tackling upstream and downstream issues together, these communities will all benefit from a robust approach and solution implementation.
- The City is finding that there is a lack of awareness among residents and developers throughout the community about the flood risks and impacts. There is a great need to educate real estate agents, sellers, residents/homeowners, and developers of the flood risk in the community and ways they can reduce their risk and impacts from these risks.

Discussion Summary



City of Hitchcock

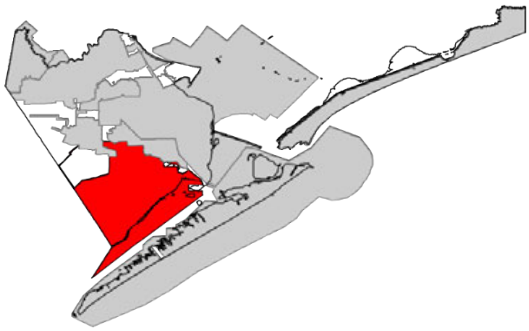


Figure 3: Hitchcock, Texas

The Hitchcock study area is red. The Galveston County boundary in black is for reference.

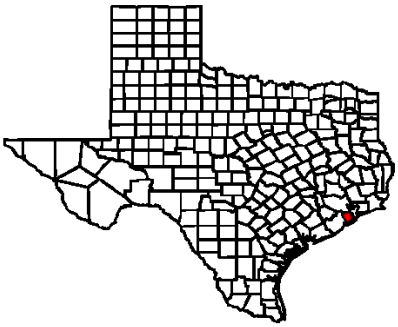


Figure 4: Galveston County, Texas

Galveston County, highlighted in red, provides reference to its location within Texas.

Overview

The City of Hitchcock is in Galveston County approximately fifteen miles south of Houston and ten miles north of Galveston Island. The City includes a large number of structures that were constructed and established pre-Flood Insurance Rate Map (FIRM). This means that many homes are slab-on-grade and below the base flood. Although the City has an established ordinance that requires new development to include two feet of freeboard, the challenge remains on how to reduce the risk these homes face. Hitchcock is located on the coast, and just downstream of several jurisdictions and municipalities. This causes Hitchcock to have to navigate compounded issues from upstream flooding, rain events and drainage issues within the city limits, and storm surge from the bay and Gulf. Due to Hitchcock's location within the Greater Houston Area and its proximity to the Gulf of Mexico, the City is facing potential development pressure throughout the community. Increased growth will only further compound issues the City faces, and it will need to work with others in the region to create a more resilient community to further improve the lives of its citizens.

Discussion Topics

The following topics summarize key issues discussed during the Hitchcock workshop:

Lowered Drainage Capacity and Constrictions

Highland Bayou and Highland Bayou Diversion Canal:

- These waterbodies have experienced significant silting, leading to sediment plugs, reduced drainage capacity, and water quality issues.
- Debris buildup exacerbates flooding by creating snagging issues, especially during storm events.
- A lack of clarity around maintenance responsibilities among local, state, and federal agencies contributes to delays in addressing these problems.
- Decreasing water quality also threatens wetland preservation, a critical component for flood mitigation and ecosystem health.

Specific Drainage Challenges:

- FM 2004 Bridge over Highland Bayou: Flow constrictions at FM 2004 and Highway 6 bridge contribute to nearby flooding. While TxDOT is upgrading this bridge, potential upstream impacts remain unclear.
- Railroad Bridge over Highland Bayou: Reduced clearance under the railroad bridge due to lack of maintenance limits water flow during high tides and storm surges, increasing upstream flood risk.
- Naval Air Station Blimp Hangar off FM 2004: Underground drainage from the WWII-era base is ineffective due to shallow tributaries, posing a concern for future development in the area.

Future Development

Hitchcock anticipates significant development pressure in the future. Key considerations include:

- Many proposed developments are in the 1% annual-chance flood (100-year flood zone), requiring costly flood mitigation measures that may deter some projects.
- Including green spaces in new developments is critical for managing flood risk and enhancing water quality, while also providing recreational and aesthetic value.
- Identifying strategies to address challenges in high-risk areas could enable sustainable growth while minimizing environmental and economic risks.

Regional Approach for Stormwater Management

Hitchcock's location between the coast and neighboring municipalities presents unique challenges and opportunities:

- Coastal and upstream influences compound flood risks, necessitating a regional approach to stormwater management.
- Collaboration with neighboring cities (e.g., La Marque, Santa Fe, Dickinson) could enable the development of comprehensive, region-wide solutions to shared challenges.
- Benefits of regional collaboration include shared resources, consistent standards, and reduced risk across jurisdictions.

Public and Private Education and Awareness of Flood Risks

There is a significant need to increase awareness of flood risks among residents, developers, and real estate professionals:

- Real Estate Professionals**:** Ensure buyers are informed about flood risks associated with properties.
- Residents and Developers: Provide education on flood risk, mitigation strategies, and preparation measures to reduce vulnerabilities.

Base Level Engineering (BLE) and Flood Insurance Rate Maps (FIRMs)

BLE data presented during the workshop highlighted significant changes in flood risk:

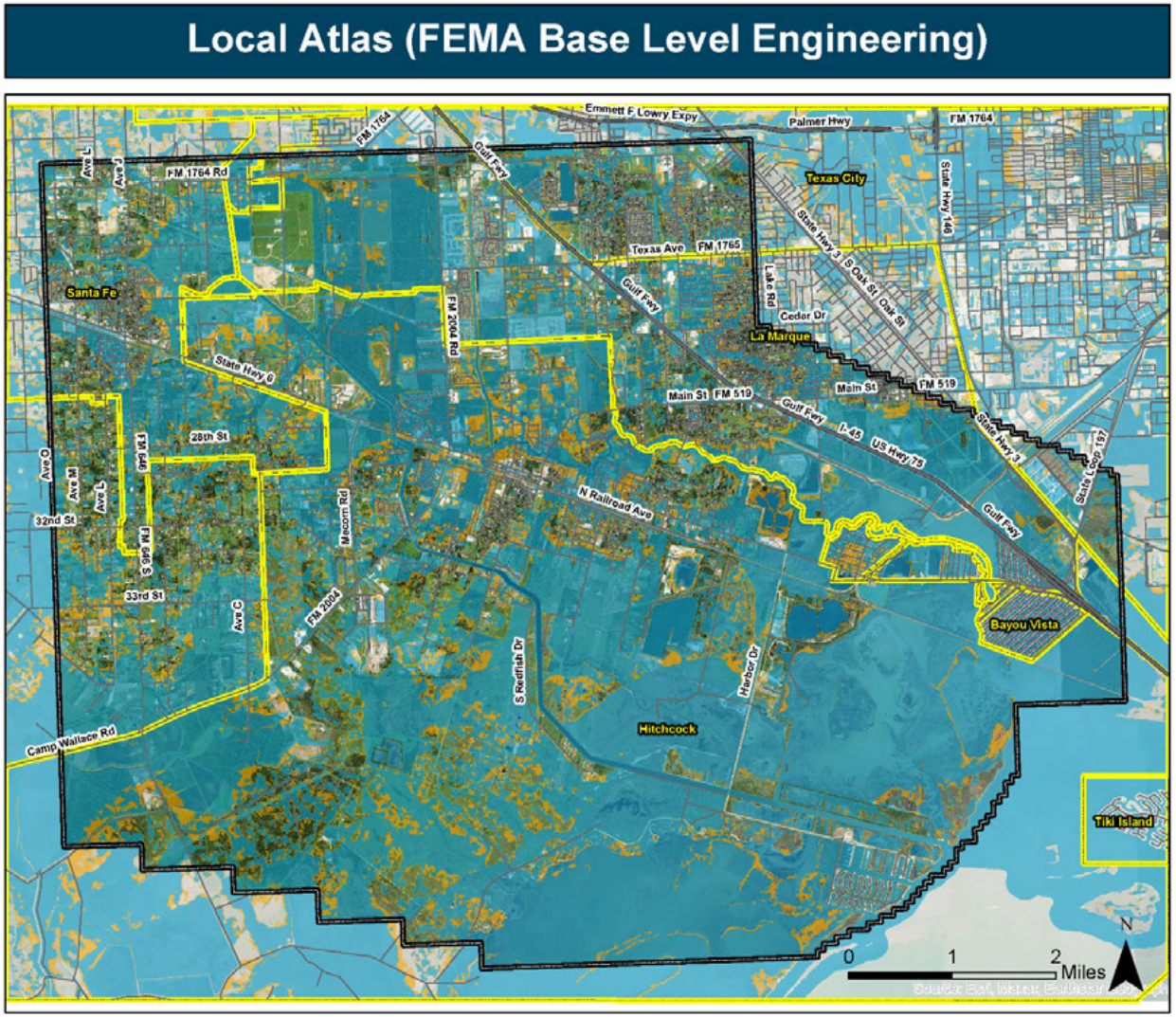
- More areas of the city are now shown in the 1% annual-chance flood zone, while fewer areas fall within the 0.2% annual-chance flood zone (500-year flood).
- These changes indicate a higher overall flood risk, underscoring the need for proactive floodplain management and community engagement to address these vulnerabilities.

More information about BLE is in the next section, Mapping Products.

Mapping Products

The following maps and tables, Figures 3 – Figures 46, include information relevant to all table discussions, as well as information specific to each table that ran through any analysis. Each map includes a brief description of what is included on the map, and describes any results shown from an exercise. It is important to note that the exercises utilized in the Hitchcock CHARM model were based on the Federal Emergency Management Agency (FEMA) BLE and not the FIRMs.

BLE generates watershed-wide flood hazard information built from foundation level hydrologic and hydraulic engineering models – providing floodplain boundaries, flood depth and water surface elevation grids. BLE uses the latest modeling software to create modeling in agreement with FEMA's Standards for Flood Risk Projects. While this data does not immediately replace a community's Flood Insurance Rate Map (FIRM), the analysis provides information to support local communities to determine Base Flood Elevations (BFE) for Zone A and newly identified flood prone areas identified by the BLE analysis. To read more about BLE, visit the FEMA Base Level (BLE) Tools and Resources website.

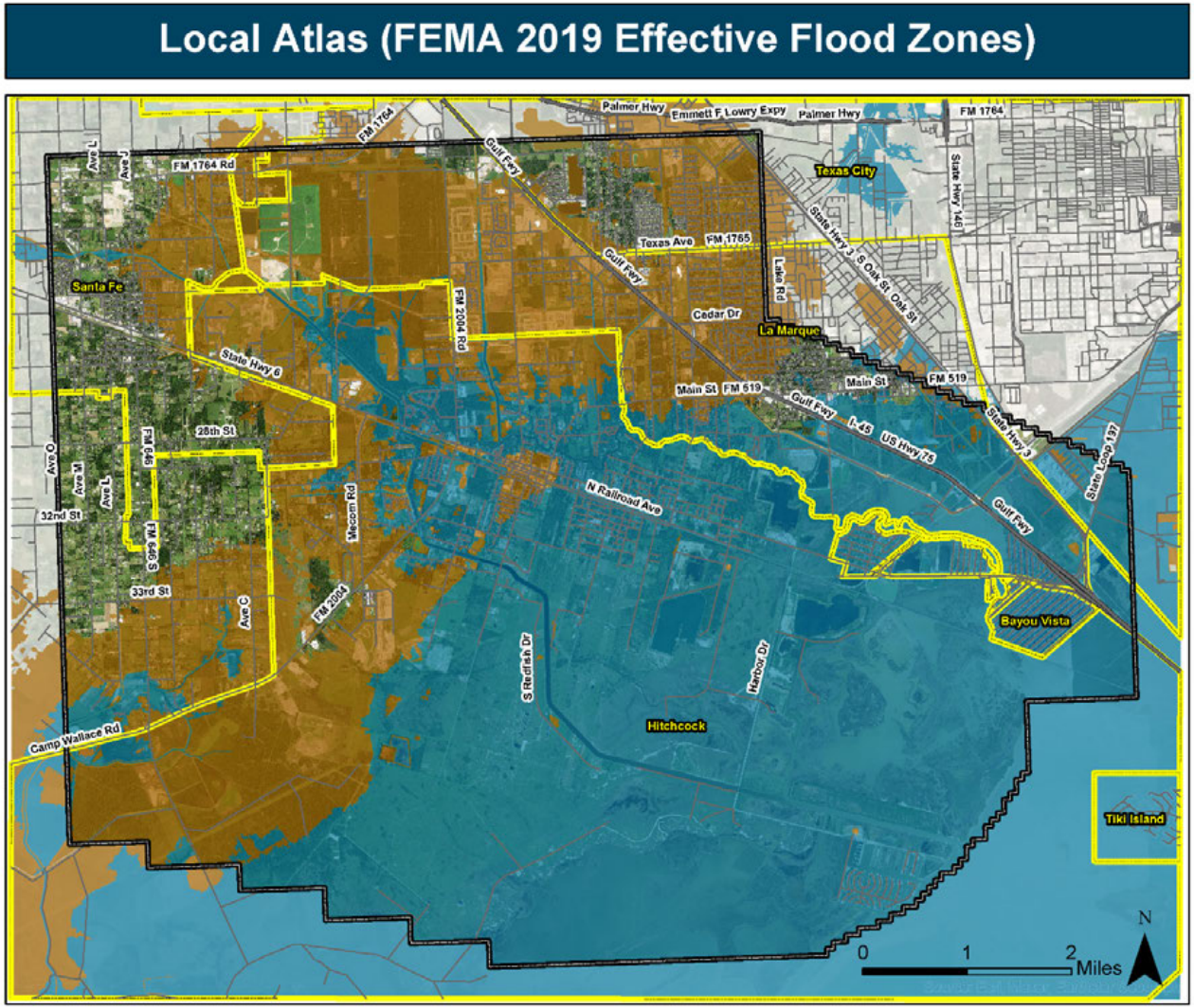


Legend

- Planning Area
- City Boundaries
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

Figure 5: Local Atlas, FEMA Base Level Engineering

The local atlas shows an overview of the CHARM model, the planning area, and the location of critical information, such as flood zones. The exercises used in the workshop utilized the flood zone information pictured here, the FEMA BLE, and not the FEMA 2019 Effective Flood Zones.



Legend

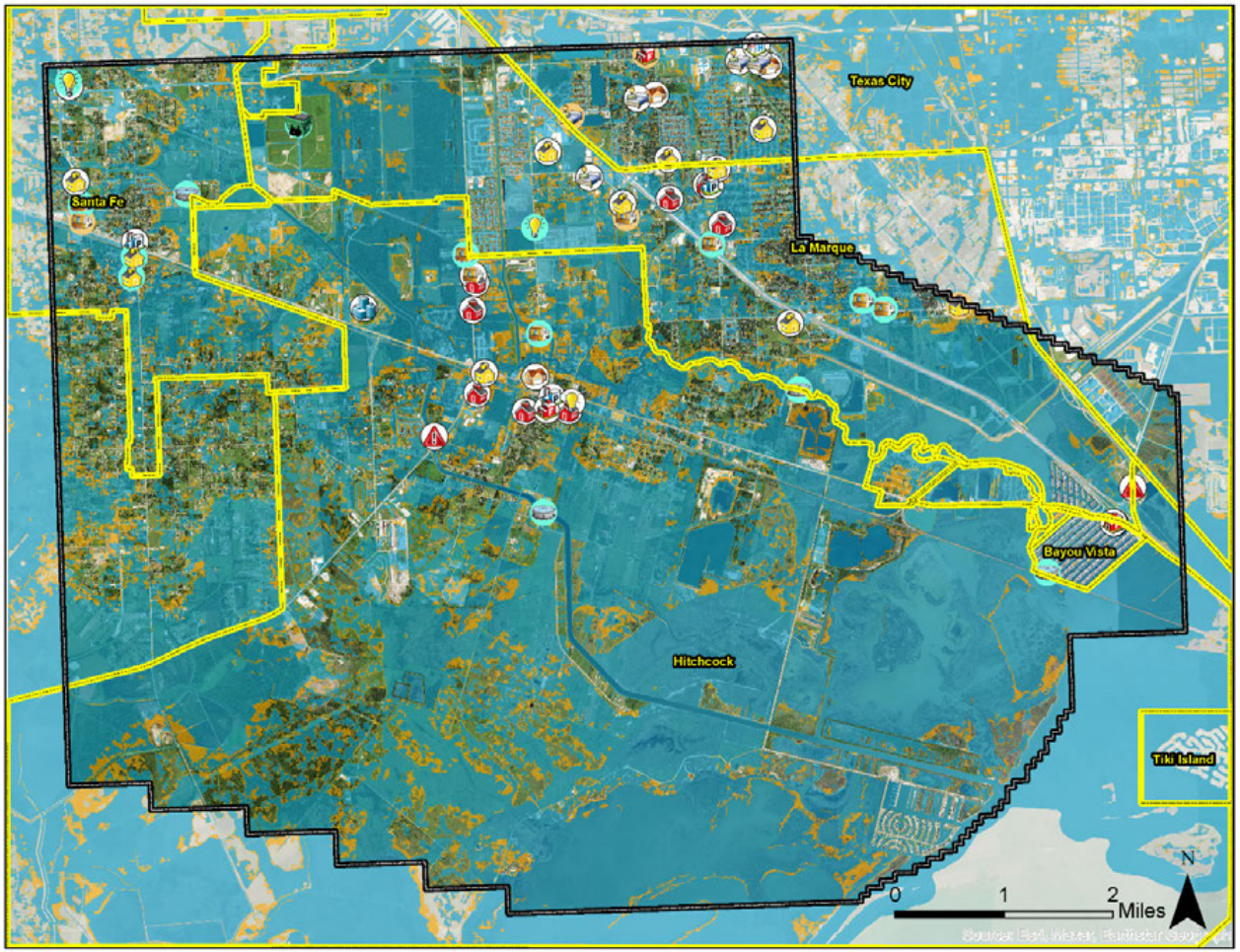
- Planning Area
- City Boundaries
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

Figure 6: Local Atlas, FEMA Effective Flood Zones (2019)

The local atlas was also shown with the FEMA 2019 Effective Flood Zones (pictured here). Although not utilized for CHARM exercises, this map shows the current regulatory Flood Insurance Rate Map (FIRM). Updated mapping, the FEMA BLE, shows that much of Hitchcock is not actually in the 500-yr, or 0.2% flood zone, but in the 100-yr, or 1% flood zone. The updated FEMA BLE is the most-up-to-date FEMA flood modeling, and more information can be found at this website: https://webapps.usgs.gov/infrm/estbfe/.

Please note that the FEMA 2019 Effective Flood Zones, FIRMs, are still considered regulatory at the date of this report.

Critical Facilities in 100-Year and 500-Year Flood Zones

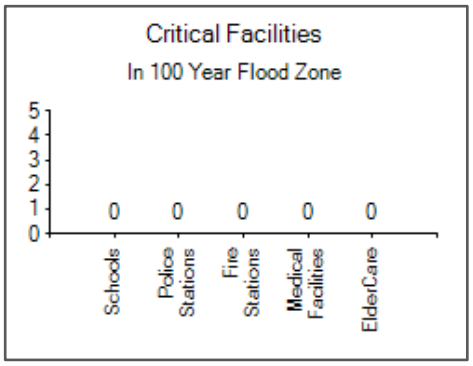


Legend

- Planning Area
- City Boundaries
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

Critical Facilities

- Convention Center
- Substation
- Fire Station
- Medical Facility
- Mobile Home Park
- Police Station
- School
- Day Care
- Hazardous Materials Facility
- Nursing Home
- Senior Living
- Solid Waste Facility
- Waste Water Treatment Plant



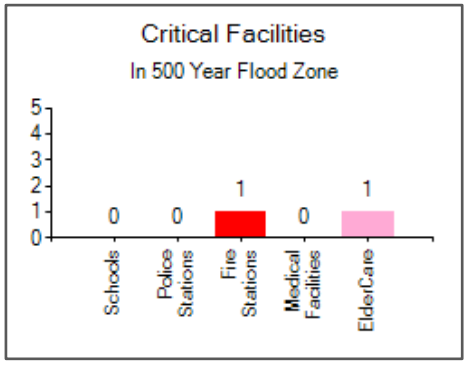
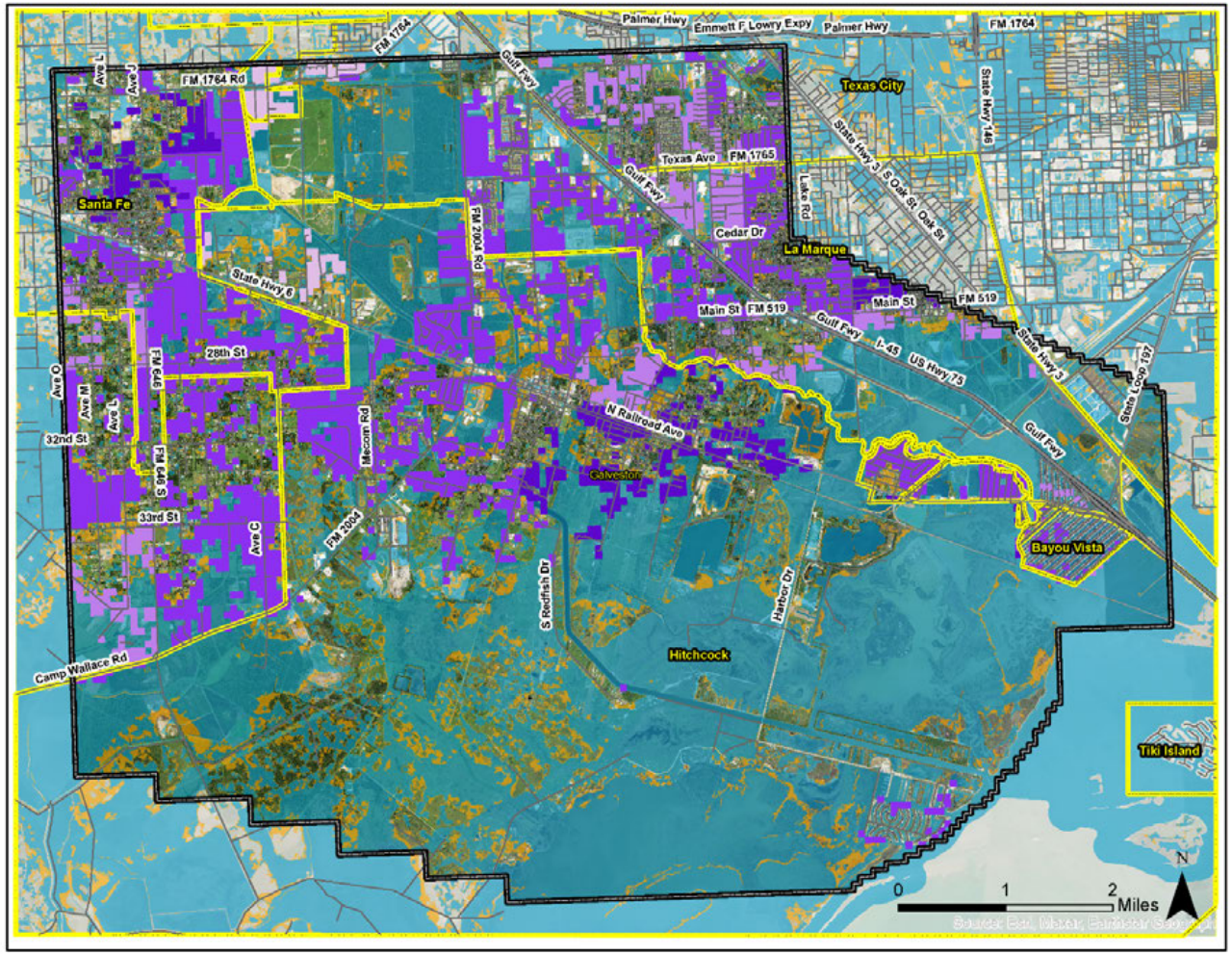


Figure 7: Critical Facilities in 100- and 500-Year Flood Zones

This map shows the critical facility locations in the City of Hitchcock, and their proximity to the FEMA BLE flood zones. It should be noted that there are no critical facilities located within the 100-year, or 1%, flood zone, and there is one fire station, and one elder care facility located within the 500-yr, or 0.2% flood zone.

Social Vulnerability
Age 65+, Per Capita Income, Mobile Homes, 100-Yr Flood Zone



Legend

- Planning Area
- Places
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

Social Vulnerability Index

- Low Vulnerability
- Medium-Low Vulnerability
- Medium-High Vulnerability
- High Vulnerability

Social Vulnerability

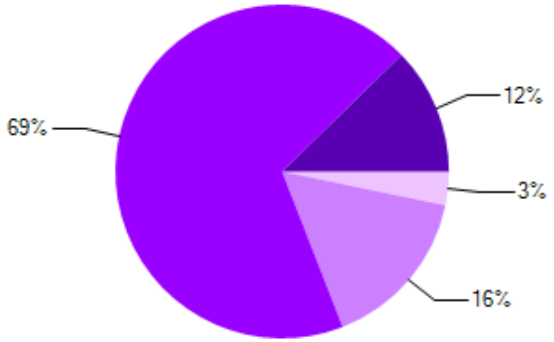
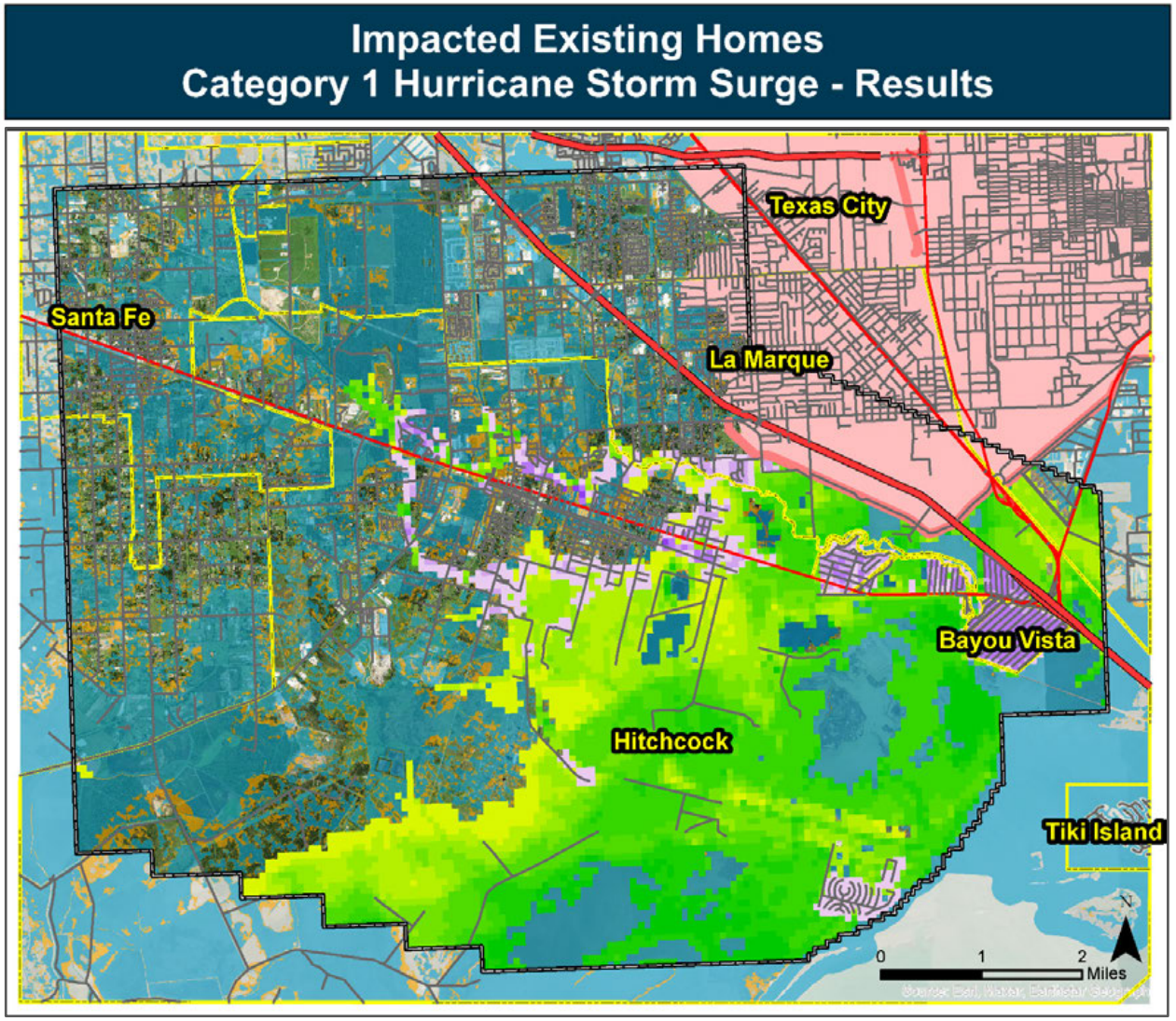
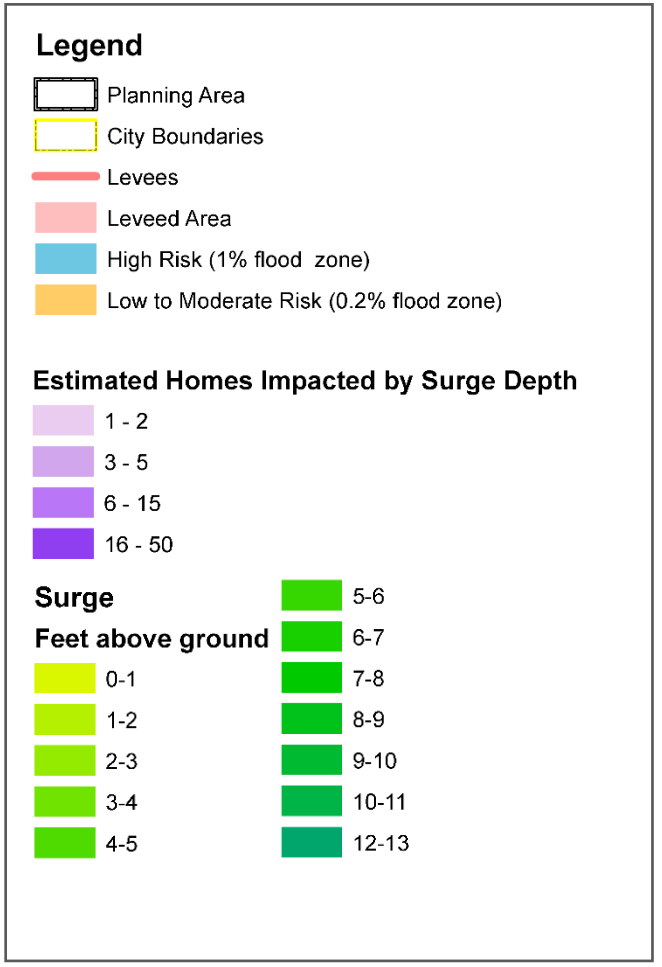


Figure 8: Social Vulnerability - Age 65+, Per Capital Income, Mobile Homes, 100-Year Flood Zone

This map shows the social vulnerability of multiple vulnerabilities. The darkest purple represents the "High Vulnerability" population representing 12% of the population that is impacted by all these vulnerabilities. The largest portion of at-risk populations, in the medium to high vulnerability range, is at 69% of the population impacted by all these vulnerabilities. The purpose of these colors is to show where there is higher risk associated with compounded vulnerabilities. Residents who face compounded vulnerabilities are particularly susceptible to natural disasters such as hurricanes and floods and may face more hurdles when trying to recover and become more resilient to future disasters.





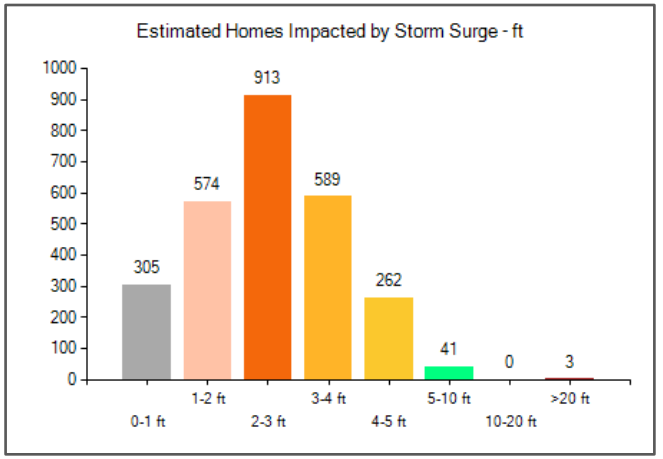
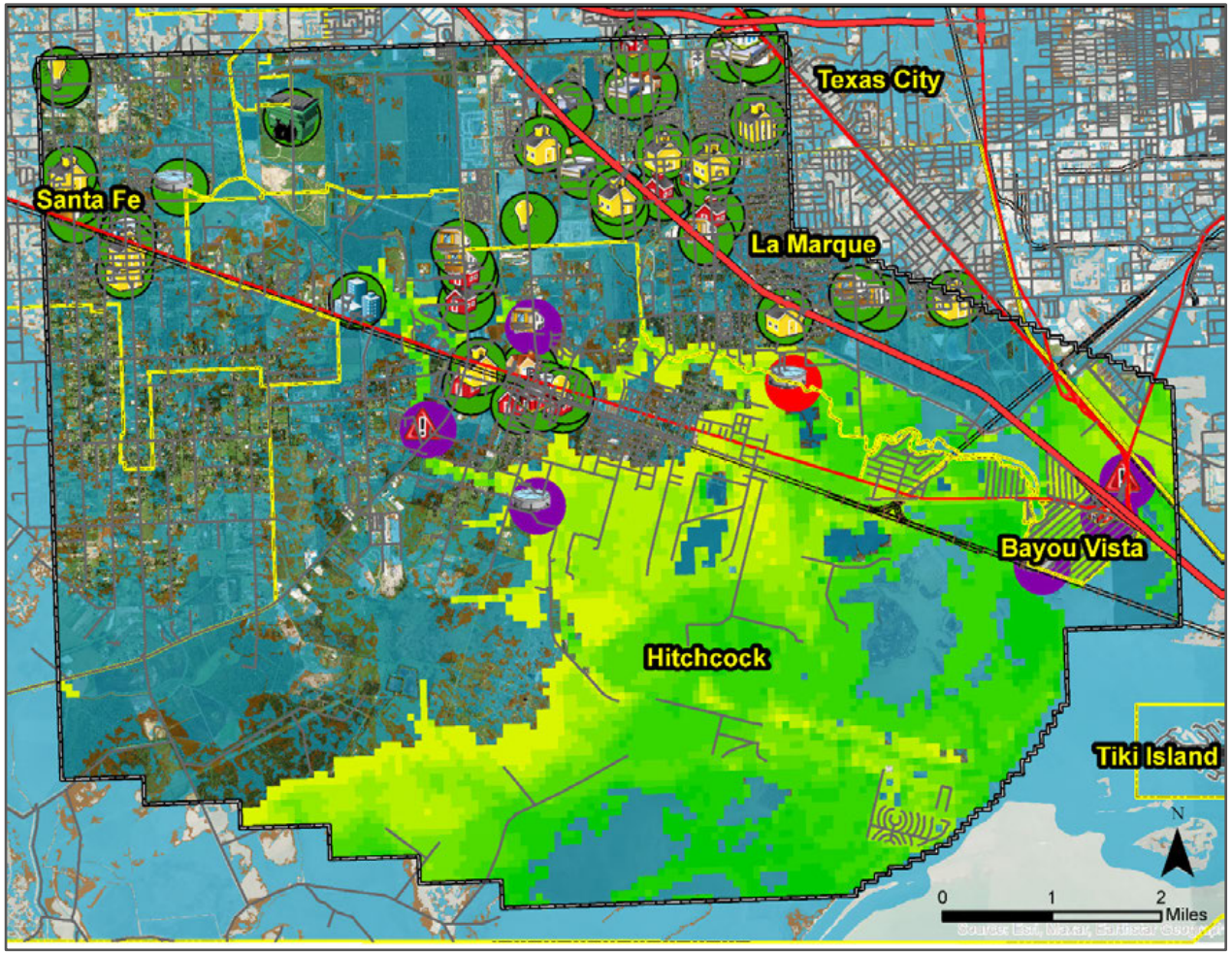


Figure 9: Impacted Existing Homes - Category 1 Hurricane Storm Surge – Results

This map shows impact to existing homes from a Category 1 Hurricane storm surge. During a Category 1 Hurricane, the City of Hitchcock is likely to see some impacts to homes that are in the lowest lying areas, or nearest to the coast and potentially other waterbodies.

Impacted Critical Facilities
Category 1 Hurricane Storm Surge - Results



Legend

- Planning Area
- City Boundaries
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

Surge
Feet above ground

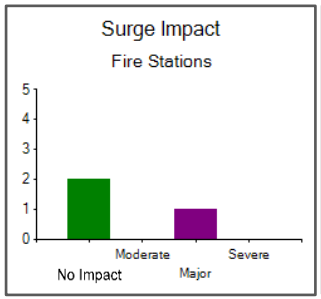
0-1	3-4	8-9
1-2	4-5	9-10
2-3	5-6	10-11
	6-7	12-13
	7-8	

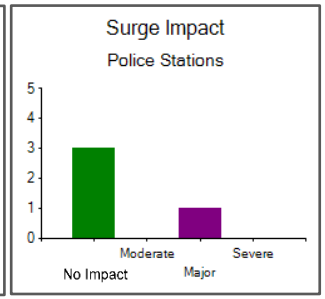
Surge Impact

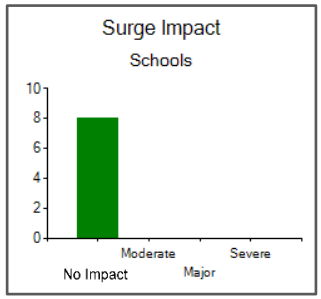
- No Impact
- Major
- Moderate
- Severe

Critical Facilities

- Convention Center
- Substation
- Fire Station
- Medical Facility
- Mobile Home Park
- Police Station
- School
- Day Care
- Hazardous Materials Facility
- Nursing Home
- Senior Living
- Solid Waste Facility
- Waste Water Treatment Plant







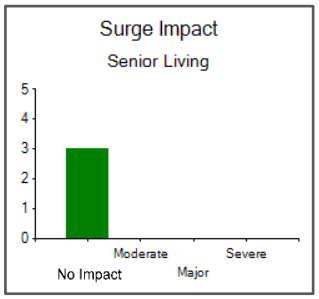
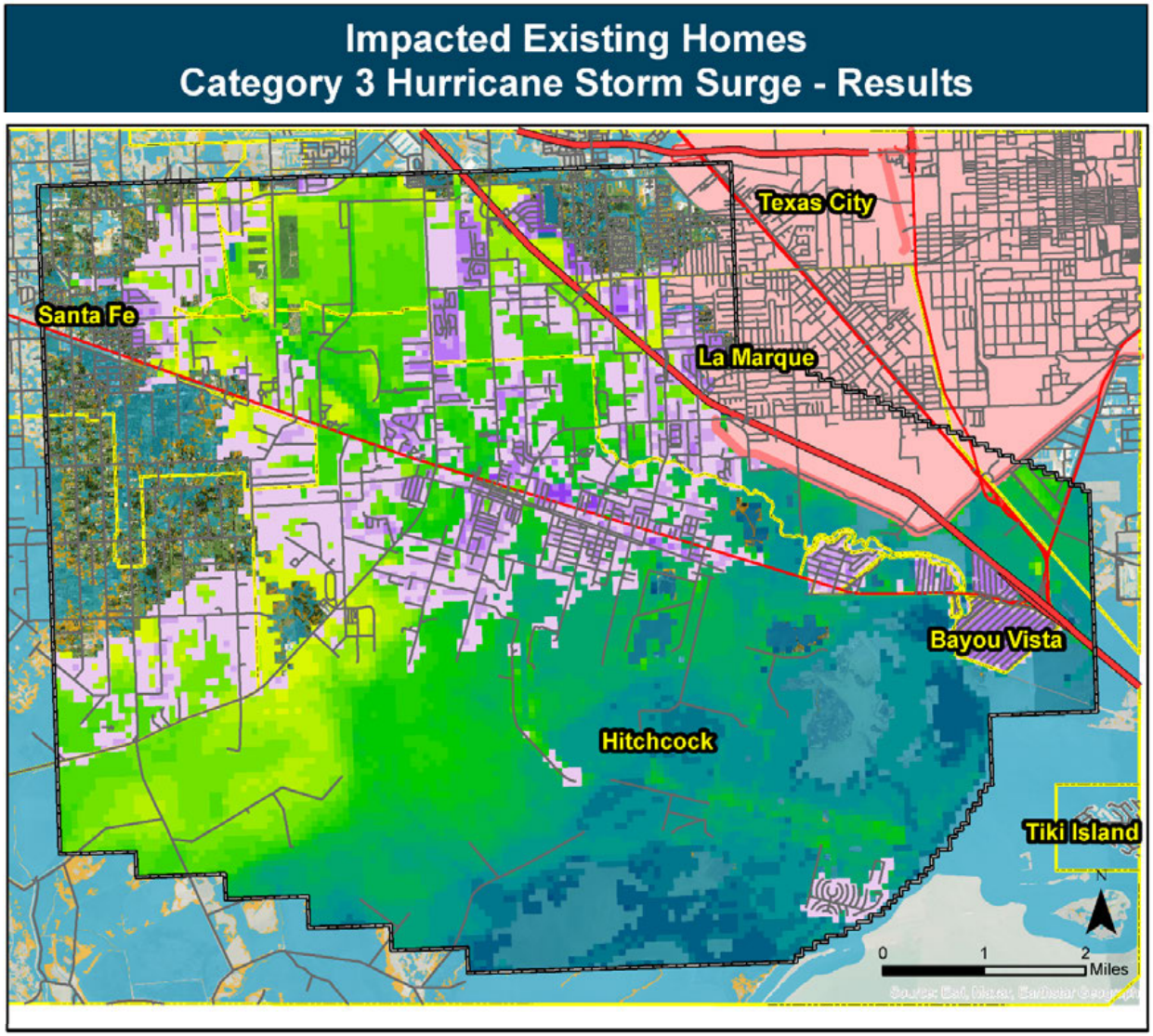
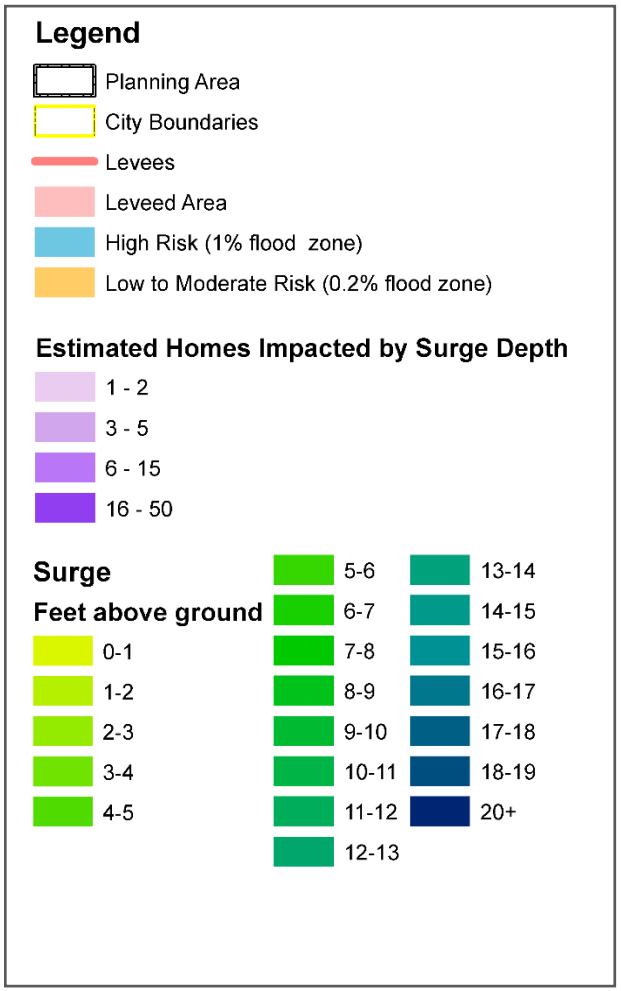


Figure 10: Impacted Critical Facilities - Category 1 Hurricane Storm Surge – Results

This map shows impact to existing critical facilities from a Category 1 Hurricane storm surge. During a Category 1 Hurricane, the City of Hitchcock is likely going to have impacts to facilities that are in the lowest lying areas, or nearest to the coast and potentially other waterbodies. While senior living and schools will see no impact, fire and police stations may be impacted by storm surge during a Category 1 hurricane.





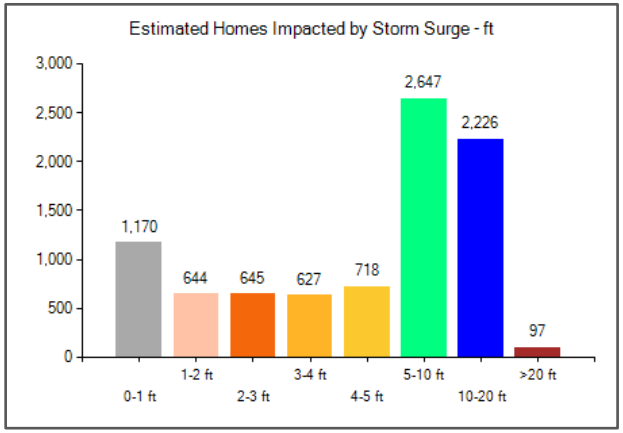
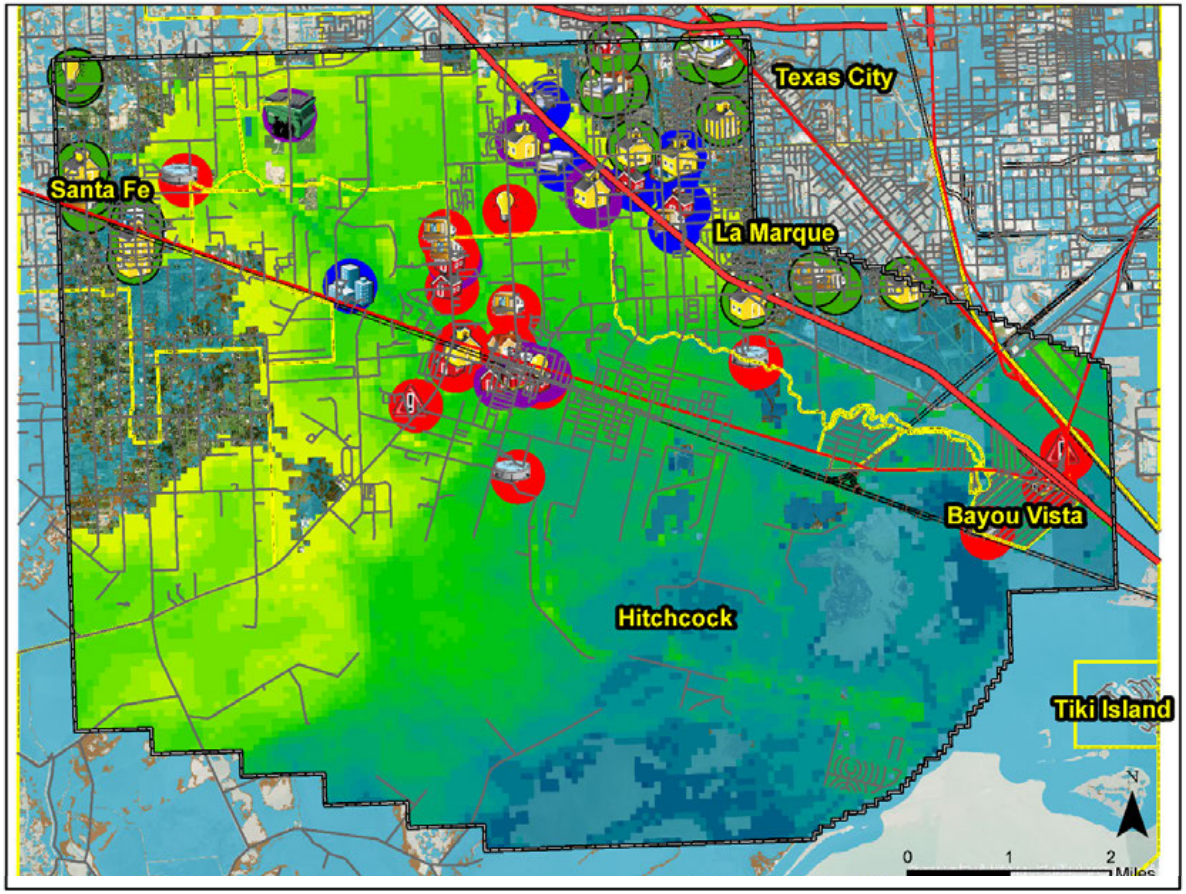


Figure 11: Impacted Existing Homes - Category 3 Hurricane Storm Surge – Results

This map shows impact to existing homes from a Category 3 Hurricane storm surge. During a Category 3 Hurricane, the City of Hitchcock would likely see significant impacts from storm surge around the community.

Impacted Critical Facilities
Category 3 Hurricane Storm Surge - Results



Legend

- Planning Area
- City Boundaries
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

Surge
Feet above ground

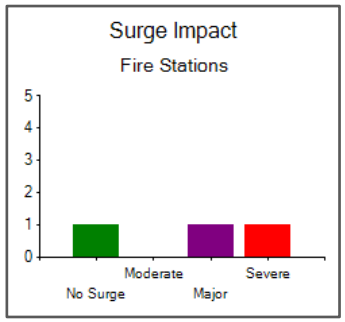
0-1	5-6	13-14
1-2	6-7	14-15
2-3	7-8	15-16
3-4	8-9	16-17
4-5	9-10	17-18
	10-11	18-19
	11-12	20+
	12-13	

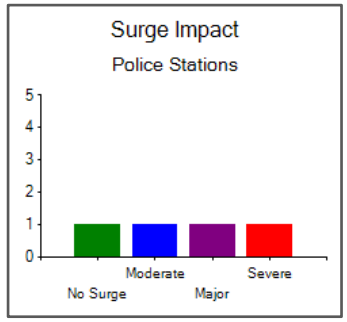
Surge Impact

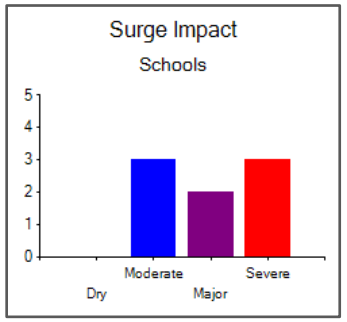
No Impact · Moderate · Major · Severe

Critical Facilities

- Convention Center
- Substation
- Fire Station
- Medical Facility
- Mobile Home Park
- Police Station
- School
- Day Care
- Hazardous Materials Facility
- Nursing Home
- Senior Living
- Solid Waste Facility
- Waste Water Treatment Plant







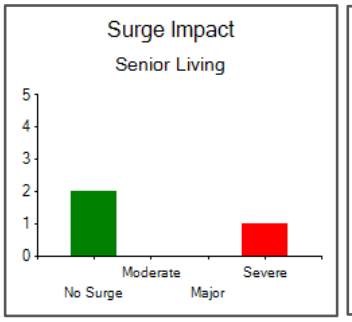
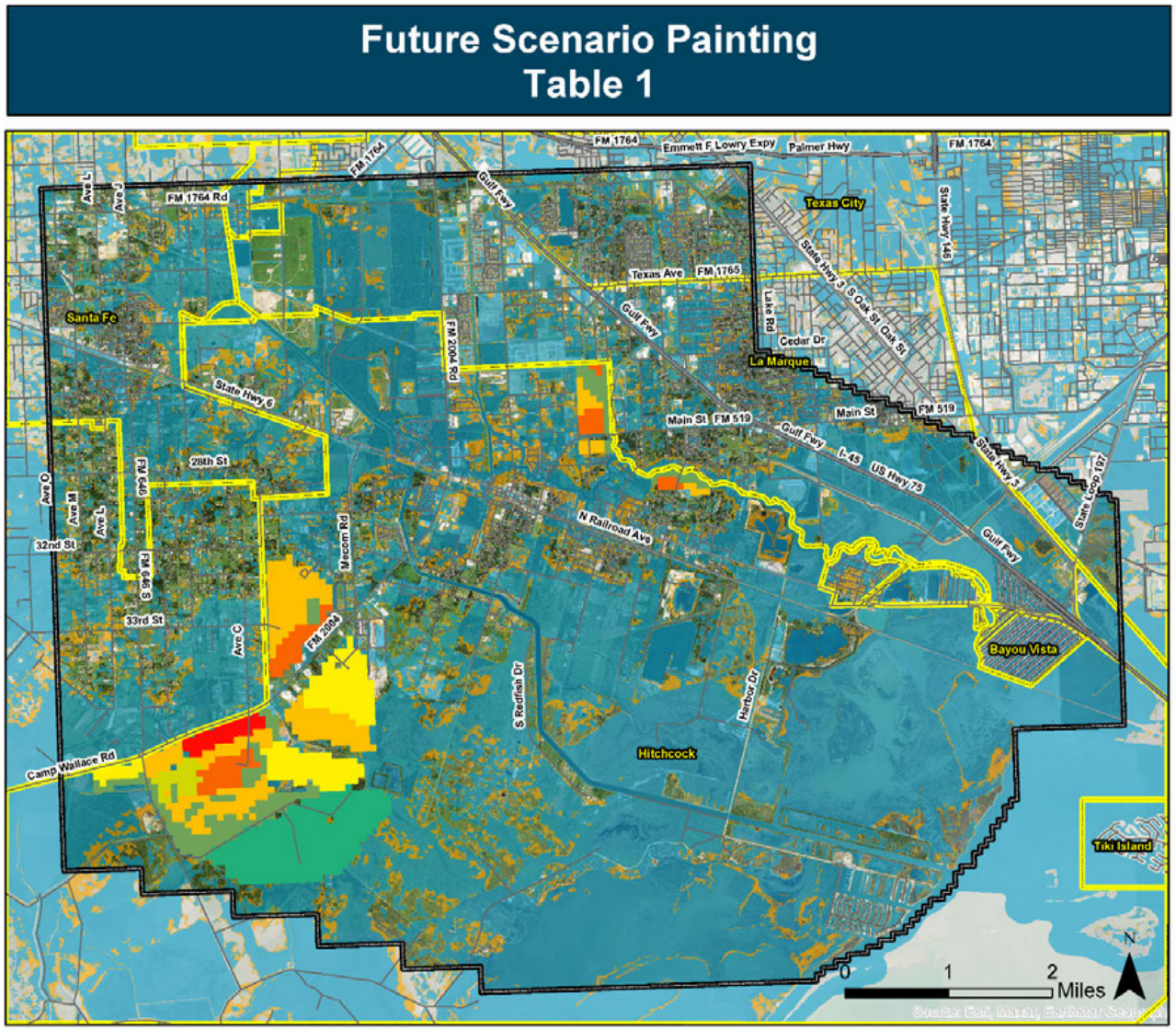


Figure 12: Impacted Critical Facilities - Category 3 Hurricane Storm Surge – Results

This map shows impact to existing critical facilities from a Category 3 Hurricane storm surge. During a Category 3 Hurricane, several types of critical facilities will be impacted from moderate to severe levels.



Legend

- Planning Area
- City Boundaries
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

Land Use Paint

- Town Homes
- Medium Density Residential
- Urban Residential
- Suburb Subdivisions
- Big Box Stores or Strip Malls
- Conservation Area
- Park-Recreation Facilities

Figure 13: Future Scenario Painting, Table 1

This map shows the scenario painting that occurred at Table 1. Discussions at this table included adding urban residential, suburb subdivisions, townhomes, big box stores or strip malls, conservation areas, and park-recreation facilities.

On the next page are five tables that display calculated graphical results in number of homes, acreage development, estimated open space benefit, and population numbers based on the scenario painting that occurred at Table 1. It should be noted that these are estimates and not exact calculations and should be utilized for high-level or conceptual planning only.

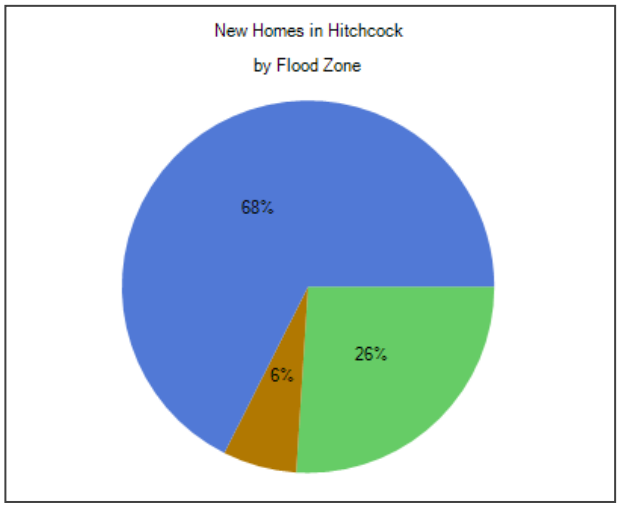


Figure 14: New Homes in Hitchcock by Flood Zone, Table 1

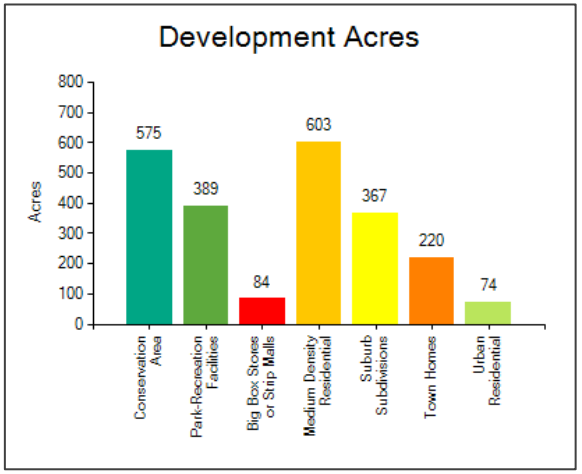


Figure 15: Development Acres, Table 1

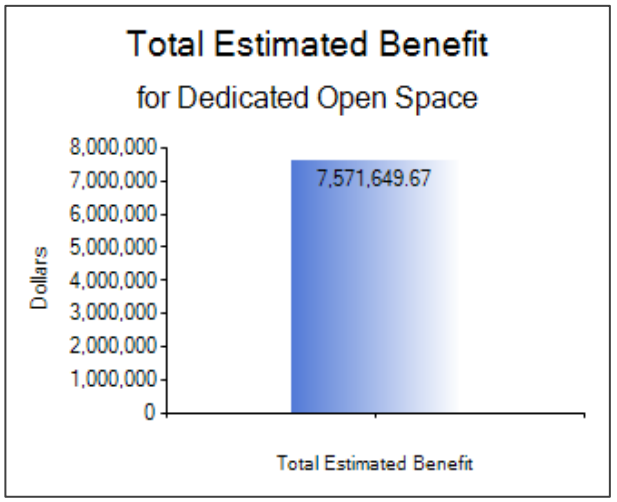


Figure 16: Total Estimated Benefit for Dedicated Open Space, Table 1

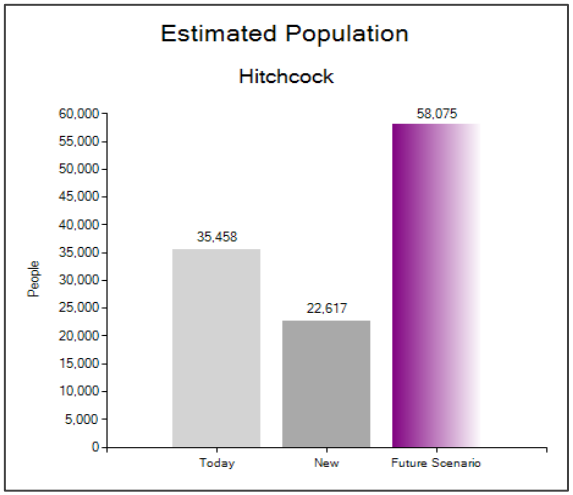


Figure 17: Estimated Population, Table 1

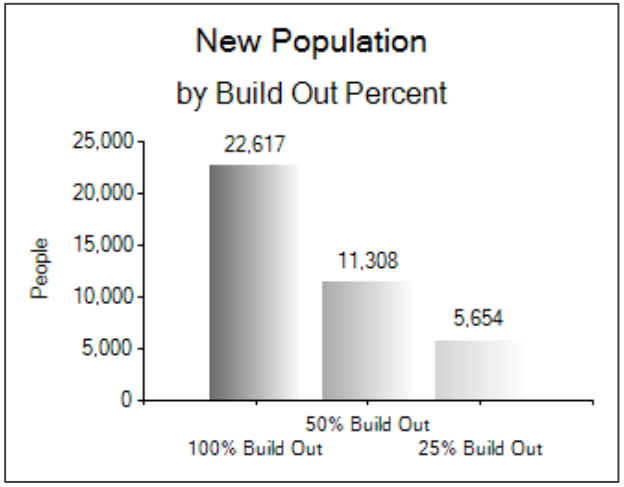


Figure 18: New Population by Build Out Percent, Table 1

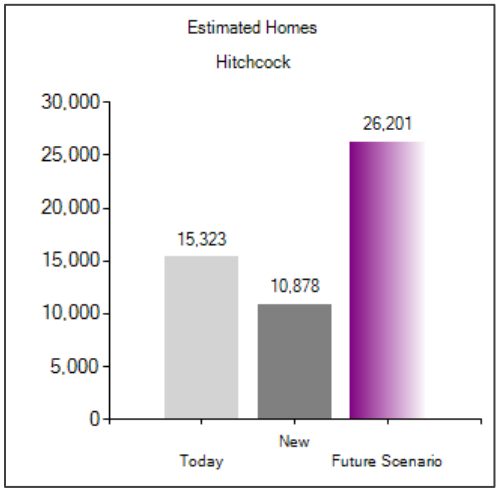
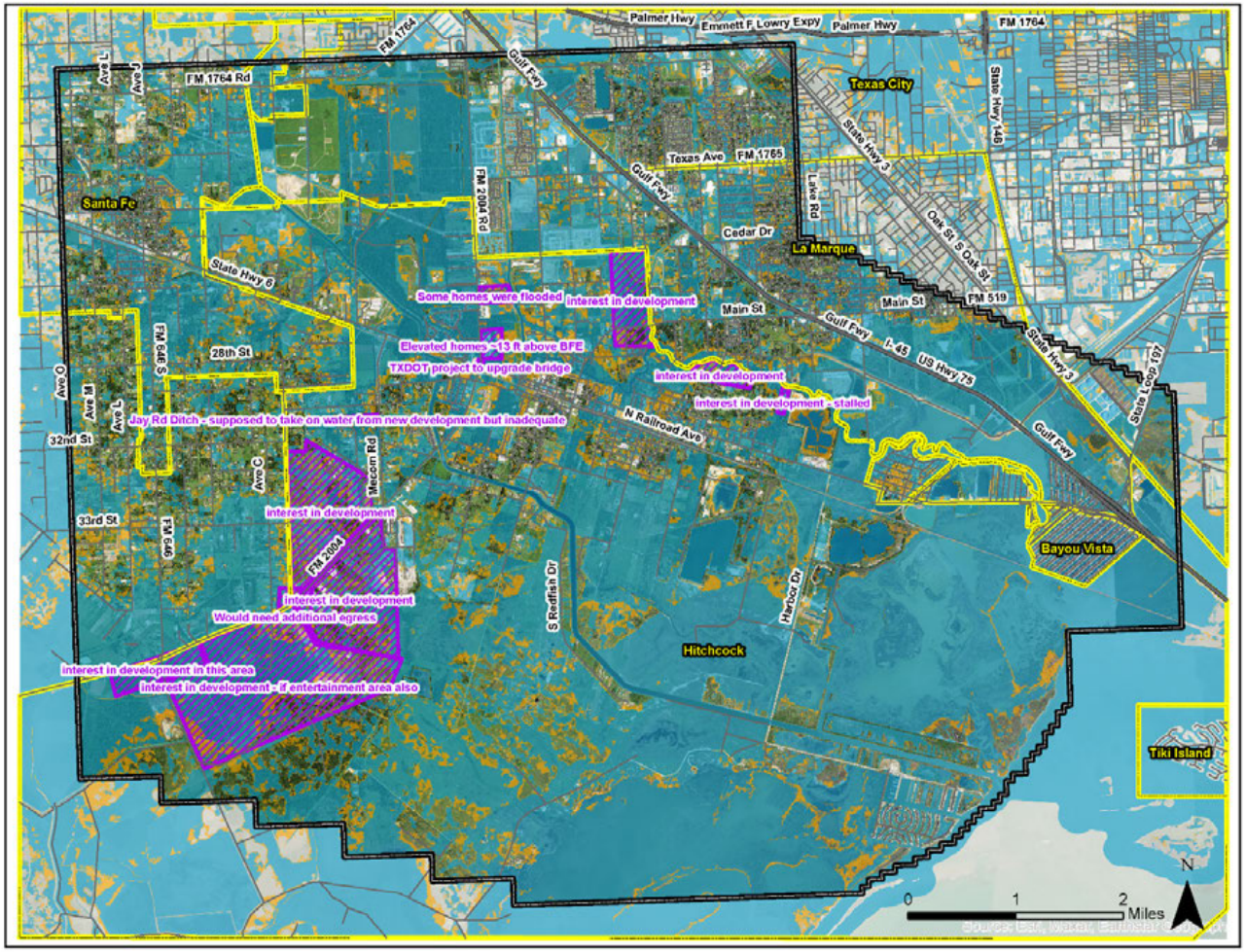


Figure 19: Estimated Homes, Table 1

Comments
Table 1



Legend

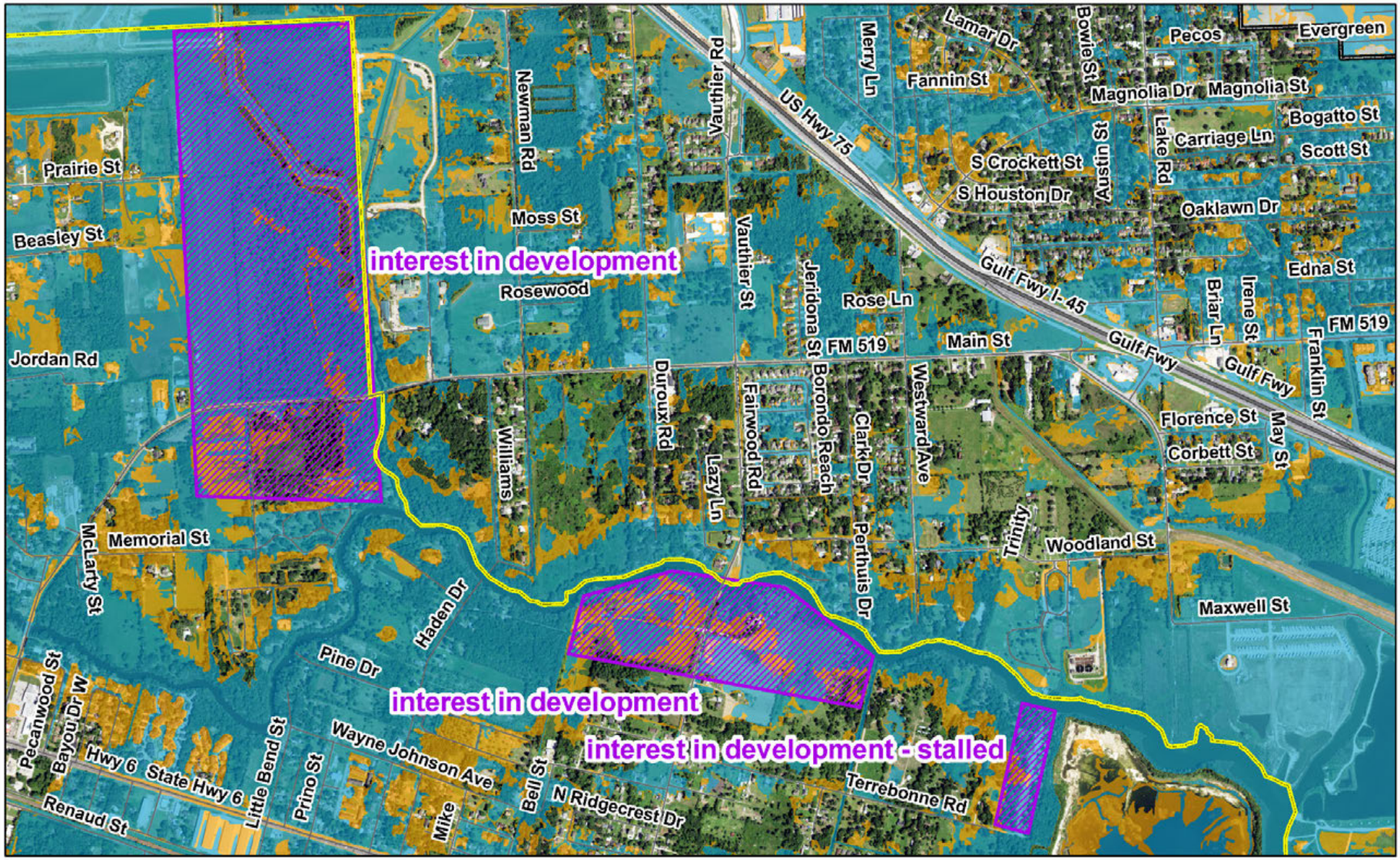
- Planning Area
- City Boundaries
- Comments
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

Figure 20: Table Comments Overview, Table 1

This map shows a community-wide overview of comments from discussions held at Table 1. The next three figures show zoomed-in comment areas.

Comments range from problem areas and solution ideas to general thoughts or information.

Comments - Table 1



Legend

- Planning Area
- City Boundaries
- Comments
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

0 0.25 0.5 Miles

N

Figure 21: Table Comments (1), Table 1

Comments - Table 1

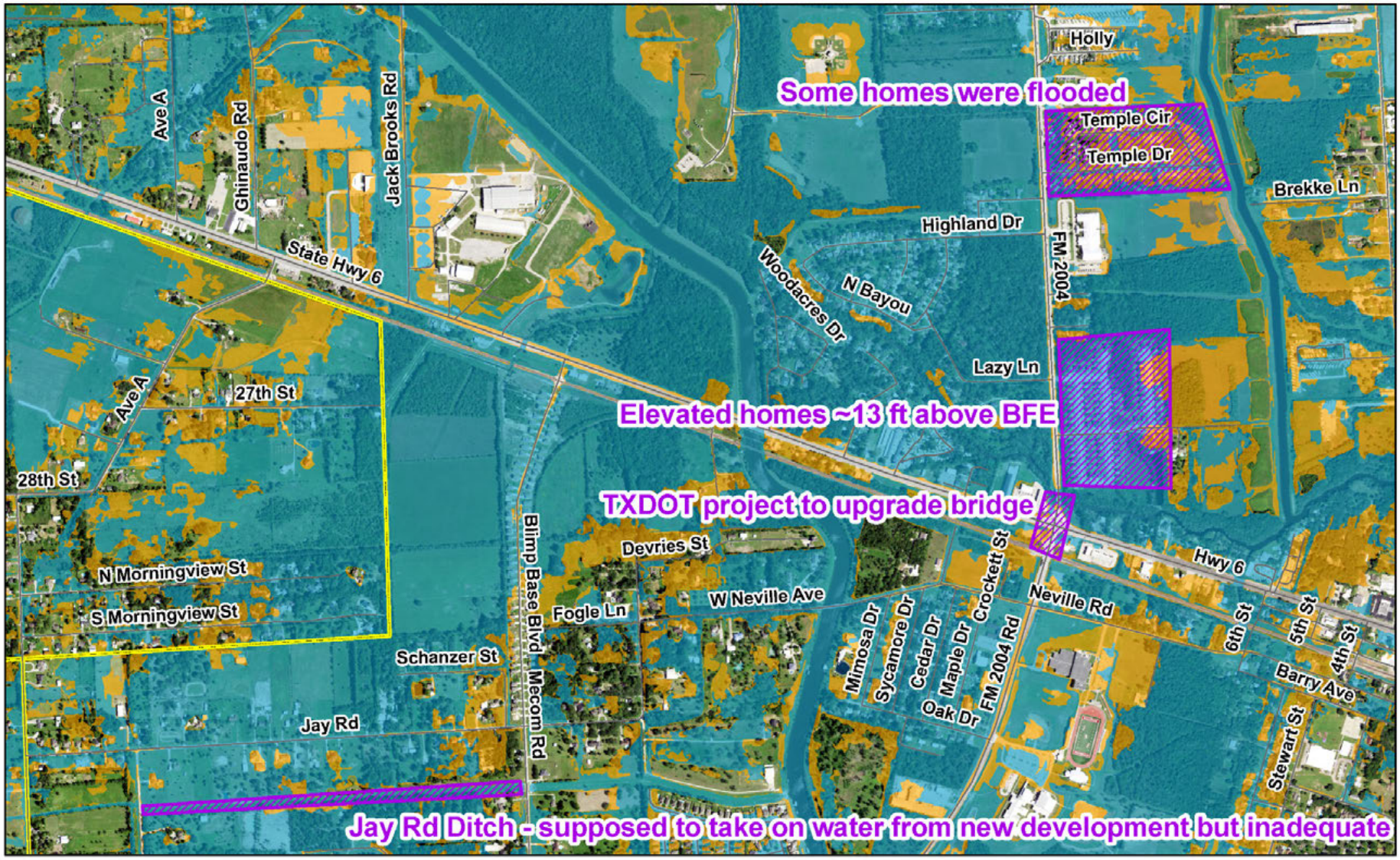


Figure 22: Table Comments (2), Table1

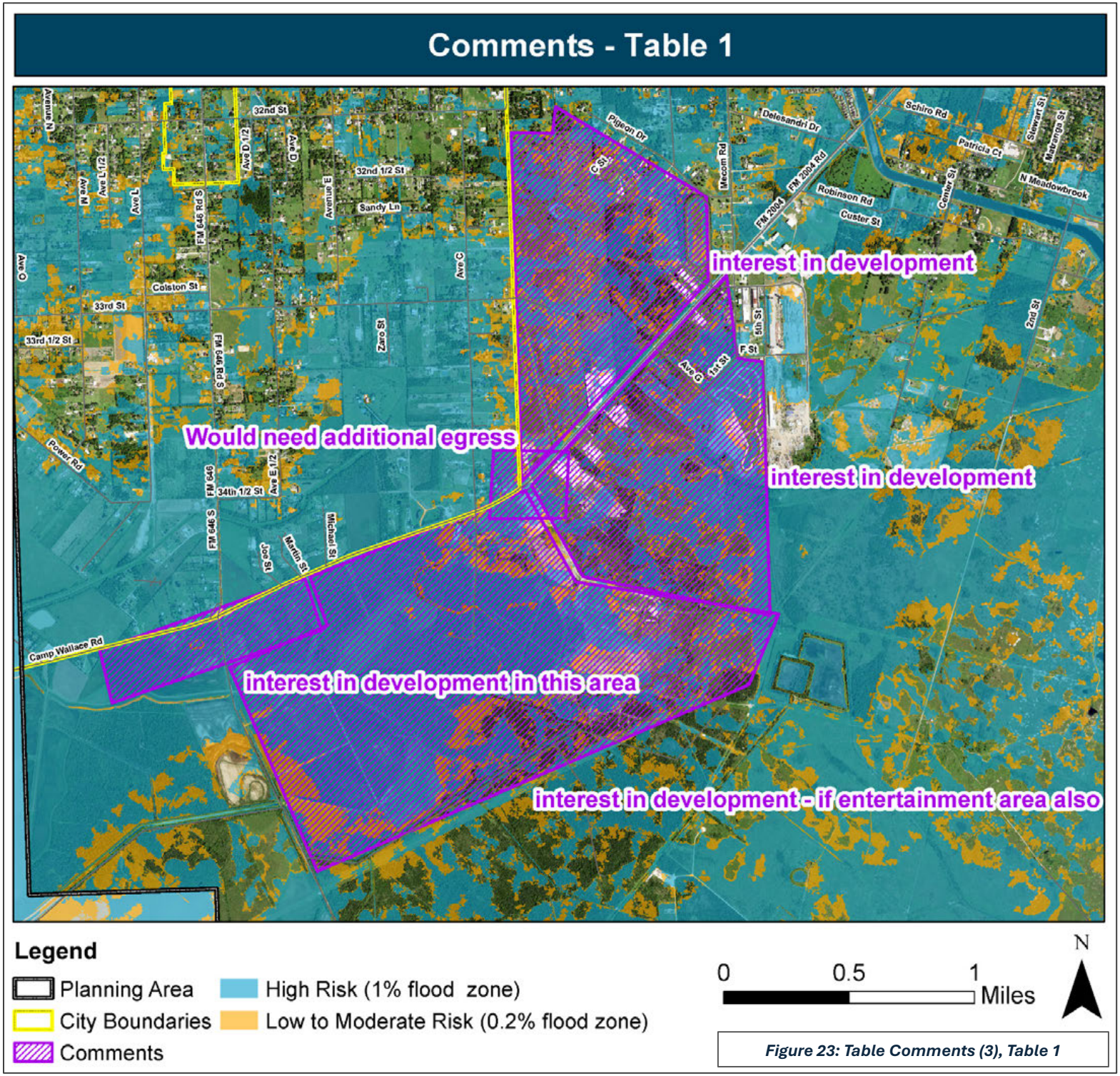
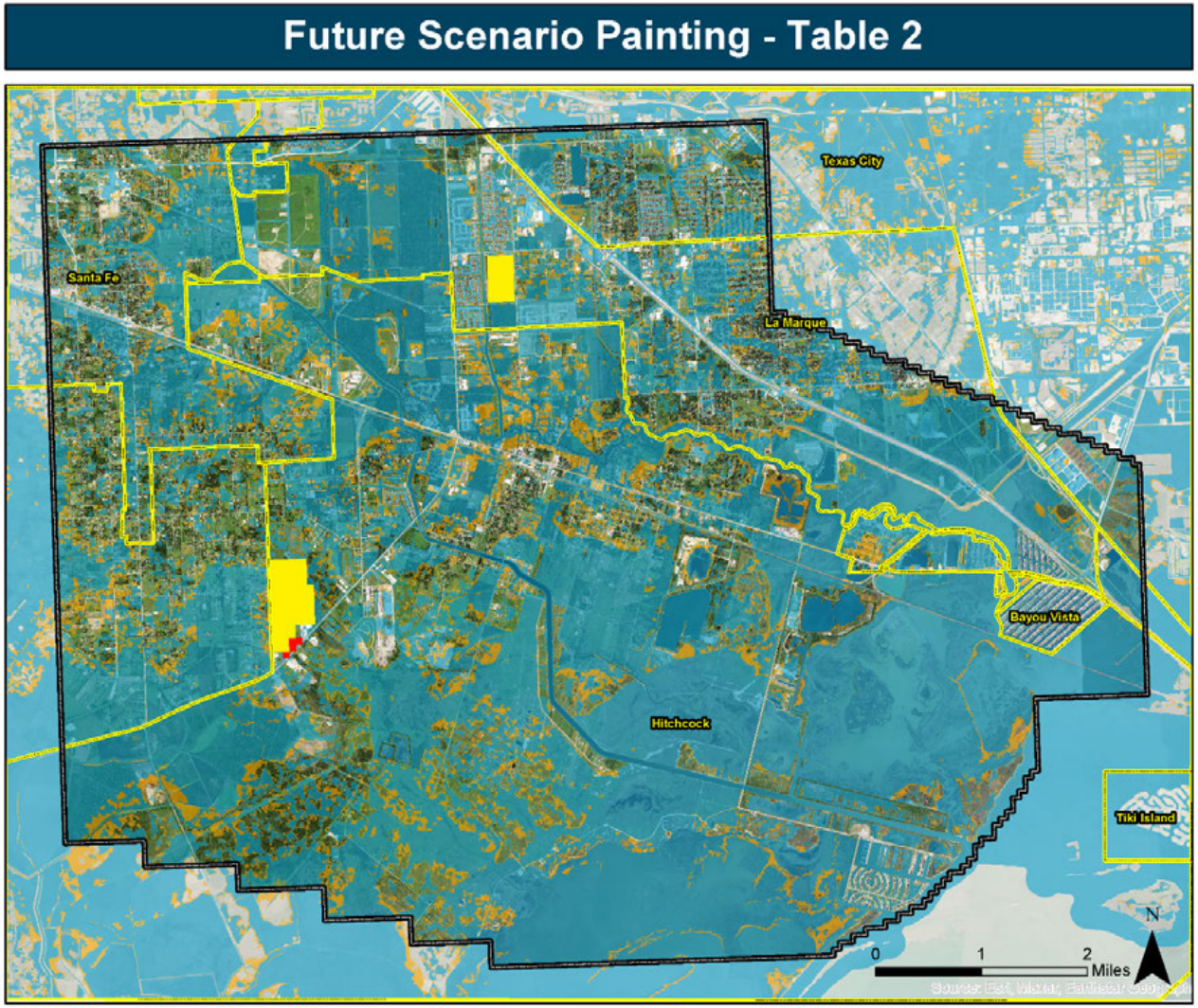


Figure 23: Table Comments (3), Table 1



Legend

- Planning Area
- City Boundaries
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

Land Use Paint

- Suburb Subdivisions
- Big Box Stores or Strip Malls

Figure 24: Scenario Painting, Table 2

*This map shows the scenario painting that occurred at Table 2. Discussions at this table looked at adding urban suburb subdivisions and big box stores. Most of the discussion around potential development was not painted in this scenario but was identified in the comment maps (***Figure 30** – **Figure 35**).

On the next page are five tables that display calculated graphical results in number of homes, acreage development, and population numbers based on the scenario painting that occurred at Table 2. It should be noted that these are estimates and not exact calculations and should be utilized for high-level or conceptual planning only.

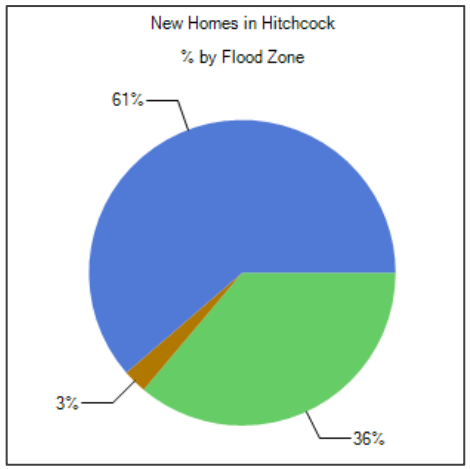


Figure 25: New Homes in Hitchcock by Flood Zone, Table 2

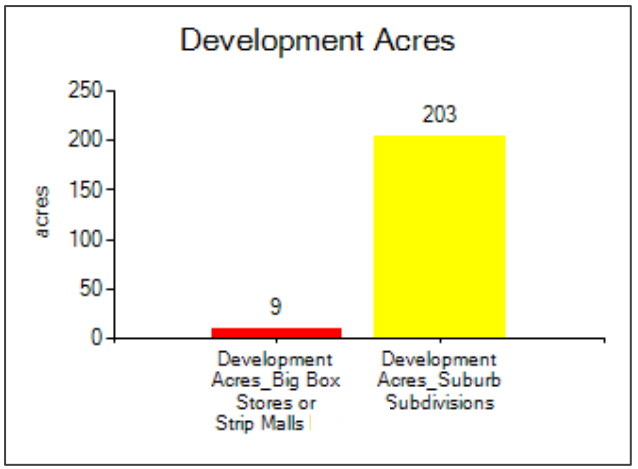


Figure 26: Development Acres, Table 2

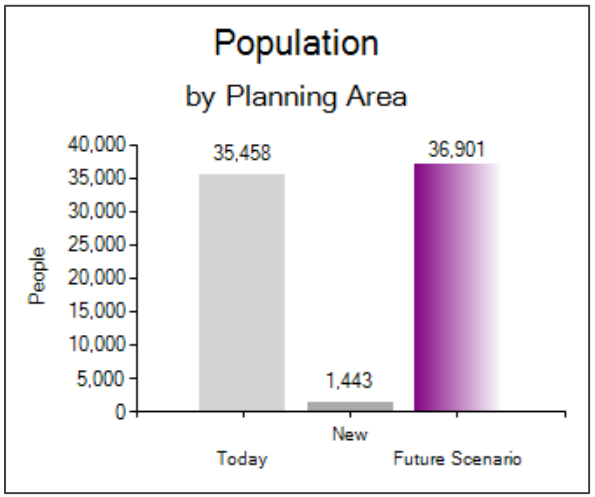


Figure 27: Estimated Population, Table 2

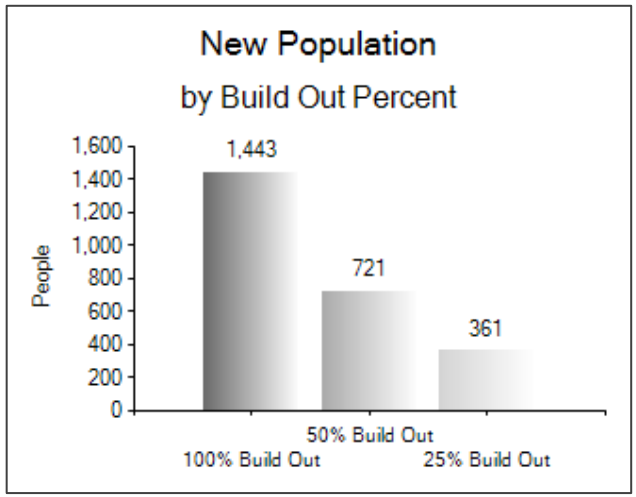


Figure 28: New Population by Build Out Percent, Table 2

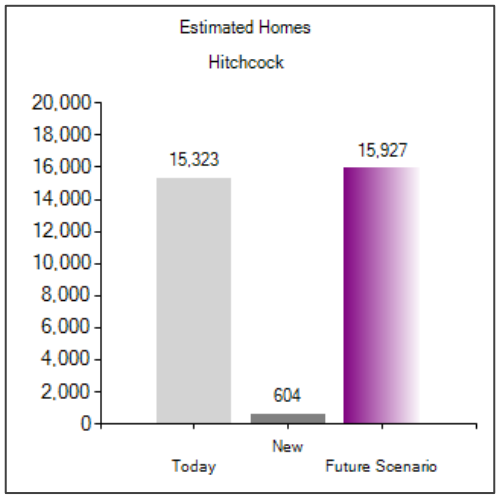
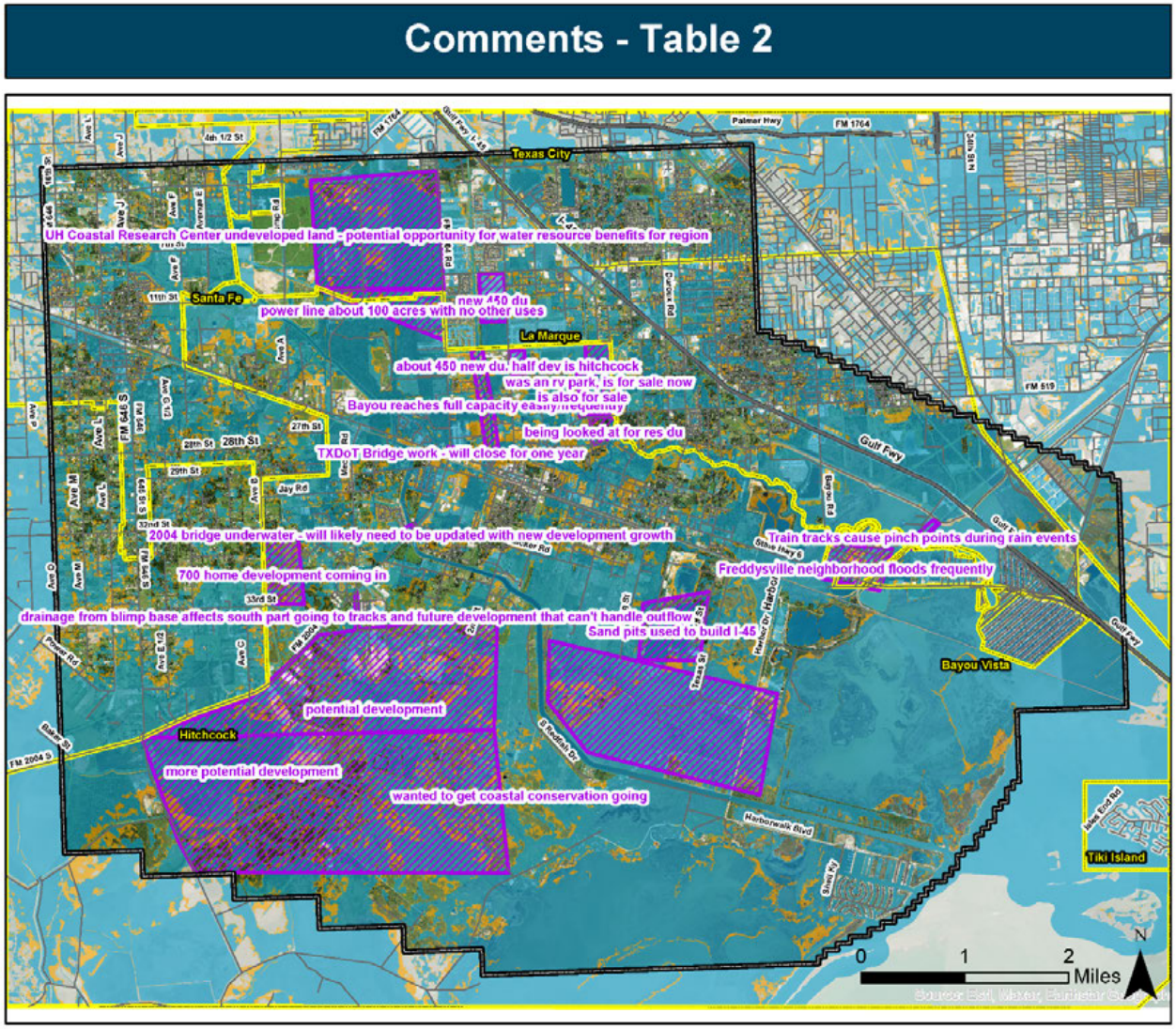


Figure 29: Estimated Homes, Table 2



Legend

- Planning Area
- City Boundaries
- Comments
- High Risk (1% flood zone)
- Low to Moderate Risk (0.2% flood zone)

Figure 30: Table Comments Overview, Table 2

This map shows a community-wide overview of comments from discussions held at Table 2. The next five figures show zoomed-in comment areas.

Comments range from problem areas and solution ideas to general thoughts or information.

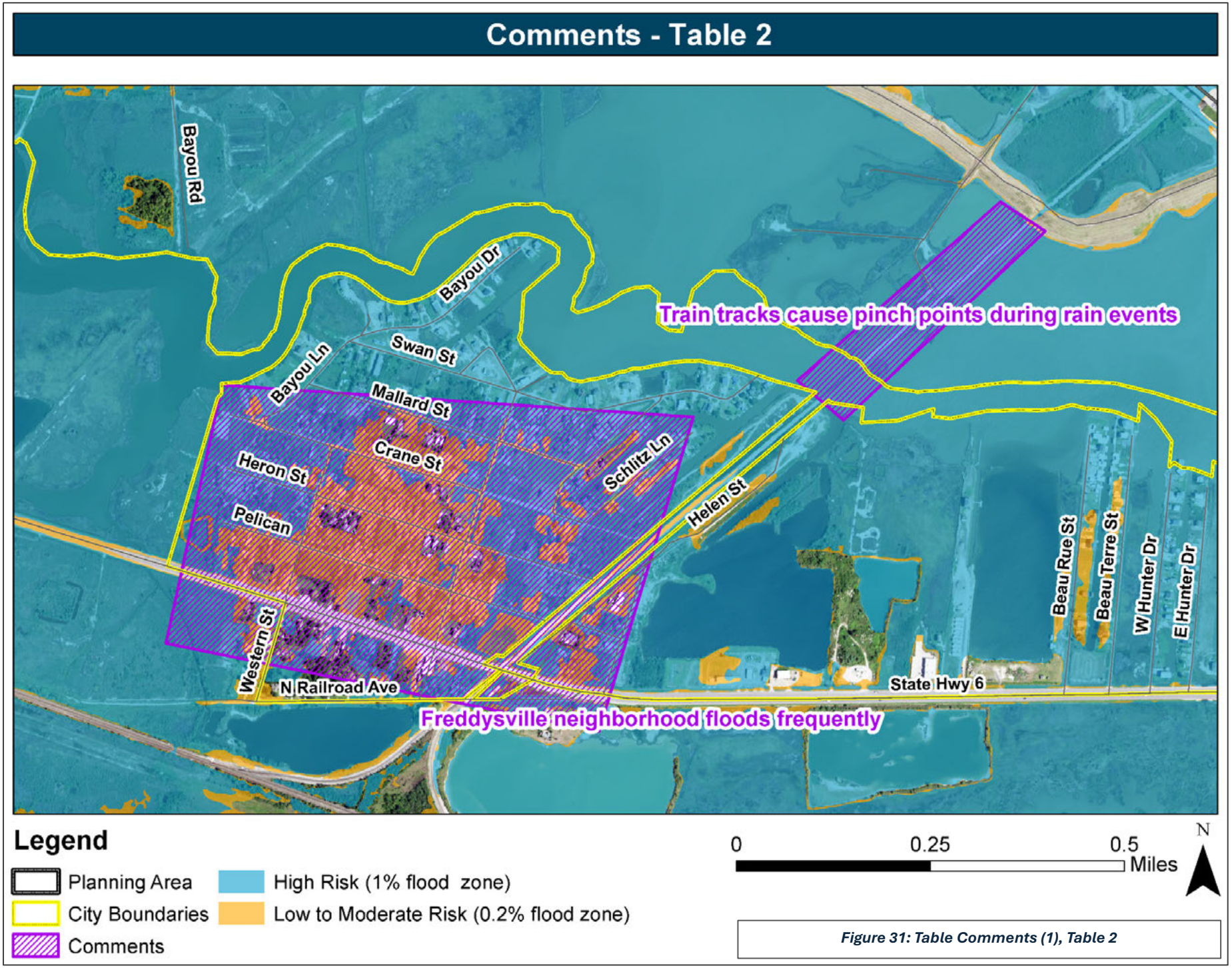


Figure 31: Table Comments (1), Table 2

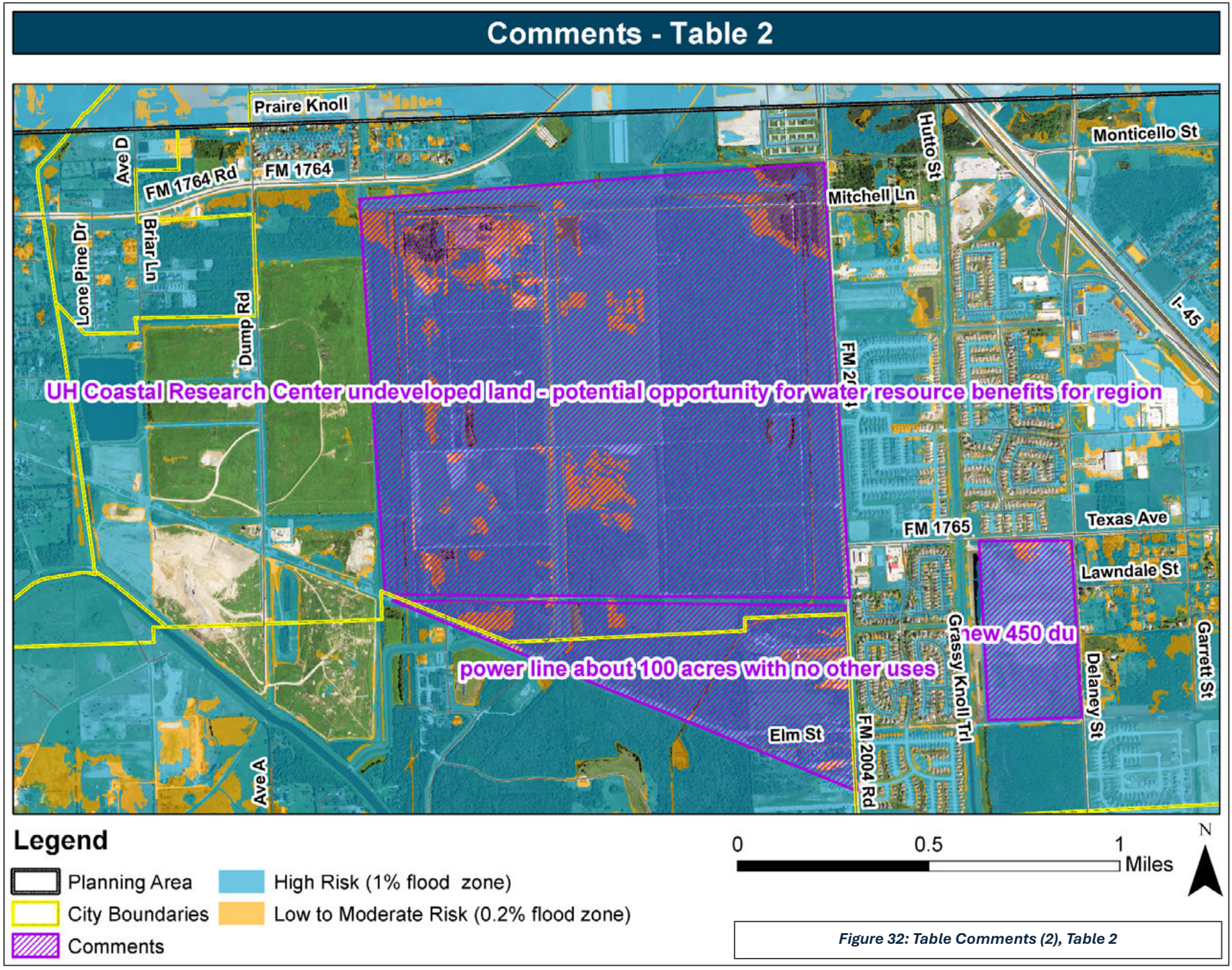


Figure 32: Table Comments (2), Table 2

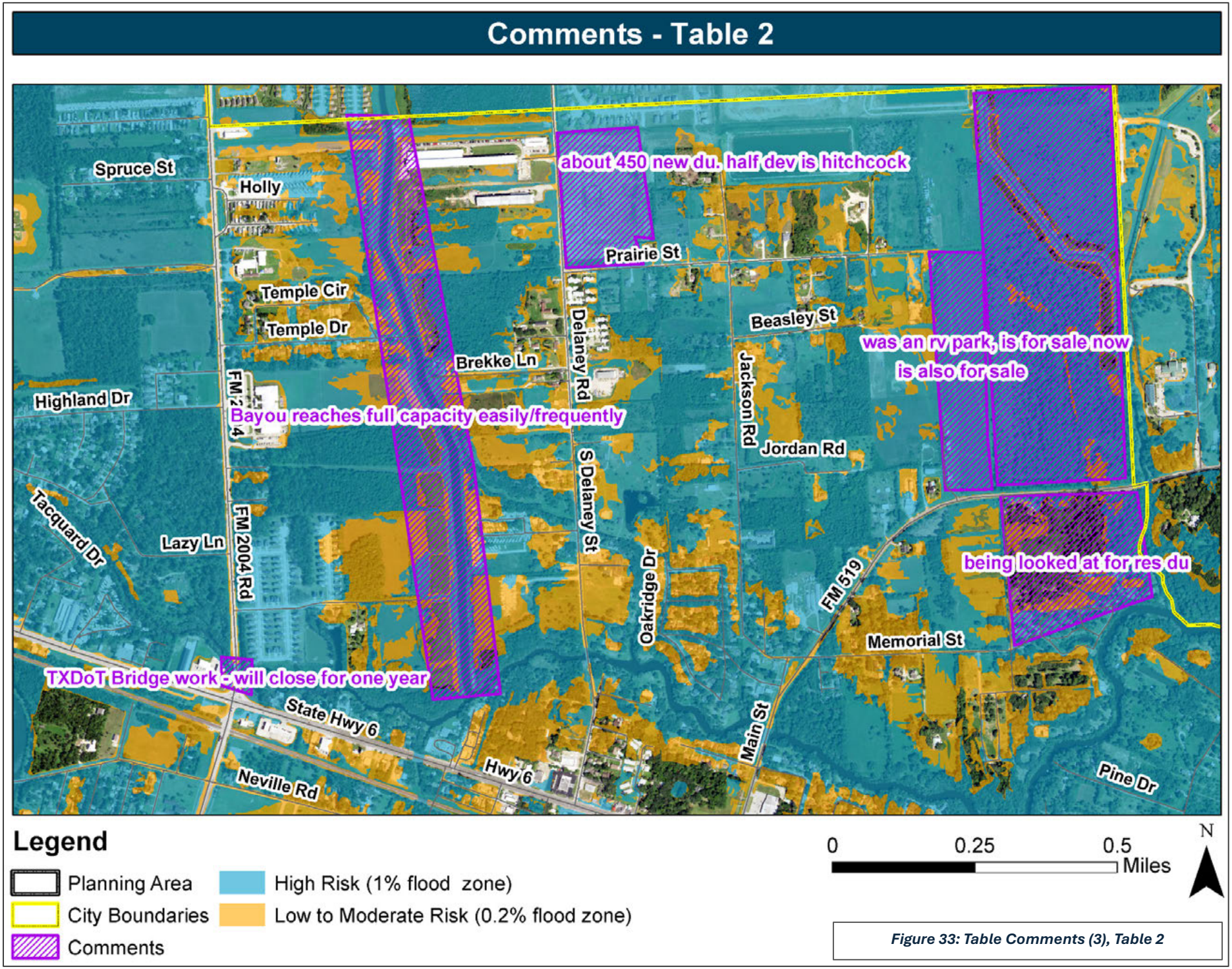


Figure 33: Table Comments (3), Table 2

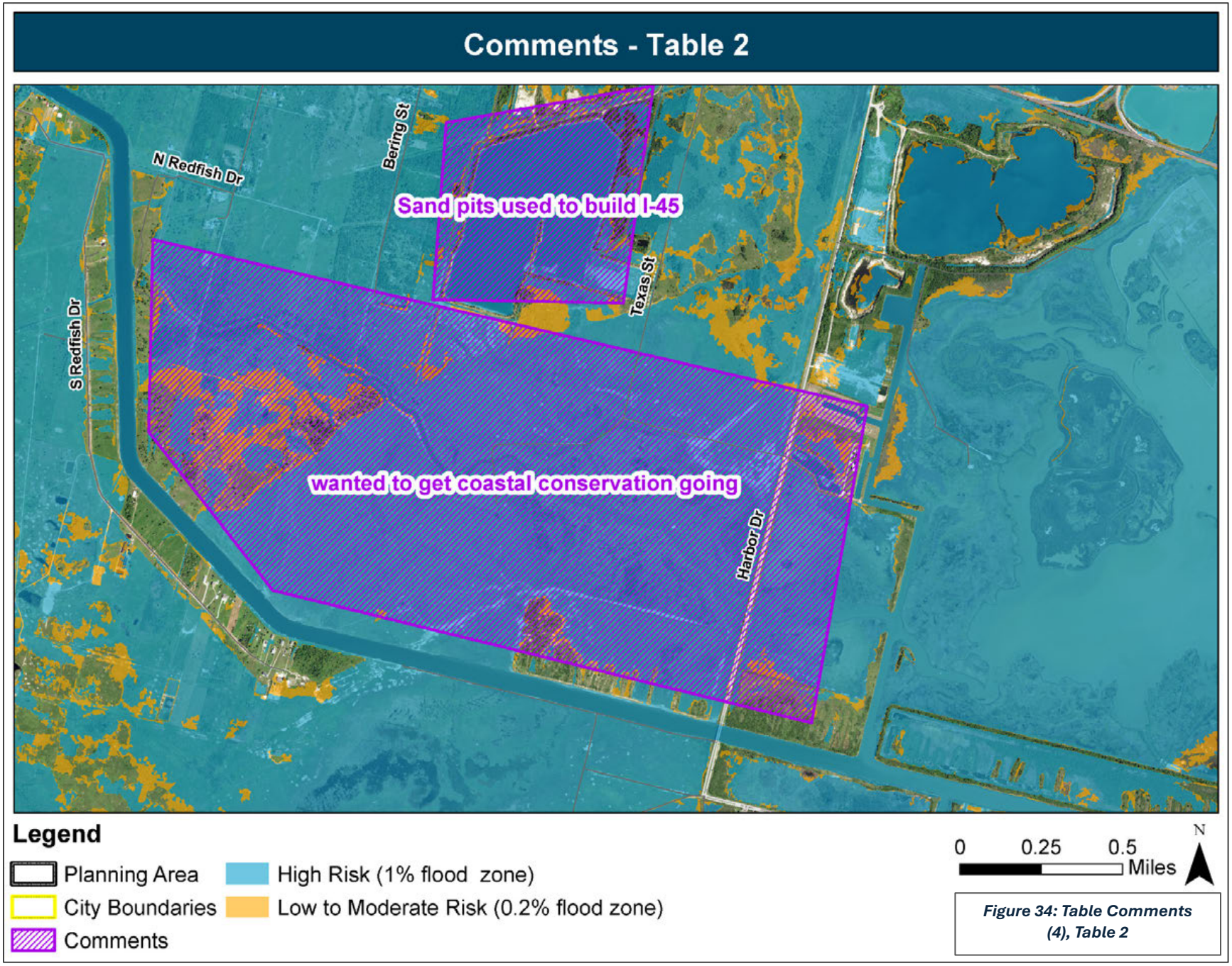


Figure 34: Table Comments (4), Table 2

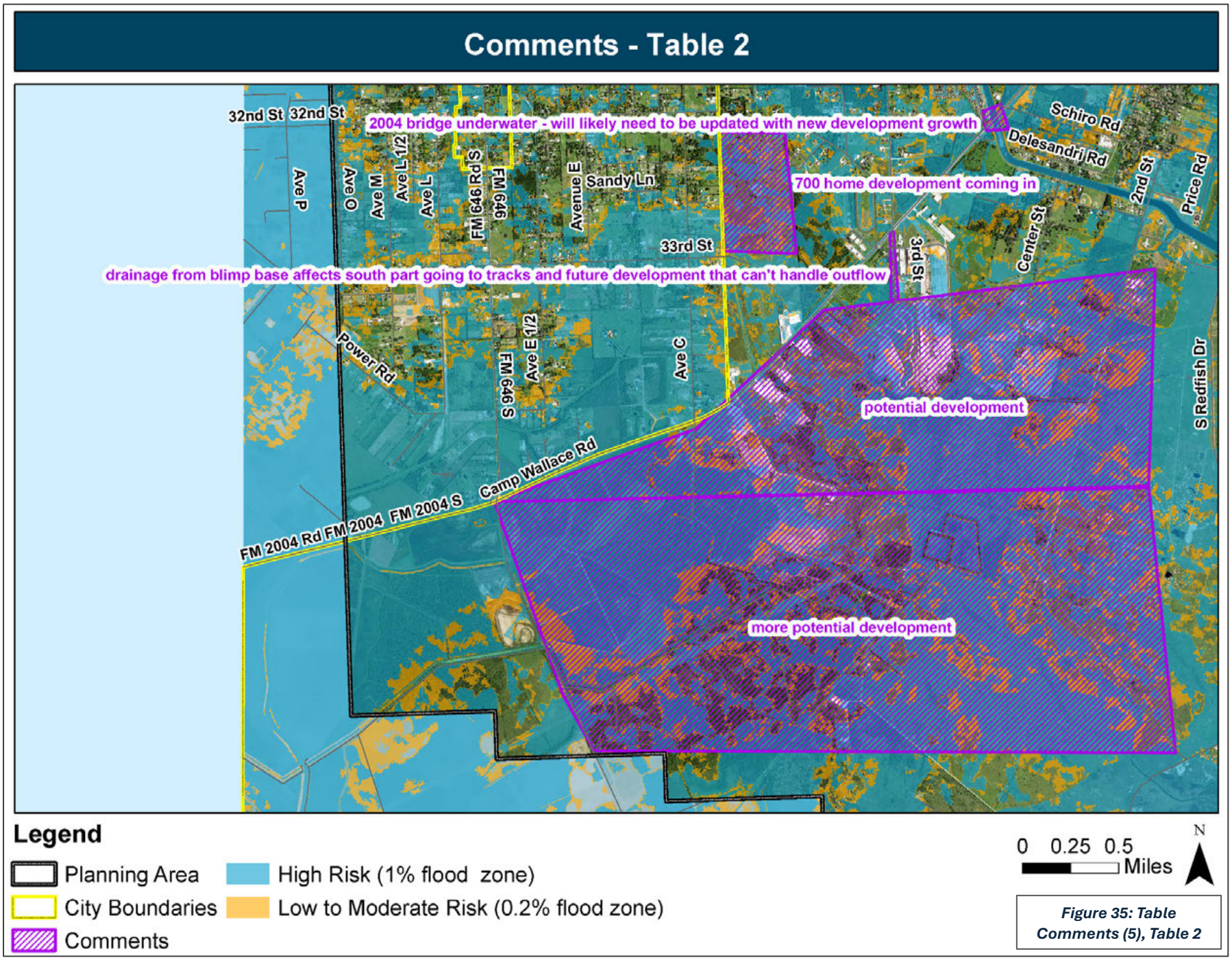


Figure 35: Table Comments (5), Table 2

Potential Mitigation Actions

Structure and Infrastructure Projects with Natural Systems Protections

Structure and infrastructure projects involve constructing manmade solutions, such as stormwater wetlands, bioswales, and rain gardens, to mitigate hazards. Natural systems protection focuses on minimizing damage while preserving or restoring the functions of ecosystems, such as through conservation easements and wetland restoration. Below are opportunities and recommendations:

Enhance Stormwater Management with Green Infrastructure

Combine green and gray infrastructure to maximize stormwater management, improve resilience, and prepare for future development. Green infrastructure promotes runoff infiltration and water quality improvement, while gray systems provide reliable capacity and structure for large-scale challenges. Integrating these approaches offers redundancy and enhances community protection.

- Site-Scale Green Infrastructure: Implement low-impact solutions, such as rain gardens, bioretention systems, pervious pavement, green roofs, and rainwater harvesting. These practices naturally manage rainwater on individual sites and can reduce strain on gray infrastructure.
- Mid-Scale Green Infrastructure: Address neighborhood-level stormwater needs by blending green and gray systems, such as vegetated swales, retrofitted basins (wet or dry), stormwater wetlands, and traditional drainage systems. This combination promotes flexibility and improved performance in diverse conditions.
- Address Development-Driven Drainage Needs: With Hitchcock expecting significant development pressure, ensure that new developments include adequate drainage plans to prevent exacerbating existing issues. Emphasize the inclusion of green space in development plans to manage flood risks, improve water quality, and offer aesthetic and recreational benefits.
- Incorporate Maintenance and Debris Removal Plans: Work with the appropriate agency (Texas Department of Transportation (TxDOT), U.S. Army Corps of Engineers (USACE), County, etc.) to address issues such as sediment plugs and debris clogging drainage channels by including regular maintenance programs. This is particularly important for pinch points like the FM 2004 bridge and the railroad bridge over Highland Bayou, which require proactive management to preserve flow capacity.

Expand Vegetative Buffers and Leverage Local Ecosystems

Utilize Hitchcock's natural assets, such as coastal and wetland areas, to implement ecosystem-based strategies for stormwater management and hazard reduction. Expanding vegetative buffers and urban tree canopy can stabilize soil, reduce erosion, improve infiltration, and provide additional benefits like shade and habitat preservation.

Conserve and Protect Key Undeveloped Areas

Identify and dedicate undeveloped tracts for conservation to improve stormwater quality and reduce runoff. Look for areas upstream of hazard zones to preserve ecosystem services, such as floodwater retention. These conserved areas can also support green infrastructure and low-impact development to deliver stacked benefits.

Local Plans and Regulations

Importance of Plans and Regulations for Resilience

Local plans and regulations play a key role in fostering resilience within a community. By creating frameworks for managing growth, development, and environmental protection, these policies can help Hitchcock reduce vulnerability to natural hazards and improve long-term sustainability. Effective planning and regulatory measures ensure that green infrastructure is integrated into both new and existing development. When communities adopt and enforce plans that prioritize resilient infrastructure and environmental protection, they are better equipped to mitigate flooding, enhance water quality, and create a more sustainable urban environment.

Considerations for Hitchcock might include developing or updating hazard mitigation plans, integrating green infrastructure requirements into zoning codes, and engaging in land use planning that encourages sustainable practices. Aligning local regulations with both regional goals and best practices for stormwater management will help ensure that policies are not only effective but also forward-looking.

Utilize Base Level Engineering (BLE) Data and FEMA Flood Insurance Rate Maps (FIRMs)

BLE modeling provides updated flood risk insights that may not yet be reflected in FEMA's official Flood Insurance Rate Maps (FIRMs). Hitchcock can use BLE to inform hazard mitigation plans, update zoning codes, and guide development decisions to better account for areas now at higher flood risk.

- Plan for Future Development in High-Risk Areas: As BLE shows more areas within the 1% annual-chance flood zone (100-year flood zone), the City should consider adjusting policies to prioritize mitigation in these high-risk zones. This includes updating floodplain management practices, requiring additional safeguards for development in these areas, and incentivizing risk-averse land use practices.
- Promote Cluster Development with Green Space: Encourage cluster development practices that concentrate buildings in lower-risk areas while preserving green space. This approach can help reduce impervious surfaces, minimize flood risk, and maintain ecological functions in high-risk areas.

Strengthening Ordinances and Standards for Development

- Enact ordinances requiring developers to demonstrate no adverse flood impacts for new projects in the 1% annual-chance flood zone.

- Adopt policies that mandate the inclusion of open spaces or green infrastructure features in development proposals to manage stormwater and reduce downstream flood risk.

Creating Incentives for Sustainable Development

Incentivize sustainable development practices that align with the City's resilience goals, such as offering tax credits or fee reductions for projects incorporating green infrastructure, low-impact design, or flood mitigation measures.

Policy and Regulatory Examples

This section provides examples of policies and regulations from other cities and organizations that can serve as models for Hitchcock. These examples include ordinances, standards, and planning strategies that can be adapted or serve as inspiration for creating local policies aimed at improving resilience, reducing environmental impact, and promoting green infrastructure.

- Low Impact Development (LID) Standards: Adopt LID standards, like those in Colonial Beach, VA, which require developers to incorporate green infrastructure techniques in new developments to manage stormwater and protect water quality. Example ordinance

  https://library.municode.com/va/colonial_beach/codes/code_of_ordinances?nodeId=COOR_APXBSUOR_S5DEST_5-4LOIMDELI

- Green Infrastructure Incentives: Implement ordinances like Port Aransas, TX, which incentivize sustainable renovations and integrate green stormwater infrastructure (GSI) into new and retrofitted developments. Example ordinance

  https://cityofportaransas.org/wp-content/uploads/2023/04/Port-Aransas-Stormwater-Management-Plan-and-Ordinances-2021.3.30-Final.pdf

- Water Supply and Conservation Ordinances: Drawing inspiration from Lakeway, TX, integrate water conservation policies that focus on reducing water demand, enhancing water quality, and promoting wildlife habitat preservation through comprehensive landscaping ordinances. Lakeway Landscape Ordinance

  https://www.lakeway-tx.gov/2174/Landscaping-Ordinance

Additional Guides and Resources for Policy and Green Infrastructure Implementation

This section provides valuable resources, guides, and tools that can help Hitchcock build and refine its plans and regulations to support resilience and the adoption of green infrastructure practices.

- FEMA Local Mitigation Handbook: A guide for local governments to develop or update hazard mitigation plans, focusing on reducing vulnerabilities to natural hazards through policy. FEMA Local Mitigation Handbook

  https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-handbook_052023.pdf

- Texas Water Development Board – Green Project Reserve: This program encourages projects that incorporate green infrastructure and sustainable water management practices. It offers guidance for funding green practices to complement and augment traditional infrastructure. Green Project Reserve

  https://www.twdb.texas.gov/financial/programs/GREEN/index.asp

- EPA Model Ordinances for Nonpoint Source Pollution: A collection of sample ordinances from across the U.S. focused on preventing nonpoint source pollution through stormwater management, buffer zones, and more. EPA Model Ordinances

  https://www.epa.gov/nps/urban-runoff-model-ordinances-prevent-and-control-nonpoint-source-pollution

- American Planning Association Guide: Resource offering insights into using green infrastructure to build resilience to coastal storms and climate change, including regulatory tools and best practices for implementation. APA Guide

  https://planning-org-uploaded-media.s3.amazonaws.com/publication/download_pdf/Supporting-Regional-Green-Infrastructure.pdf

Education, Outreach, and Partnerships

Building community resilience and reducing risk requires not only technical solutions but also informed, engaged citizens and strong partnerships across multiple levels of government and organizations. The City of Hitchcock can create a more resilient community through education, outreach, and collaborative efforts. Below are strategies to increase awareness, foster partnerships, and ensure that all residents are informed and empowered to take part in flood risk mitigation.

Community Education and Awareness

Raise Awareness of Flood Risks and Mitigation

Educate citizens, property owners, and elected officials about local flood risks and effective mitigation strategies. Use targeted outreach to inform the public about green infrastructure practices, sustainable stormwater management, and simple flood risk mitigation actions they can implement on their property.

- Increase Public Awareness: Host community workshops, events, or campaigns to educate residents about flood risks, preparedness, and mitigation strategies. Interactive programs or tools, such as flood risk maps or flood simulation models, can enhance understanding and engagement.
- Provide Clear, Actionable Guidance: Equip the community with information about available resources, such as FEMA's Flood Risk Communication Toolkit, and promote simple, cost-effective actions like elevating HVAC systems, improving drainage, and securing flood insurance.

Flood Risk Education for New and Existing Residents

Provide targeted education for new residents moving into flood-prone areas to ensure they understand the risks they face. Similarly, educate residents in older parts of the city about their risks and potential mitigation measures they can take.

- Actionable Step: Develop tailored educational materials for both new and existing residents, including brochures, digital resources, and workshops. Emphasize the importance of updated FEMA Flood Insurance Rate Maps (FIRMs), flood insurance coverage, and personal flood preparedness.

Engage Developers and Real Estate Professionals

- Provide training and resources for developers to emphasize the importance of incorporating green infrastructure, flood-resistant design, and sustainable drainage solutions into new projects.
- Partner with real estate agents to ensure buyers receive accurate flood risk information and understand mitigation measures.

Targeting Vulnerable Populations and Equitable Solutions

Understanding Social Vulnerability in Flood Zones

Identify socially vulnerable populations in Hitchcock, especially in flood-prone and low-lying areas, where risks are compounded by limited resources. Educate these groups about flood risks and provide them with tools to mitigate and adapt to potential flooding.

- Actionable Step: Collaborate with local nonprofits, public health agencies, and other community-based organizations to better understand these vulnerabilities and develop inclusive mitigation strategies.
- Equitable Outreach: Use data from FEMA's Resilience Analysis and Planning Tool (RAPT) or Social Vulnerability Index (SoVI) to target outreach efforts and resources where they are needed most.

  FEMA RAPT: https://www.fema.gov/about/reports-and-data/resilience-analysis-planning-tool

  FEMA SoVI: https://hazards.fema.gov/nri/social-vulnerability

Building Stronger Partnerships and Regional Collaboration

Establish Regional Partnerships for Collective Impact

Flood risks and stormwater management issues are regional challenges that require collective action. Hitchcock can join forces with neighboring cities like La Marque, Santa Fe, and Dickinson to form a coalition or regional committee for addressing shared flood risks.

- Example Case Studies:

- *Montgomery County Stormwater Quality Coalition:* A collaboration among several cities to comply with stormwater regulations and develop regional solutions. https://www.txms4.com/montgomery/
- *Rio Grande Valley Stormwater Management Task Force:* A regional task force educating and proactively addressing stormwater issues. https://rgvstormwater.org/

- Actionable Step: Reach out to neighboring communities to explore partnership opportunities. Collaborate on joint stormwater projects, shared resources, and state or federal lobbying efforts.

Community Involvement and Input

Engage Residents in Flood Risk Mapping and Solutions

Host workshops, town halls, or informational sessions to educate the public about local flood risks. Encourage residents to review FEMA's Flood Insurance Rate Maps (FIRMs) and participate in floodplain management discussions.

Collaborative Risk Mitigation Planning

Involve the community in creating tailored risk mitigation strategies. Seek public input in areas related to enhanced green infrastructure, improved drainage systems, or prioritized flood risk reduction zones.

- Leverage Citizen Participation: Encourage residents to report drainage or flood concerns through online platforms or public meetings, helping the City track and address issues in real time.

Promoting Public-Private Partnerships

Collaborate with local businesses, developers, and property owners to implement flood risk reduction measures and green infrastructure projects.

- Incentivize Private Action: Offer tax credits, fee reductions, or grants for property owners and developers who implement mitigation measures like rain gardens, permeable pavements, or elevated structures.
- Shared Responsibility: Develop co-funded projects where private and public entities share costs for flood risk mitigation in vulnerable areas.

Additional resources can be found in **Appendix A: Additional Resources for Local Plans, Regulations and Green Infrastructure Implementation.**

Resources

General Land Office Programs

Clean Coast Texas

The Texas Coastal Nonpoint Source Pollution Program works to ensure vibrant and sustainable fisheries, shellfish, and eco-tourism industries through sound science, collaboration, and partnership activities that focus on planning and effective management of nonpoint source pollution in Texas coastal waters. Clean Coast Texas is an initiative of the Texas Coastal Nonpoint Source Pollution Program supported by the GLO Coastal Management Program in partnership with stakeholders, including state and local agencies.

Clean Coast Texas provides coastal communities with technical assistance to integrate sustainable practices that:

- Restore and protect coastal natural resources.
- Address water quality and flood management for new and existing development.
- Mitigate coastal erosion.
- Enhance tourism, recreation, and economic vitality.

Information about Clean Coast Texas can be found at cleancoast.texas.gov.

A handout with Clean Coast Texas services is found in **Appendix B: Clean Coast Texas Flyer**.

Resilient Communities Program (RCP)

The Texas GLO allocated up to $100 million in Community Development Block Grant Mitigation (CDBG-MIT) funds for the Resilient Communities Program (RCP). RCP funds the development, adoption, and implementation of resilient building codes, flood damage prevention ordinances, zoning ordinances, comprehensive plans, and land use plans. Additionally, RCP funds an array of public service activities related to resilience. The maximum grant amount is $300,000 per applicant.

Information about the Resilient Communities Program can be found at https://recovery.texas.gov/mitigation/programs/resilient-communities-program/index.html.

RCP Grant Categories

More information on each of the RCP categories below, and associated performance requirements, can be found in the RCP Application Guide: https://recovery.texas.gov/documents/mitigation/programs/resilient-communities/rcp-application-guide.pdf.

Building Code

This grant category funds the development, adoption, and implementation of modern and resilient building codes. Building codes are the primary mechanism for communities to regulate the design and construction of new buildings and the renovation of existing buildings. Building Codes must meet specific performance requirements.

Flood Damage Prevention Ordinance

This grant category/eligible activity funds the development, adoption, and implementation of resilient flood damage prevention ordinances. This ordinance provides the framework for regulating what and how to build in a floodplain. Adopting such an ordinance is a requirement for participating in the Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP). Exceeding the minimum ordinance requirements can make a community eligible to participate in the Community Rating System (CRS), which in turn can reduce the flood insurance premiums paid by a community's property owners. Flood Damage Prevention Ordinances must meet specific performance requirements.

Comprehensive Plan

This grant category/eligible activity funds the development and adoption of forward-looking Comprehensive Plans. These plans take the community goals and aspirations and formalize them into actionable policies that determine what can be built within a certain jurisdiction and where. Comprehensive plans themselves serve as guiding documents that provide the framework by which regulatory structures are created. Comprehensive Plans must meet specific performance requirements.

Zoning Ordinance

This grant category/eligible activity funds the development, adoption, and implementation of Zoning Ordinances. These ordinances take the ideas outlined in the land use/comprehensive plans and codify them into a legally binding development regulation. Zoning Ordinances must meet specific performance requirements.

Public Service Activities

This grant category funds the execution of two types of public service activities: 1) Public Information activities leading to CRS credits, and 2) Education and Outreach activities to increase community knowledge around resilience.

(1) Public Information Activities Leading to CRS Credits: these are a specific set of activities detailed in the CRS Coordinator's Manual. CRS is a voluntary incentive program for communities participating in the NFIP. By completing one or more of these activities, an NFIP-participating community acquires CRS credits, which in turn can reduce the flood insurance premiums paid by a community's property owners.

(2) Other Education and Outreach Activities: these are activities that focus on alerting communities and beneficiaries about opportunities to mitigate identified risks through insurance, best practices, and other strategies. Unlike Public Information Activities Leading to CRS Credits, which focus solely on flooding, these activities can also address other risk types, such as wildfires, drought, tornadoes, and winter weather. Public Service Activities must meet specific performance requirements.

TCWP Technical Assistance

Local planning and mitigation efforts are critical steps in helping communities become more resilient. Although resources and best practices may be available, we recognize that communities may need added assistance or resources to develop solutions that fit local contexts. TCWP offers a range of services that can assist communities in addressing local planning challenges.

Project Identification Exercises

TCWP facilitates project identification exercises using CHARM to help communities turn local mitigation and planning priorities into achievable projects. These data-driven consultations can aid with identifying relevant federal and state funding opportunities, enhancing knowledge of local hazards and potential solutions, and promoting stronger dialogue between groups and organizations.

These facilitated workshops are available at no cost and offer an opportunity to continue working with CHARM and mapping data outside of the Resiliency Workshop context.

Community Technical Assistance

As a FEMA Cooperating Technical Partner, TCWP provides technical expertise in planning, GIS, and green infrastructure at no cost to communities pursuing resilience-related planning priorities. We can assist communities that may need additional staff support, expertise, or other resources through services. See Figure 47 for an overview of Community Assistance Programs provided by TCWP.

CHARM
communitycharm.org

Community Assistance Programs

Our team is here to assist your efforts to become more resilient – at no cost.

Texas A&M AgriLife Extension's expertise in community development and mitigation planning can support your local projects and needs. We are able to offer various no-cost, in-kind technical assistance and consultation services to Texas communities through a Cooperating Technical Partners agreement with FEMA Region 6.

Project Identification Exercises

An Interactive, Data-Driven Workshop: We can facilitate mitigation project identification exercises for your community using our CHARM platform, using CHARM's risk data and interactive exercises and your local knowledge to create an engaging and collaborative experience for local stakeholders.

Identifying Local Issues and Priorities: Bringing local champions and experts around the table provides an opportunity for discussion and coordination. During a typical three-hour exercise, participants review local risk data, identify emerging or unmapped hazards and issues, assess potential mitigation opportunities or strategies, and prioritize next steps and implementation needs.

Connecting You to Implementation and Funding: We know that mitigation efforts and projects take planning time and funding. After the workshop, we review your priority projects from the exercise and develop recommendations for implementation strategies, other community assistance opportunities, and funding sources such as state and federal grant and loan programs.

Technical Assistance Services

Ordinance and Plan Writing: Zoning, subdivision, floodplain, and building regulations are some of the most effective ways to reduce future risk. We work closely with your community's key stakeholders to strategically develop regulations that reflect local priorities and capacity.

Technical Analyses: Assessing current risk and future conditions is an important step in the planning process. We can use our expertise with GIS and data including our CHARM platform to study local questions such as long-term buildout, buyout feasibility, and potential future impacts of hazards.

Education and Facilitation Assistance: Informed community leaders and stakeholders are critical. We can create customized trainings for your community and assist with meeting facilitation, visioning exercises, and community engagement process design.

GIS, Data, and Mapping Support: We believe that data is an important asset for decision-making that should be easily accessible. We can assist with data creation, data gathering, and GIS trainings to ensure your community has access to the best available information to use in decision-making.

Texas A&M AgriLife Extension | Texas Community Watershed Partners | FEMA

We'd love to work with you!

Let us know how we can help your community become more resilient. To schedule a consultation, contact Kelsey Johnson at kelsey.johnson@ag.tamu.edu

Figure 36: Overview of Community Assistance Programs at TCWP

Green Infrastructure for Texas (GIFT)

Green Infrastructure for Texas (GIFT) is a program of the Texas A&M AgriLife Extension Service through the Texas Community Watershed Partners.

GIFT empowers Texas to build resilient communities adaptable to social, economic, and environmental change. We provide necessary resources about nature-based solutions to stormwater management. Through outreach, coalition-building, education, and on-the-ground demonstration projects. GIFT inspires communities to implement green infrastructure projects at any scale. Green infrastructure uses innovative design practices that emphasize local strengths and context to reduce flood risk while providing a multitude of other benefits.

For more information: Visit the GIFT website at agrilife.org/gift/ or email Charris York at Charriss.york@ag.tamu.edu.

Figure 37: GIFT Flyer

GREEN INFRASTRUCTURE

A Strategy for Flood Risk Mitigation in Coastal Communities

TEXAS A&M AGRILIFE EXTENSION

ERPT-026
2/20

What is Green Infrastructure?

Green infrastructure (GI) is a nature-based approach to water management that uses engineered natural solutions in conjunction with gray infrastructure, such as culverts, pipes, and detention basins. Practices such as rain gardens, stormwater wetlands, and bioswales hold rainwater for a set period of time, allowing for infiltration and pollutant removal. This holding period also decreases the volume of water moving downstream during the storm. Water then slowly drains over time, so the system is emptied before the next rainfall.

Green infrastructure practices offer the same benefits as gray infrastructure, plus more. These include:

- Flood reduction
- Water quality improvement
- Improved aesthetics
- Improved air quality
- Public safety
- Habitat for wildlife
- Property loss prevention
- Recreational opportunities
- Carbon sequestration

How is GI Flood Hazard Mitigation?

Flood hazard mitigation aims to reduce or eliminate the long-term risk associated with flooding. Green infrastructure projects are localized, pre-disaster management practices that hold floodwater, lessening the severity of flooding for the contributing watershed.[1]

GI practices, like any infrastructure, are designed to hold a specific amount of rainfall. Each community determines what design storm they plan for and build their infrastructure to mitigate flooding. Once the design storm for infrastructure—gray or green—is surpassed, then flooding is likely.

Types of Green Infrastructure

Site-scale — rain gardens, bioswales, rainwater harvesting, pervious pavement, tree filter boxes, green roofs

Community-scale — constructed stormwater wetlands, conservation neighborhoods, green streets

Landscape-scale — open space preservation, habitat restoration, conservation easements

Why include GI in a Hazard Mitigation Plan?

Green infrastructure is a proven solution with multiple benefits. GI is based on natural practices; however, over the last century, advances in technology have moved communities to embrace gray infrastructure. But gray infrastructure is not working. Especially in rapidly developing areas, we see more and more localized flooding due to the increase in impervious surface cover.[2] Integrating GI practices like stormwater wetlands with existing gray infrastructure is an economically viable solution.

Exploration Green constructed stormwater wetland (Clear Lake, TX) on a typical day (left) and during Hurricane Harvey flooding in 2017 (right).

When assessing the cost-benefit ratio of a project, GI offers many more benefits than gray infrastructure, despite a similar cost of installation. The long-term benefits of GI exceed those of gray infrastructure projects. Hazard mitigation grants are available both pre- and post-disaster, which can fund actions identified through the planning process, including GI.

Additional local funds can be dedicated if GI is part of a community's Capital Improvement Plan. Also, if required for new development, then the cost of installing for on-the-ground practices falls on the developer, not the taxpayer.

Figure 38: Green Infrastructure: A Strategy for Flood Risk Mitigation in Coastal Communities (Page 1). A flyer from Texas A&M AgriLife Extension, GIFT Program

How can GI fit into a Hazard Mitigation Action Plan?

The Hazard Mitigation Action Planning (HMAP) process is directed by guidance from the Federal Emergency Management Agency (FEMA) and the Texas Division of Emergency Management (TDEM). The planning process is intended to be stakeholder inclusive and to integrate recommendations from existing local and regional plans such as Comprehensive Plans, Capital Improvement Plans, Drainage Plans, and Economic Development Plans into the HMAP.

Potential hazards must be locally identified and ranked, then appropriate mitigation strategies determined. Upon approval, the HMAP competitive grants are available through FEMA's Hazard Mitigation Grant Program (HMGP). FEMA has identified four types of mitigation strategies:

1. Local plans and regulations
2. Structure and infrastructure projects
3. Natural systems protection
4. Education and awareness programs

An identified problem statement could lead to implementing the mitigation actions outlined in the table below. An example of a problem statement would be: *"Localized roadway flooding impacts multiple neighborhoods in the community, stopping traffic and preventing access by emergency vehicles several times a year. The flooding continues to worsen with increasing development pressure."*

Mitigation type[3]	Description[3]	GI example	Potential Actions
Local plans and regulations	Actions include government authority, policies, or codes	• Green Infrastructure Plan • Stormwater Management Plan • Make GI practices part of the development code	Adopt a stormwater ordinance that requires or encourages green infrastructures to manage stormwater volumes to reduce flooding and to mitigate risk to life and property.
Structure and infrastructure projects	Projects to construct manmade structures to reduce the impact of hazards	• Constructed stormwater wetlands • Bioswales • Rain gardens • Tree filter boxes	Reconstruct neighborhood storm drain systems and upgrade to include GI practices (rain gardens, constructed wetland, etc.) where feasible.
Natural systems protection	Actions that minimize damage and losses and also preserve or restore the function of natural systems	• Conservation easements • Wetland restoration • Forest management	Identify large tracts of land in and upstream from the hazard areas for acquisition and protection to preserve ecosystem services, including floodwater holding capability.
Education and awareness programs	Actions that inform and educate citizens, elected officials, and property owners about hazards and potential ways to mitigate them	• Websites with maps and information • Presentations to school groups and neighborhood organizations • Mailings to residents in hazard-prone areas	Develop materials and implement a program to educate property owners about green infrastructure options and allowable uses in the community based on existing or proposed codes and ordinances.

[1]EPA Storm Smart Cities: Integrating Green Infrastructure into Local Hazard Mitigation Plans
[2]Tyler, J. 2016. Sustainable Hazard Mitigation: Exploring the Importance of Green Infrastructure in Building Disaster Resilient Communities. The Journal of Sustainable Development Vol 15, Iss. 1, pp.134-145
[3]FEMA Local Mitigation Planning Handbook

TEXAS A&M AGRILIFE EXTENSION

Green Infrastructure for Texas | AgriLife.org/GIFT
Texas Community Watershed Partners | Houston, Texas
Disaster Assessment and Recovery Program
Authored by Charriss York, Extension Program Specialist

Publication funded by a Texas Coastal Management Grant approved by the Texas Land Commissioner pursuant to National Oceanic and Atmospheric Administration Award No. NA18NOS4190153

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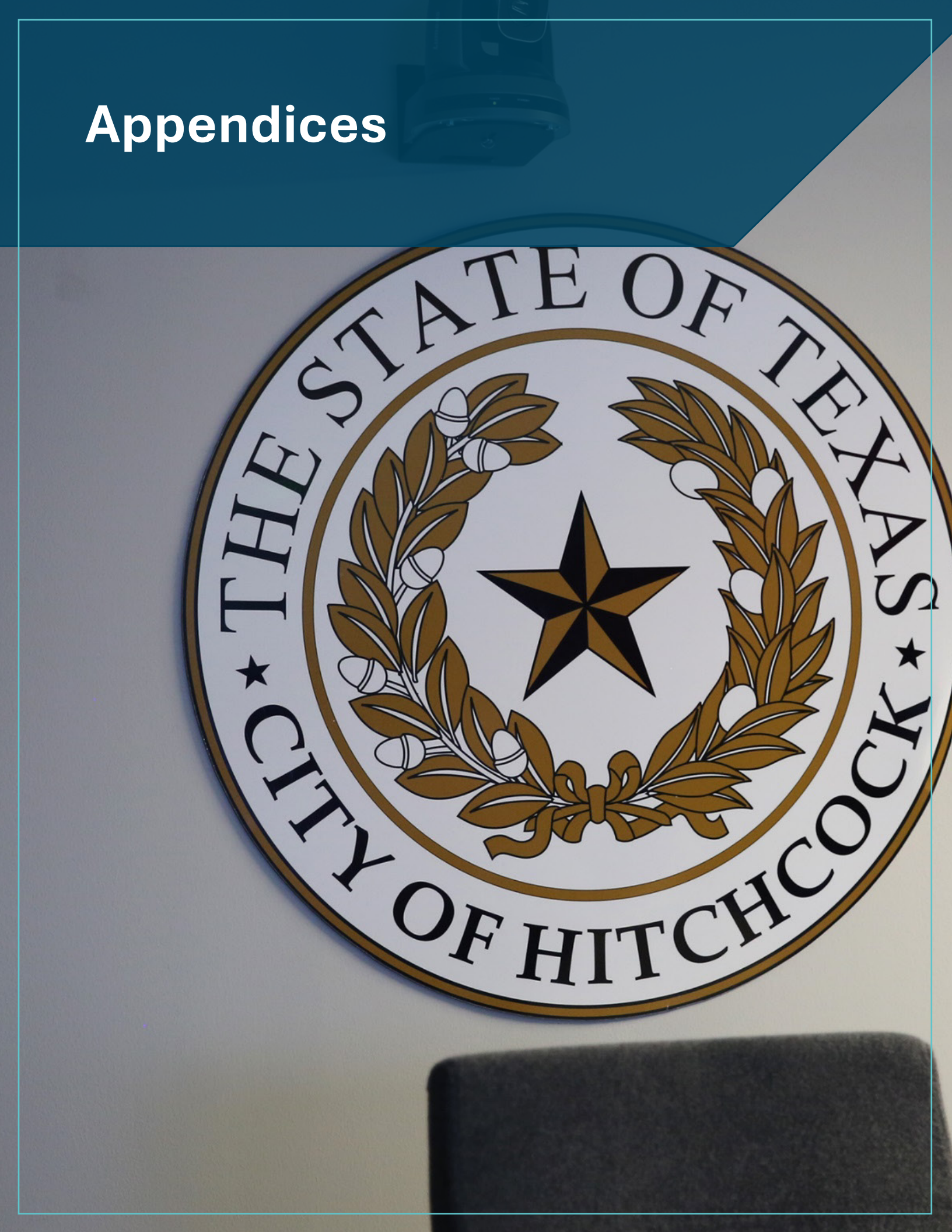
Figure 39: Green Infrastructure: A Strategy for Flood Risk Mitigation in Coastal Communities (Page 2). A flyer from Texas A&M AgriLife Extension, GIFT Program

Appendices



Appendix A: Additional Resources for Local Plans, Regulations and Green Infrastructure Implementation

This section includes additional resources, guides, and policy examples to support Hitchcock in considering and implementing green infrastructure and resilient planning approaches. These materials provide in-depth information and examples from other municipalities that could inform local decision-making.

Guides and Resources for Policy and Green Infrastructure Implementation

1. **Designing for Impact: A Regional Guide to Low Impact Development (HGAC)**
   A guide for local governments to consider low-impact development strategies in planning processes.
   Designing for Impact Guide

   https://www.h-gac.com/getmedia/52972b6c-f53b-41ac-a1ea-dc6f64c106d5/Designing-For-Impact-Guide-for-Governments.pdf

2. **FEMA Local Mitigation Handbook**
   A guide that supports local governments in developing hazard mitigation plans that integrate green infrastructure practices to reduce vulnerabilities and long-term risk from natural hazards.
   FEMA Local Mitigation Handbook

   https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-handbook_052023.pdf

   FEMA Local Mitigation Planning Policy Guide

   https://www.fema.gov/sites/default/files/documents/fema_local-mitigation-planning-policy-guide_042022.pdf

3. **Building Community Resilience with Nature-Based Solutions (FEMA)**
   A guide for integrating nature-based solutions into community planning to enhance resilience to climate change and coastal storms.
   FEMA Nature-Based Solutions Guide

   https://www.fema.gov/sites/default/files/documents/fema_riskmap-nature-based-solutions-guide_2021.pdf

Policy and Regulatory Examples

1. **Westminster, Maryland – Residential Cluster Subdivision Standards**
   Allows developers to design subdivisions that protect environmental features while maximizing the number of lots allowed.
   Westminster Residential Cluster Subdivision Standards

   https://ecode360.com/10167085#10167085

2. **Laurel, Maryland – Mandatory Dedication or Fee-in-lieu of Open Space Standards**
   Requires developers to dedicate a certain amount of land for permanent open space or pay a fee-in-lieu.
   Laurel Mandatory Dedication Standards

   https://library.municode.com/md/laurel/codes/unified_land_development_code?nodeId=CH20LADESU_ARTIISU_DIV1INGE_S20-29.10MADEF-LOPSP

3. **City of Lakeway, Texas – Landscaping and Environmental Ordinances**
   Includes regulations addressing water supply, environmental considerations, and impervious cover as part of an integrated water management strategy.
   Lakeway Environmental and Impervious Cover Regulations

   https://ecode360.com/39616767#39616767:~:text=arrow_forward-,ARTICLE%2028.10,ENVIRONMENTAL%20AND%20IMPERVIOUS%20COVER%20REGULATIONS,-%C2%A7%C2%A028.10.001

Appendix B: Clean Coast Texas Flyer

Put Clean Coast Texas to Work For Your Community!

Clean Coast Texas provides coastal communities with technical assistance to integrate sustainable practices that:

- Restore and protect coastal natural resources
- Address water quality and flood management for new and exisiting development
- Mitigate coastal erosion
- Enhance tourism, recreation, and economic vitality

Services

We work with coastal communities to facilitate non-regulatory, incentive-based programs and projects to protect and restore water quality, habitat, and shorelines. We support your efforts to educate residents, assist in community planning, pursue and implement grants, develop drainage/ water quality criteria, and build projects that reduce pollution in the Texas Coastal Zone.

Clean Coast Texas, an initiative of the Texas Coastal Nonpoint Source Pollution Program, is guided by the Texas General Land Office (GLO) Coastal Management Program in partnership with numerous stakeholders, including state and local agencies.

See back for details!

Who is Eligible For Funding and Technical Assistance?

Communities and programs operating within the Texas Coastal Zone Boundary, which includes all or part of 18 counties along the Gulf of Mexico (view map). Technical assistance can be provided to state departments, municipalities, counties, non-governmental organizations, councils of government, river authorities, bay and estuary programs, developers, and engineers.

Sea Grant Texas
The Meadows Center for Water and the Environment, Texas State University
DOUCET
ANCHOR QEA

cleancoast.texas.gov

Menu of Services

Stormwater Retrofit Design & Construction

Managing stormwater from urbanized areas

- Water quality and stormwater management for new and existing development
- Conceptual designs
- Construction plans, cost estimates, and permitting
- Maintenance guidance

Water Quality Analysis & Citizen Science

- Texas Stream Team citizen science trainings
- Water quality management and evaluation
- Review and comment on engineering and drainage studies
- Policy evaluation and development

Ordinance & Stormwater Criteria

- Prepare stormwater management criteria
- Support ordinance adoption
- Floodplain management

Community Planning

- Community Master Planning
- Stormwater Master Planning

Grant Funding Assistance

- Grant writing support
- Find and interpret grant opportunities
- Identify grant matching resources

Partnership Development

- Identify connections and opportunities
- Coordination with local governments, nonprofit organizations, regional councils of governments, and program managers of watershed protection plans
- Inter-local agreements to define roles and responsibilities

Education & Community Events

- Workshops
- School and adult programs
- Interpretive signage
- Trash cleanup events

cleancoast.texas.gov

Appendix C: Workshop Agenda

CHARM

Hitchcock, Texas CHARM Workshop

Hosted by Texas A&M AgriLife Extension Service
and the Clean Coast Texas Collaborative Program

Agenda

Wednesday
September 18, 2024

Hitchcock Council Chambers
8102 Highway 6
Hitchcock, TX 77563

Doors Open and Sign-in
8:30 AM CST

Opening Remarks
9:00 AM CST

- *Amanda Cain, Resilience Planner, TCWP*
- *Arnold J Cross, Jr. CFM, Director of Community Development, City of Hitchcock*

Clean Coast Texas Program and CHARM
9:05 AM CST

- *Clean Coast TX Program Overview - Jason Pinchback, Water Resources Manager, TX GLO*
- *Risk, Resiliency, and CHARM Overview - Kelsey Johnson, Senior Resilience Planner, TCWP*

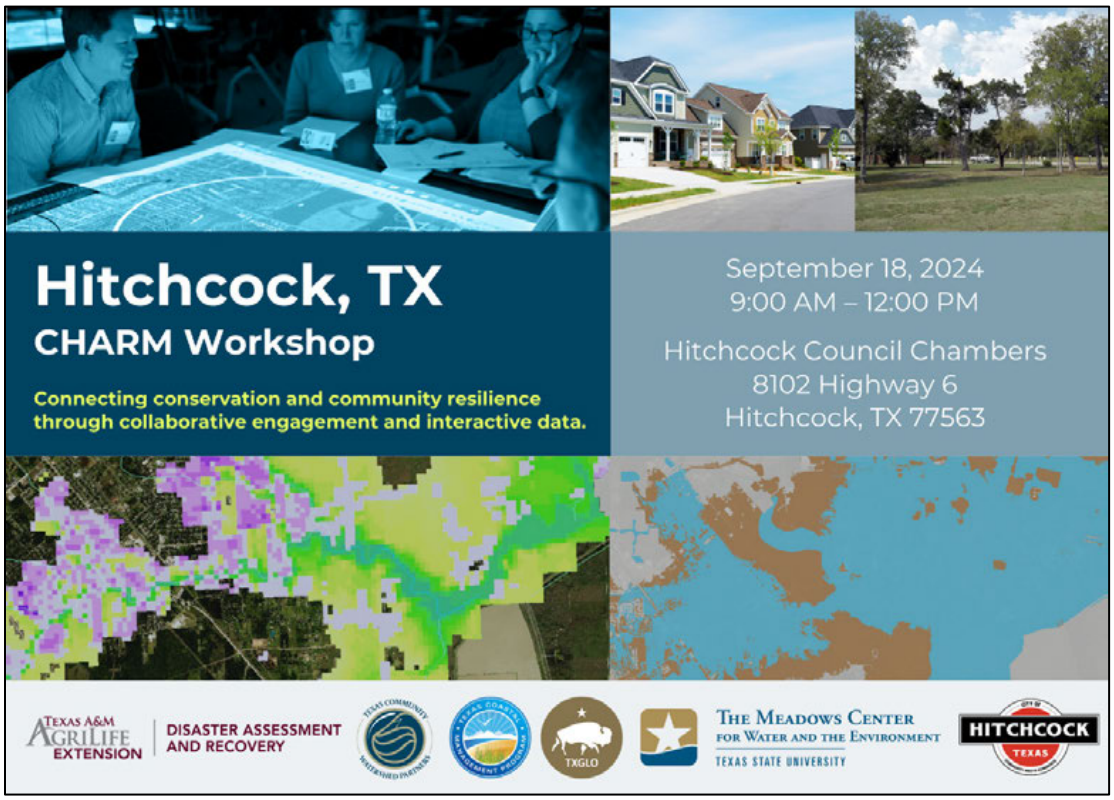
CHARM Table Exercises
9:35 AM CST

Full Room Reflective/Debrief Session
11:35 AM CST

Adjourn
12:00 PM CST

Texas A&M AgriLife Extension | Disaster Assessment and Recovery
The Meadows Center for Water and the Environment, Texas State University
Hitchcock Texas

Appendix D: Workshop Postcard



Appendix E: Workshop Attendees

Local and Regional Stakeholders

Table 1: Local and Regional Stakeholder Workshop Attendees

Organization	Name	Title
City of Hitchcock	Stacey Baker	Community Development Specialist
City of Hitchcock	Arnold Cross Jr.	Community Development Director
City of Hitchcock	Marian Cross	Resident
City of Hitchcock	Cordella Daniels	Resident
City of Hitchcock	Henry Debord	Building Inspector
City of Hitchcock	Monio Mark II	Finance Director
City of Hitchcock	Leroy Thomas	Public Works Director
City of Hitchcock, Planning and Zoning Board	David Wells	Member
City of La Marque	JB Pritchett	Deputy City Manager
Hitchcock Economic Development Corporation	Devin DePascal	Executive Director
Hitchcock Economic Development Corporation	Allen Johnson	Board Member
Hitchcock Economic Development Corporation	Jack Click	President

State and Federal Partners

Table 2: State Partner Workshop Attendees

Organization	Name	Title
Texas General Land Office	Jason Pinchback	Water Resources, Manager
U.S. Army Corps of Engineers	Aaron Chastain	Project Manager
U.S. Army Corps of Engineers	Jen Morgan	Outreach Specialist

Texas Community Watershed Partners Staff

Table 3: Texas Community Watershed Partners Staff

Organization	Name	Title
Texas A&M AgriLife Extension Service, TCWP	Amanda Cain	Resilience Planner
Texas A&M AgriLife Extension Service, TCWP	Dana Borham	Geoanalyst
Texas A&M AgriLife Extension Service, TCWP	Brian Garcia	Graphic Designer
Texas A&M AgriLife Extension Service, TCWP	Kelsey Johnson	Resilience Planner
Texas A&M AgriLife Extension Service, TCWP	Scott Jones	Program Coordinator
Texas A&M AgriLife Extension Service, TCWP	Celina Gauthier Lowry	GIFT Extension Program Specialist
Texas A&M AgriLife Extension Service, TCWP	Erika Pham	Geoanalyst
Texas A&M AgriLife Extension Service, TCWP	Carlos Reyes	Geoanalyst
Texas A&M AgriLife Extension Service, TCWP	Dana Raborn	Resilience Planner
Texas A&M AgriLife Extension Service, TCWP	Kaitlynn Wiener	Business Coordinator