THE PORT OF EVERYTHING

Port Of Galveston, Texas
Hazard Mitigation Plan
2025-2030

Reducing repetitive damage, loss of life, and loss of property caused by disasters.

Port of Galveston
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Galveston, TX 77550

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1 Introduction

1.1 Background

The Port of Galveston HMP assesses the potential impact of all identified hazards to the Port and provides mitigation strategies and actions that may reduce such risks. The HMP prioritizes mitigation strategies and includes an implementation plan. The HMP is designed to integrate with other mitigation plans in the region.

The Port is undergoing a period of rapid growth and expansion as well as changes in operations. The HMP Update takes these changes into account and provides a blueprint for reducing vulnerability to existing and anticipated hazards. Changes to the Port's operations over the last five years include:

- The port has increased its cruise ship capacity with the opening of a $125 million state-of-the-art Royal Caribbean cruise terminal. This Royal Caribbean facility was the first LEED Zero Energy facility in the world, generating 100% of the energy it needs through onsite solar panels.
- In 2023, the port announced its $53 million investment in a major expansion at Cruise Terminal 25 to accommodate Carnival Cruise Line's Carnival Jubilee, a new cruise ship arriving in December.
- In 2019, the port highlighted that they were helping fuel the state's booming wind energy industry by moving wind turbine sections through the port. In turn, this clean-energy industry is generating port revenue and third-party jobs for stevedores, ship line handlers, ship pilots, railway workers, truck drivers and more. The huge white cylinders and blades you see on our waterfront are imported from Spain, South Korea, Malaysia and Indonesia and headed to wind farms in Texas and Oklahoma. Each turbine is made up of four tower sections, three blades, one hub and one nacelle, which contains the turbine's energy-generating components.
- Grain operations ceased in 2023, eliminating the explosion hazard associated with similar grain operations. The existing grain silos and conveyers will be dismantled in 2024, and that dock will be developed.

The next five years will continue to see future development at the port. Thanks to the robust recovery of Galveston Wharves cruise business, it is poised to make major advances with its capital projects and waterfront infrastructure renovations to bring one of this region's major economic engines to its full potential. New development plans include:

- Planned improvements and expansion of the West Port Cargo Complex
- Repairs to decaying berths and docs

- Expansion of cruise ship capacity
- Improvements to the Pier 19 commercial area
- Expansion to internal roadway
- Advancing Green Marine environmental initiatives

The Port's Office of Special Projects is responsible for providing the oversight and structure to manage mitigation projects safely and efficiently. They work closely with internal organizations, such as the CFO, Harbormaster, Engineering, Construction and Maintenance, and Procurement, to prioritize and fund mitigation projects. When needed, they will engage external resources, such as Consultants and Engineering firms to ensure that the identified projects are designed and constructed to meet the current and future needs of the port, ensuring best practices in mitigation, resilience and environmental practices.

1.2 Purpose and Scope

While the scope of the HMP encompasses all areas of the Port, including all its departments and affiliate agencies, the Port is the single jurisdiction seeking approval of this HMP. The HMP identifies all natural, technological/human-caused, and malevolent hazards that could threaten life and property at the Port. The scope of this HMP includes short- and long-term mitigation strategies, plan implementation, and possible sources of project funding.

In addition, the HMP contains the following information:

- The vision of mitigation in the Port
- A profile of the Port, including its geography, history, physical features, and other community features
- The planning process and the involvement of the Port, state, and federal governments; the public; private industry; and other Port stakeholders
- Documentation of the Port's past and predicted exposure to natural, technological, and malevolent hazards, including risks that could affect critical infrastructure and anticipated losses resulting from such an event
- An overview of the Port's capabilities to implement hazard mitigation goals, objectives, and policies to effectively mitigate risks to the community
- Procedures for maintaining an effective, long-range HMP and the strategy to implement it
- An assessment of the Port's current policies, goals, and regulations pertaining to hazard mitigation
- Critical facilities information
- Documentation of the process

The plan was prepared under the direction of the Port of Galveston Hazard Mitigation Planning Team (HMPT). For additional information, please contact the Port Special Project group.

1.3 Plan Development and Maintenance

The Director of Special Projects oversees the Port's hazard mitigation planning process. The board of trustees will formally adopt the plan by resolution, in accordance with the federal DMA2K. The Director has established the Port's Hazard Mitigation Planning Team (HMPT) to develop and implement the HMP.

The Port contracted an emergency management consulting firm, AG Witt, LLC, to guide the HMPT and participating departments and agencies through the planning process.

This HMP will be updated and maintained by the Port Special Projects group to continually address hazards determined to be of high and moderate risk, as detailed in the vulnerability assessment for the Port. Other hazards that pose a low or negligible risk will continue to be evaluated for future updates to the HMP. However, they may not be fully addressed until they are determined to be of medium or high risk. The geographic scope of the HMP includes all acreage of the Port.

The Port recognizes that the risk landscape is constantly evolving. The Port will monitor current events and make updates to the Plan as necessary.

The following table contains a list of the Port departments and affiliate agencies, and the representatives that comprise the Port HMPT that participated in this planning effort.

Table 1-1 Port of Galveston Hazard Mitigation Planning Team (HMPT) / Stakeholders

Name	Organization	Title
Port of Galveston Departments		
Kenneth Campbell	Port of Galveston	Director of Public Safety
Laura Camcioglu	Port of Galveston	Director of Special Projects
Brett Milutin	Port of Galveston	Deputy Executive Director
Partner Organizations		
United States Coast Guard (USCG)		
U.S. Army Corps of Engineers (USACE)		
Texas Department of Emergency Management		
City of Galveston Building Division (Floodplain Management)		

Galveston Office of Emergency Management
University of Texas Medical Branch
Galveston Texas City Pilots

1.4 Authority

Disaster Mitigation Act of 2000

To support the expanded role of emergency management, Congress passed the DMA2K, commonly known as the Stafford Act. Section 322, an amendment to the act, deals with the development of local HMPs. DMA2K was signed into law on October 30, 2000 (Public Law 106-390). The Interim Final Rule for planning provisions (44 Code of Federal Regulations [CFR] Part 201) was published in the Federal Register in February 2002, and again in October 2002. Local hazard mitigation planning requirements are implemented in 44 CFR Part 201.6. The purpose of DMA2K is to establish a national program for pre-disaster mitigation, streamline administration of disaster relief, and control federal costs of disaster assistance. Congress envisioned that implementing these new requirements would result in the following key benefits:

- Reduction of loss of life and property, human suffering, economic disruption, and disaster costs
- Prioritization of hazard mitigation planning at the local level, with an increased emphasis placed on planning and public involvement, assessing risks, implementing loss reduction measures, and ensuring critical services/facilities survive a disaster
- Establishment of economic incentives, awareness, and education of state, tribal, and local governments to promote community-based partnerships, implement effective hazard mitigation measures, leverage additional nonfederal resources, and establish commitments to long-term hazard mitigation efforts

Hazard Mitigation Grant Program

In 1988, Congress established the HMGP by enacting Section 404 of the Stafford Act. In 2002, regulations pertaining to the HMGP to reflect the DMA2K were changed by 44 CFR Part 206, Subpart N. An Interim Final Rule was issued in October 2002, wherein the final compliance date was set to November 1, 2004. The HMGP assists states and local communities with implementing long-term hazard mitigation measures by providing federal funding after a major disaster declaration. Eligible applicants include state and local agencies, tribal organizations, and certain nonprofit organizations. The following are examples of typical HMGP projects:

- Property acquisition and relocation projects

- Structural retrofitting to minimize damages from high winds, earthquakes, floods, or other natural hazards
- Elevation of flood-prone structures
- Vegetative management programs

Pre-Disaster Mitigation Program

The Pre-Disaster Mitigation Program was authorized by Section 203 of the 2000 Stafford Act, 42 United States Code (Public Law 106-390). Funding for the program is provided through the National Pre-Disaster Mitigation Fund to assist state, local, and tribal governments with implementing cost-effective hazard mitigation activities that complement a comprehensive mitigation program. The PDM offers two types of grants: planning grants, which are allocated funds to be used for HMP development; and competitive grants, which are funds for hazard mitigation projects distributed via an application process open to all state, local, and Tribal governments.

The following are the minimum eligibility requirements for jurisdictions receiving competitive Pre-Disaster Mitigation Program funds:

- Participation in the National Flood Insurance Program (NFIP)
- Must not be suspended or on probation from the NFIP
- Must have a FEMA-approved HMP

Flood Mitigation Assistance Program

The Flood Mitigation Assistance (FMA) Program was created as part of the National Flood Insurance Reform Act (NFIRA) of 1994 (42 United States Code 4101) with the goal of reducing or eliminating claims under the NFIP. Funding for the program is provided through the National Flood Insurance Fund. FMA provides funding to assist states and communities with implementing measures to:

- Reduce the number of repetitively or substantially damaged structures and the associated claims on the National Flood Insurance Fund.
- Encourage long-term, comprehensive mitigation planning.
- Respond to the needs of communities participating in the NFIP to expand their mitigation activities beyond floodplain development review and permitting.
- Complement other federal, state, and local mitigation programs with similar long-term mitigation goals.

The following three types of grants are available under the FMA Program:

- FMA planning grants are available to states and communities to prepare flood mitigation plans.

- FMA project grants are available to states and NFIP participating communities to implement measures to reduce flood losses. NFIP-participating communities with approved flood mitigation plans can apply for FMA project grants.
- Technical assistance grants are a part of project grants. Up to 10 percent of the project grants funding is made available to states for technical assistance. These funds may be used by the state to help administer the program.

The NFIRA stipulates that to be eligible to receive an FMA grant, a community must have a FEMA-approved HMP and must be participating in the NFIP.

1.5 Incorporating Mitigation into Existing Planning Mechanisms

It will be the responsibility of the Port to determine additional implementation procedures when appropriate. This includes integrating the requirements of the HMP into other local planning documents, processes, or mechanisms such as the following:

- Comprehensive plans
- Strategic plans
- Capital improvement plans
- Growth management plans
- Ordinances, resolutions, and regulations
- Continuity of operations plans

Port tenants will be required to follow the plan and integrate it into their business continuity plans. The US Army Corps of Engineers will coordinate with the Port and its plan or channel management.

Members of the HMPT will remain charged with ensuring that the goals and strategies of new and updated local planning documents for departments and agencies are consistent with the goals and actions of the HMP and will not contribute to increased hazard vulnerability in the Port. Opportunities to integrate the requirements of this HMP into other local planning mechanisms will continue to be identified through future meetings of the Port HMPT throughout the 5-year review process.

The primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update, and implementation of each department's individual plans and ordinances that require specific planning and administrative tasks (e.g., plan amendments, ordinance revisions, and capital improvement projects).

During the planning process for new and updated local planning documents (such as a comprehensive plan, capital improvements plan, or emergency management plan), the Port will

provide a copy of the HMP to the appropriate parties and recommend that all goals and strategies of new and updated local planning documents be consistent with and support the goals of the HMP and will not contribute to increased hazards in the affected areas.

Although it is recognized that there are many possible benefits to integrating components of this plan into other local planning mechanisms, the development and maintenance of this stand-alone HMP is deemed by the HMPT to be the most effective and appropriate method to ensure implementation of local hazard mitigation actions at this time.

1.6 Mitigation Planning Process

Local hazard mitigation planning is a process of organizing community resources, identifying and assessing hazard risks, and determining how to minimize or manage those risks. This process results in an HMP that identifies specific mitigation actions, each designed to achieve short-term objectives and a long-term community vision. To ensure the functionality of mitigation actions, responsibility is assigned to a specific agency, department, or individual, along with a schedule for implementation. Plan maintenance procedures are established to monitor implementation progress and the evaluation and enhancement of the plan. These plan maintenance procedures ensure that the Port's HMP remains a current, dynamic, and effective planning document over time and offers the following benefits:

- Saving lives and property
- Saving money
- Facilitating recovery following disasters
- Reducing future vulnerability through wise development and post disaster recovery and reconstruction
- Expediting the receipt of pre- and post-disaster grant funding
- Demonstrating a commitment to improve community health and safety

Typically, mitigation planning has the potential to produce long-term and recurring benefits by breaking the repetitive cycle of disaster loss. A core assumption of hazard mitigation is that pre-disaster investments will significantly reduce the demand for post disaster assistance by lessening the need for emergency response, repair, recovery, and reconstruction. Mitigation practices will enable residents, businesses, and industries to recover in the wake of a disaster to ensure the Port's economy is re-established quicker and with less interruption.

The benefits of mitigation planning go beyond reducing hazard vulnerability. Measures such as land acquisition or regulation in known hazard areas can help achieve community goals, such as preserving open space, maintaining environmental health, and enhancing recreational

opportunities. It is vitally important that mitigation planning be integrated with other planning efforts, and that mitigation strategies are congruent with other community goals or initiatives.

In preparing this HMP, the Port used an interdepartmental/interagency planning process consistent with the one recommended by FEMA (Publication Series 386). A local mitigation plan review tool provides a summary of FEMA's current minimum standards of acceptability for compliance with DMA2K and notes the location where each requirement is met within the plan. These standards are based upon FEMA's Interim Final Rule, as published in the Federal Register on February 26, 2002, in Part 201 of the CFR.

All Port personnel were notified prior to the commencement of the 2023 updating of the HMP and process. These communications took place in meetings, and via emails. Internally, twenty-three (23) Port personnel were interviewed by the Consultant. External agencies were contacted by phone, as part of this planning process including the Galveston Fire Department, Galveston Police Department, United States Coast Guard, University of Texas Medical Branch, Texas Department of Transportation, Galveston County Emergency Management Agency, and City of Galveston Floodplain Management. Every effort was made to ensure that all information is correct and that all departments/agencies, organizations, and the public's input were included as presented.

Table 1-2 Key Project Dates

Date	Task
February 24, 2023	Project Kickoff Meeting
March 13, 2023	Interviews with Port staff began
March 24, 2023	Interviews with Port staff completed
May 18, 2023	Toured Port (at night)
May 19, 2023	Toured Port (during day)
May 19, 2023	Met with HMPT Lead
July 26, 2023	HMPT meeting #1
August 8, 2023	HMPT meeting #2
August 28, 2023	HMPT meeting #3
August 30, 2023	Met with HMPT Lead
October 9, 2023	HMPT meeting #4
November 20, 2023	HMPT meeting #5
November 28, 2023	Met with HMPT Lead to discuss Public Meeting communications

Date	Task
December 6, 2023	Final draft plan submitted to the Board of Galveston Wharves for review
February 25, 2024	Board of Trustees approved the DRAFT HMP for Public Meetings.
March 8, 2024	Advertised solicitation for public comments on Port of Galveston website (https://portofgalveston.com/). DRAFT HMP and electronic form posted online, and accessible via QR code.
March 15, 2024	Public Meeting #1 (30-day notice) and Public Meeting #2 notice advertised in local newspaper and on the port's website. Notarized affidavit in Appendix D of this document.
April 16, 2024	Public Meeting #1 conducted. Electronic form accessible via QR code. Public Meeting #2 announced at this meeting.
April 19, 2024	Public Meeting #2 notice (30-day notice) advertised in the local newspaper and on the port's website. Notarized affidavit in Appendix D of this document.
May 21, 2024	Public meeting #2 conducted. Electronic form accessible via QR code. Public comments will remain open for 15 days (TBD).
June 5, 2024	Public feedback period closed
June 24, 2024	Draft HMP and FEMA crosswalk sent to TDEM for state review
November 5, 2024	State level review
December 11, 2024	TDEM review completed
December 12, 2024	Submit to FEMA
January 29, 2025	Federal level review completed
May 2, 2025	FEMA approval
TBD	Formal plan adoption by the board of trustees
TBD	Plan implementation

Throughout the planning process, the HMPT worked collaboratively to develop, review, and analyze each plan component. The following table documents and summarizes how each section was updated and revised by the HMPT.

Table 1-3 HMP Updates and Changes in 2024

Section	Description
Section 1: Introduction	This section reflects the background, propose, and scope of the project as well as information on the planning process, including interdepartmental/interagency participation.
Section 2: Planning Area Profile	The HMPT developed this section by researching available historical records incorporating the Port's background and history of establishment. The HMPT also analyzed topographical data, engineering information, FEMA project worksheets, recent census data, and environmental and geological data to display the Port's overall composition and provide a basis for later sections of the plan to identify hazards and assess risks.
Section 3: Capability Assessment	This new section was developed to better articulate the administrative capabilities of the Port and its partners to administer and enact mitigation planning as well as manage and implement mitigation strategies, actions, and projects.
Section 3: Hazard Analysis	The HMPT conducted a hazard vulnerability assessment for the Port beginning with hazard identification. Hazard identification procedures completed by the HMPT included the following: ▪ Reviews of the state, county (Galveston), and city (Galveston) HMPs; local and regional hazard reports and plans; flood ordinances; and land use regulations ▪ Discussions with experts from federal, state, and local agencies ▪ Reviews of collected data from past events and declared disasters ▪ Searches of the Internet and newspapers for hazard data and statistics ▪ Review of the FEMA National Risk Index for Natural Hazards ▪ Review of the FBI Uniform Crime Report (UCR) Program ▪ Discussions with veteran Port personnel and staff ▪ Interviews and information from emergency responders regarding incidents in the area ▪ Profiles of the identified hazards found by assessing the locations or geographical areas that may be affected by each hazard. The HMPT also analyzed and documented the extent of each hazard, including the potential magnitude, severity, and probability of occurrence.

Section	Description
Section 4: Vulnerability Assessment and Loss Estimation	To estimate potential losses, the HMPT gathered the monetary values of common structure types within the Port and calculated loss in intervals of 75 percent, 50 percent, and 25 percent. The HMPT also reviewed land use and development trends, authorities, and ordinances for inclusion in the plan. The HMPT also compiled a list of critical facilities by category, determined their total square footage, and calculated total structural values to determine overall risk.
Section 5: Mitigation Strategies	To develop the Port's mitigation strategies, the HMPT conducted a workshop focused entirely on developing the goals, objectives, and actions in the plan. Each strategy was developed on its current relevance, status (completed, deleted, or deferred), cost, and time frame. The HMPT also addressed the following criteria questions in developing the mitigation strategies: ▪ Do the goals and objectives identified in the plan reflect the risk assessment? ▪ Do the goals and objectives identified in the plan lead to mitigation projects and/or changes in policy that help the Port reduce vulnerability? ▪ Do the goals and objectives identified in the plan support any changes in mitigation priorities? ▪ Are goals identified in the plan reflective of current state goals?
Section 6: Program Implementation	This section details the ongoing process for adopting and maintaining the HMP.

1.6.1 Inclusive Outreach and Public Involvement

To be an effective plan, input from the public is vital. The HMPT recognizes the valuable contribution the public can provide to the contents and accuracy of this plan.

As required by FEMA, the HMPT conducted two public meetings to allow the public to provide comments on the plan. These meetings were advertised 30 days in advance, both in the local newspaper and posted on the Port website. In addition, to encourage public feedback, each

advertisement included a QR code that enabled access to the DRAFT HMP document online, as well as an electronic feedback form.

On the port's website, in the newspaper advertisements, and at both Public Meetings, it was announced that the public feedback period would be open for comments until 15 days after the second public meeting. Upon that date, all electronic feedback forms that were submitted (1) and comments cards received at the Public Meetings (0) were compiled and submitted to the HMPT for consideration. Those that were approved, either as submitted or in part, were integrated into the FINAL plan. It was then submitted to the HMPT and the Board of Trustees, where a final review of the final draft HMP before submittal to TDEM and FEMA. In all cases, the submitters were notified of the status of their feedback.

The Port of Galveston will continue to proactively encourage public participation in the plan maintenance process by holding an annual public meeting and posting the plan to the Port website for public feedback. Information for accessing the plan on the Port website will be provided to the public through the local media advertisement for the annual public meeting and will be reemphasized during the conduct of the annual public meeting.

The Port's Director of Administration and Board of Trustees are responsible for coordinating the HMPT, as well as coordinating and monitoring the implementation of the plan over time and tracking the status of identified hazard mitigation actions. The plan will be evaluated annually by the HMPT for its overall effectiveness in achieving defined goals. Every five years, the HMPT will participate in a full update of the plan to reflect any potential changes or new hazards. The HMPT has selected the following activities to guide their plan maintenance strategy.

Table 1-4 Plan Maintenance Strategy

Activity	Time Frame	Responsible Department(s)
Plan monitoring	Ongoing	Port's Office of Special Projects
HMPT meetings for plan evaluation	Annually	Port's Office of Special Projects, Board of Trustees, HMPT
Public meetings	Annually	Port's Office of Special Projects, Board of Trustees, HMPT
Plan review, evaluation and update (including but not limited to new hazard identification, additions/ revisions to the risk assessment,	Annually	Port's Office of Special Projects, Board of Trustees, HMPT

Activity	Time Frame	Responsible Department(s)
and status updates to mitigation strategies)		
Mitigation strategy status update meetings for participating departments/agencies	Annually	Port's Office of Special Projects, Board of Trustees, HMPT
Submittal of the updated plan to TDEM/FEMA for review and approval	Every 5 years	Port's Office of Special Projects, Board of Trustees, HMPT

2 PORT PROFILE

2.1 Port History and Operations

The Port of Galveston (Port) was established on October 17, 1825, by the Congress of Mexico, as the land was owned by Mexico at the time. The Port of Galveston is the oldest port on the Gulf of Mexico west of New Orleans. The Port expanded its operations throughout the next several decades, and by the early 1900s was the leading port for the export of cotton in the United States.

Private holdings were sold to the City of Galveston in 1940 as a result of a popular vote. Since that time, vast improvements and additions to property and infrastructure have taken place as funds allowed, and as previously identified in the 2013 HMP, included the construction of new piers, container terminals and grain elevators, and additional dredging to add depth to the deepwater channel. In 2022, a new state-of-the-art zero-energy cruise terminal was opened.

In 1990, the Galveston cruise ship terminal was dedicated. Today, the Port is ranked fourth in the nation in terms of cruise passenger embarkations and the Port handles over 1.2 million cruise passengers annually. The Port is served by both major western railroad operators and contributes significant economic impact to the State of Texas. The Port provides an annual economic impact of $2.3 billion, generates approximately 13,890 jobs, and $869.8 million is annual income for Texas workers. The Port's Pelican Island facilities comprise a combination of undeveloped property, an active ship and rig repair facility, and liquid bulk operations.

Located at the entrance to Galveston Bay, the Port leases and maintains facilities situated on the north side of Galveston Island and on adjacent Pelican Island. The Galveston Island operations are a diversified mix of traditional and nontraditional cargo operations including roll-on/roll-off cargo, dry bulk, export grain, refrigerated fruit, general cargo, and project cargo.

Foreign-Trade Zone No. 36 operates a Service Area that includes all of Galveston County, including the cities of Galveston, Hitchcock, Dickinson, La Marque, Santa Fe, League City and Webster. As Grantee of the Zone, the Port of Galveston sponsors applications for new sites and interfaces with the Foreign-Trade Zones Board and zone users. Additionally, the Grantee is responsible for compiling and sending an annual report to Washington, DC that chronicles each year's zone activity. The port also works closely with Customs and Border Protection (CBP) to ensure that all zone activities are properly handled by the zone Operators.

FTZ No. 36 includes Scholes International Airport as well as sites operating within the Port's property boundaries on Galveston Island and areas within Galveston County. FTZ No. 36 is a general-purpose zone which can store and manipulate imported goods before they enter the commerce of the United States or are re-exported. Other approved zone activities include

assembling, packaging, destroying, storing, cleaning, exhibiting, re-packing, distributing, sorting, grading, testing, labeling, repairing, combining with foreign or domestic content, or processing. Manufacturing and processing require specific FTZ Board approval.

2.2 Location and Geography

The Port is located on Galveston Island, Texas, in Galveston County, Texas. It is approximately 30 minutes sailing time from the open waters of the Gulf of Mexico. The Port of Galveston consists of the Galveston Ship Channel, the south side of Pelican Island, the north side of Galveston Island, and the entrance to Galveston Bay.

Figure 2-1 Port of Galveston Area

Figure 2-2 Port of Galveston Developed Areas

According to the U.S. Census Bureau, the Port has a total area of 850 square miles. The topography of Galveston Island is generally low, with little variation. The eastern 10 miles of the island is fronted by the massive Galveston Seawall. The seawall was built to an average height of approximately 17 feet. The land surface behind it is graded uniformly to slope downward to the north, from an elevation of approximately 14 to 18 feet adjacent to Seawall Boulevard to approximately 8 to 9 feet in the shipping industrial area of Galveston Harbor, near Galveston Channel. Natural elevation averages approximately 6 feet along the remaining 20 miles of the island, west of the seawall. Due to increased storm-related and long-term erosion, frontal dunes along this stretch of the coast are small, and therefore provide minimal protection against wave action, particularly storm-induced waves.

2.3 Transportation

Interstate 45 has a southern route in Galveston, via the Galveston Causeway, and serves as a main artery to Galveston from mainland Galveston County, Harris County, and Houston. Farm-to-Market Road 3005 (locally called FM 3005), also known as the Bluewater Highway, connects Galveston to Brazoria County via the San Luis Pass-Vacek toll bridge. State Highway 87, known locally as Broadway Street (via Sewall Boulevard, and Ferry Road, connects the island to the Bolivar Peninsula via the Galveston – Port Bolivar Ferry.

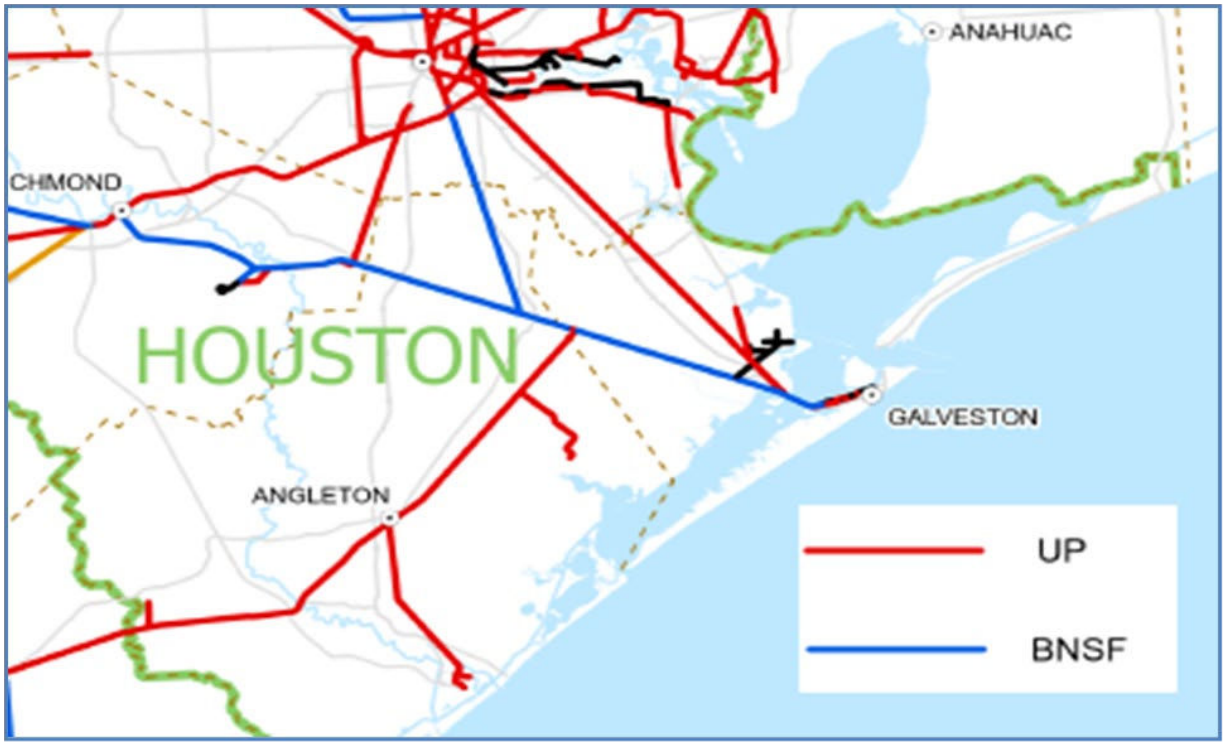
There are two (2) active railway systems that service the Port, the Union Pacific (UP) and Burlington Northern Sante Fe (BNSF) railroads. These are both classified as Class I railroads, being part of the largest in the railroad networks. Both railroads access Galveston via a separate railroad causeway, which also operates a lift bridge to accommodate vessel traffic.

The U.S. Department of Transportation, Federal Railroad Administration has reported two trespasser-related fatalities outside of Port property. All accidents or incidents related to railroad activities are investigated by the Federal Railroad Administration (FRA) and/or the National Transportation Safety Board (NTSB).

The Galveston Railway, originally established and named in 1854 as the Galveston Wharf and Cotton Press Company, is a Class III terminal switching railroad headquartered in Galveston, that primarily serves the transportation of cargo to and from the Port. The railway operates 32 miles of yard track at Galveston, over a 50-acre facility. Island Transit, which operates the Galveston Island Trolley, manages the city's public transportation services.

There is abandoned rail that is attached to the Pelican Island Causeway bridge, which runs between Galveston and Pelican Island, but the rail has been removed once it transitions to land.

Figure 2-3 Railroad Lines in the Galveston Area



Travel by air is primarily serviced by Houston Hobby International Airport and George Bush International Airport. Both are located in Houston, Texas, approximately 35 minutes and 90 minutes north of the Port, respectively. Galveston Island is also host to Scholes International Airport at Galveston, which is operated by the City of Galveston. Scholes International Airport at Galveston is a two-runway airport; the airport is primarily used for general aviation, offshore energy transportation, and some limited military operations. The University of Texas Medical Branch has two heliports, one for Ewing Hall and one for its emergency room.

2.4 Climate

Galveston's climate is classified as humid subtropical. Prevailing winds from the south and southeast bring heat from the deserts of Mexico and moisture from the Gulf of Mexico. Summer temperatures regularly exceed 90°F and the area's humidity drives the heat index even higher. Winters in the area are temperate, with typical January highs above 60°F and lows near 50°F. Snowfall is generally rare. Annual rainfall averages well over 40" a year with some areas typically receiving over 50".

2.4.1 Climate Change – Sea Level and the Texas Coastal Environment

Climate change is described as a significant change in either the average state of the climate or in its variability over an extended period. Climate change in and of itself is not necessarily a hazard, but it may increase the frequency and/or intensity of identified hazards over time. Climate change could affect communities in a variety of ways, but it is currently unclear what extent the impacts will have on the Planning Area. It is anticipated that hazard-causing events will fluctuate due to climate change over time. As new information and new models are developed, a climate change Risk Assessment may be enhanced to measure and assess these impacts more accurately.

The Bureau of Economic Geology (BEG), a research unit at The University of Texas at Austin has reported "Gulf Coast environments respond to the impact of powerful tropical storms, pounding wind and waves, and sea-level rise by shifting inland. To manage and develop the coastal zone wisely, it is vitally important to understand natural processes and to monitor the impacts of development. Over the past century, ocean tide gauges around the world and satellite measurements have indicated that sea level is rising more rapidly than before.

Sea level impact is occurring more rapidly along the upper Texas coast than worldwide because some coastal lands are sinking. Studies by the Environmental Protection Agency have estimated that along the Gulf Coast a 0.30-m (1ft) rise in sea level is likely by 2050. In the next century, a 0.60-m (2 ft) rise is most likely, but a 1.2 m (4 ft) rise is possible. A rise in sea level could cover a substantial amount of land along the Gulf Coast"

The Harte Research institute for the Gulf of Mexico, Texas A&M University states "The Houston region experiences the highest rate of sea level rise impact in Texas, and indeed one of the highest in the world, due to widespread sinking of the land called subsidence."

Climate change has impacted the Port, as well as Galveston in several instances, such as hurricanes, sea level rise, and subsidence.

2.5 Historical Hazard Events and Disasters

The Galveston area is known for being the site of the deadliest natural disaster in US history; the hurricane of 1900 killed over 8,000 people and destroyed approximately 7,000 buildings and damaged every single dwelling in Galveston. Over ten feet of storm surge inundated the city. Fortunately, Galveston has been spared a similar storm strike since then but has been the subject of 11 disaster declarations in the past 25 years and is constantly at risk of another severe hurricane event. As described in Table 2-1, seven declarations were associated with tropical systems (hurricanes and tropical storms), once was related to severe storms and flooding, one from a global pandemic, one associated with a severe winter storm, and one from extreme wildfire threat. DR-1624-TX (wildfire) was statewide threat but Galveston Wharves did not have any impacts from the event. The event is included in this plan to record the history of declarations for Galveston and should not be interpreted as an incident impacting or causing risk to the jurisdiction.

Table 2-1 Historical Galveston Disaster Declarations

Date	Disaster Number	Event
June/July 2001	DR-1379-TX	Tropical Storm Allison
September 2002	DR-1434-TX	Tropical Storm Fay
July 2003	DR-1479-TX	Hurricane Claudette
September 2006	DR-1606-TX	Hurricane Rita
January 2006	DR-1624-TX	Extreme Wildfire Threat
September 2008	DR-1791-TX	Hurricane Ike
November 2015	DR-4245-TX	Severe Storms, Tornadoes, Winds, and Flooding
August 2017	DR-4332-TX	Hurricane Harvey
March 2020	DR-4485-TX	COVID-19 Pandemic
August 2020	DR-4572-TX	Hurricane Laura
February 2021	DR-4586-TX	Severe Winter Storm

2.6 Services

2.6.1 Fire Department / Ambulatory Services

There are six (6) Fire Stations on Galveston Island:

- Station 1 – Downtown, 823 26th Street is a new is a top-of-the-art facility (2019) and offers the necessary indoor storage space for first responders and their equipment, so it is protected from the island's climate. Station 1 is home to Engine 1, Tower 1, BC01 (Battalion Command), Squad 1, Medic 1, Medic 2, High Water Rescue, and the Chief's car.
- Station 2 – East End, 428 Church Street protects the east end of Galveston Island including the UTMB Hospital District and the eastern portion of the Port of Galveston. Station #2 houses Engine 2 and Brush 2.
- Station 4 – Scholes Airport, 8700 Cessna Drive is located at Scholes International Airport and serves the airport itself and the surrounding residential area, including Moody Gardens and Schlitterbahn Galveston. Station 4 houses Engine 4, Ladder 4, and Battalion 4.
- Station 5 – Midtown, 5728 Ball Street protects the Midtown area including Pelican Island, the Galveston Island Convention Center, The San Luis Resort, and the western portion of the Port of Galveston. Station 5 houses Engine 5, Brush 5, and Marine 5.
- Station 7 – Pirates Beach, 3902 Buccaneer Boulevard is located near the Pirates Beach subdivision and is primarily residential. Station 7 is one of two stations not protected by the Galveston Seawall. This area includes Galveston Island State Park. Station 7 houses Engine 7 and Squad 7.
- Station 8 – Sea Isle, 21710 Shelby Drive South, is in the Sea Isle subdivision and protects the far west end of Galveston Island. Station 8's area is primarily residential with numerous multimillion-dollar dwellings and resort-style complexes. Station 8 is one of two stations not protected by the Galveston Seawall. Station 8 houses Engine 8 and Brush 8.

2.6.2 Law Enforcement

The Port has its own Police Department providing 24/7 coverage. Shift coverage depends on the activities that are taking place within the Port, such as cruise ships in Port, vessel activity, and special circumstances, such as the unloading or loading of explosives. The on-duty resources are scheduled and dispatched from the Port's Dispatch Center, which is also responsible for monitoring the Port's 400 surveillance cameras.

Port Police deal with many of the crime prevention and law enforcement issues that are found in any city and receive specialized training to respond to situations unique to ports.

Enforcement incidents include parking violations, contraband offenses, public intoxication, assaults and thefts. Officers are involved in almost all aspects of daily Port operations. They monitor and assist with entry to secured areas, meet with the captains of arriving ships to review regulations and security directives, facilitate cargo movements, and monitor Port facilities for safety and environmental hazards. They are responsible for enforcing state and federal laws and ensuring Port security.

They also have a Marine Division, with their specially trained Port police crewing a 31-foot police boat equipped with state-of-the-art navigational and rescue equipment. Officers patrol Galveston harbor, escort vessels embarking and debarking from the Port, conduct waterside pier sweeps to ensure Port security and safety, and assist with search and rescue missions in the Galveston area.

The joint Galveston Police Department, Galveston County Sheriff's, Galveston County Jail, and the Galveston Office of Emergency Management (OEM) facility is located at 601 54th Street in Galveston.

There is an active Interlocal Cooperation Agreement, signed and notarized, titled "Mutual Aid Law Enforcement Agreement Between the Board of Trustees of the Galveston Wharves and the County of Galveston." It was executed pursuant to Chapter 791 of the Government Code, commonly known as the Interlocal Cooperations Contract Act and Chapter 362 of the Local Government Code commonly known as the Mutual Aid Law Enforcement Service Act. This agreement took effect on July 9, 2013, and continues in force until the Participating Agencies have terminated their participation.

2.6.3 Emergency Management Offices

The Galveston Office of Emergency Management (OEM) is located at 601 54th Street in Galveston (see law enforcement above).

The Galveston County Office of Emergency Management is located at 1353 FM 646 Road West, Suite 201, Dickinson, Texas 77539, approximately 18 miles northwest of Galveston. The National Weather Services also has offices in the facility.

There is an active Interlocal Agreement, signed, titled *"Interlocal Agreement for use of Public Safety Communications Systems."* This agreement was made pursuant to Chapter 791 of the Texas Government Code and entered into by and between Harris County, Texas (the "County"), acting by and through its governing body, the Harris County Commissioners Court, and the Board of Trustees of the Galveston Wharves (the "User"), acting by and through its governing body and in accordance with the Interlocal Cooperations Act Tex. Gov't Code §§791.001, *et. seq*, as amended. This agreement was approved on May 29, 2019, and authorized (Commissioners Court) on June 25, 2019.

2.6.4 Local Medical Services

The University of Texas Medical Branch Galveston (UTMB) Campus houses four schools, research facilities, John Sealy Hospital, the Jennie Sealy Hospital, the Rebecca Sealy hospital, and a Level I trauma center.

The Shriners Hospitals for Children is also located at the facility grounds, which is a pediatric burn hospital, research, and teaching center located on the campus of the UTMB in Galveston.

Medical helicopter access to the island is available via the heliport located on the north side of Harborside Drive, diagonally from the UTMB Health Emergency Room. The longitude / latitude of the heliport in decimal degrees is 29.313222, -94.778356.

There is an active Memorandum of Understanding (MOU), signed, titled *"A Memorandum of Understanding."* The MOU was established to define the working relationship between the Port of Galveston Police Department and The University of Texas Medical Branch at Galveston, Police Department. This MOU was signed by both parties on July 30, 2012, and remains in effect from the date executed until such a time that the principals of their successors agree upon a modification.

3 CAPABILITY ASSESSMENT

3.1 General

As a self-sustaining facility, the Port has a unique type of "governance." The 840-acre Port operates much like an independent city with its own services, law enforcement, governing body, financial and regulatory resources, and planning authority.

3.2 Administration

3.2.1 Board of Trustees

The Board of Trustees of the Galveston Wharves is designated by the City Charter as having the ultimate responsibility for operating the Port. The wharf and terminal properties were originally purchased by the City of Galveston and designated as a utility of the city.

3.2.2 Port Director

The Port Director is hired by the Board to execute the policy directives of the Board. The Director is responsible for administrative decisions relating to the day-to-day business and personnel affairs of the Wharves and its routine operations, execution of the Board's policy decisions, and other matters delegated by the Board.

The Port Director has the primary responsibility to conceive and develop plans and programs relating to expansion, variation, and diversification of the Wharves' business and its more efficient and profitable operation in conformity with the economic welfare of the City of Galveston. All matters within the Board's responsibility shall be submitted by the Port Director to the Board for a decision.

3.2.3 Administrative and Technical Capabilities

The Port maintains administrative and technical resources within its departments to determine, evaluate, and coordinate resources for mitigation activities. The table below lists potential resource needs and indicates whether the Port has staff with that expertise or utilizes outside contractors.

Table 3-1 Port of Galveston Administrative and Technical Capabilities

Port of Galveston Administrative and Technical Capabilities		
Staff/Personnel Resources	**On Staff**	**Department/Agency**
Planner(s) or engineer with knowledge of land development and land management practices	Yes	Engineering
Engineer(s) or professional(s) trained in	Yes	Engineering

construction practices related to buildings and/or infrastructure		
Planners or engineer(s) with an understanding of natural and/or human-caused hazards	Yes	Engineering
Certified Floodplain Manager	No	Outsourced when services required
Surveyors	No	Outsourced when services required
Staff with education or expertise to assess the community's vulnerability to hazards	Yes	Port Police Department
Personnel skilled in GIS and/or HAZUS	Yes	Engineering
Historic Preservation Specialists	No	Outsourced when services required
Emergency Management Coordinator	Yes	Executive
Emergency Response Team	Yes	Port Police Department
Disaster Program Director	Yes	Executive

3.3 Legal and Regulatory Resources

The Port has jurisdiction over their tenants. All tenants, such as cruise ship companies, are required to develop, monitor, and maintain an emergency plan for their employees, clients, and facilities. Tenants are required to be familiar with, and align their activities with, this hazard mitigation plan.

The Port is also a special district of the City of Galveston with its own managing Board of Trustees. The Port coordinates with the City to enact and enforce ordinances, plans, and policies relevant to hazard mitigation. The table below provides information about each.

Table 3-2 City of Galveston Ordinances, Plans, and Policies related to Hazard Mitigation

Galveston Ordinances, Plans and Policies Relevant to Hazard Mitigation		
Ordinance/Plan/Policy	**Description**	**Enforcement**
Zoning Ordinances	How land use is controlled and public health, welfare and safety is protected. Allows the municipal government to control and limit the type and density of development.	Development Services
Subdivision Ordinance	Regulates the development of housing, commercial, industrial and other uses, including associated public infrastructure, as land is subdivided into buildable lots for sale or future development.	Development Services

Building Codes, Permitting and Inspections	Regulates construction standards and ensures enforcement of the City's adopted standards.	Development Services
Flood Damage Prevention Ordinance	Provides the framework for action regarding the corrective and preventative measures in place to reduce flood-related impacts.	Development Services, Certified Floodplain Manager
Stormwater Management Plan	Designed to address flooding associated with stormwater runoff, and is focused on design and construction measures that are intended to reduce urban flooding.	Public Works Department, Municipal Utilities Department
Water and Sewer Master Plans	The blueprints for future development of the City's water and sewer systems, and considers prevention of failures to function of both systems.	Municipal Utilities Department
City of Galveston Hazard Mitigation Plan	The blueprint for how the City intends to reduce the impact of natural and human- caused hazards on people and assets in the City.	Development Services and Emergency Management
Emergency Management / Operations Plan	Outlines the responsibilities of those responding to an emergency or disaster and how resources are deployed.	Emergency Management Coordinator, Mayor's Office, City Manager's Office
Continuity of Operations / Government Plan	Establishes a clear chain of command, line of succession and plans for backup or alternate facilities in case of an extreme emergency or disaster	Emergency Management Coordinator, Mayor's Office, City Manager's Office
Evacuation / Re-entry Plan	Establishes the process by which the City will evacuate citizens and allow for re-entry after a hazard event (particularly a tropical event)	Emergency Management Coordinator, Mayor's Office, City Manager's Office
Comprehensive Plan	Establishes the overall vision for the City, and helps to guide municipal decision-making	Development Services
Capital Improvement Plan	Guides the scheduling of spending on Capital Improvement Projects (CIP) and serves as a mechanism to guide future development.	Public Works Department, Municipal Utilities Department
Historic Preservation Plan	Guides the City's efforts to preserve historic assets throughout the City	Development Services, Historic Preservation Officer

Historic Structure Disaster Response Plan	Provides information on how the City's historic assets will be cared for in the aftermath of a disaster, and provides information to property owners for ways to protect and repair their historic properties	Development Services, Historic Preservation Officer
Coastal Zone Management Plan	As part of the State's plan, it provides information for the preservation and protection of coastal zones; works in conjunction with the City's beach/dune preservation ordinances	Development Services, Texas General Land Office

3.4 Funding Sources

The Port received a $16,529,828 award for damages caused by Hurricane Ike in 2008. During the incident, severe storm surge inundated multiple Port facilities. The concrete floor slab at Pier 15 subsequently demonstrated subsidence caused by erosion of supporting fill materials from underneath the slab.

The following table provides a list of potential funding sources that the Port may engage when seeking mitigation funding.

Table 3-3 Select State and Federal Hazard Mitigation Programs and Funding Sources

Summary of Selected State and Federal Regulations, Plans, and Funding Sources Relevant to Natural Hazard Mitigation					
Title	**Program Type**	**Federal, State, or Local**	**Administered By**	**Eligible Subrecipient**	
				City	**Other Agency**
FEMA Public Assistance (PA) Grants	Funding	Federal	Texas Division of Emergency Management	X	X
FEMA Hazard Mitigation Grant Program (HMGP)	Funding	Federal	Texas Division of Emergency Management	X	X
FEMA Building Resilient Infrastructure & Communities (BRIC) Grants	Funding	Federal	Texas Division of Emergency Management	X	
FEMA/NFIP Flood Mitigation Assistance (FMA) grants	Funding	Federal	Texas Water Development Board	X	

Housing and Urban Development Community Development Block Grants (CDBG) (all colors)	Funding	Federal	Texas General Land Office	X	X
US Army Corps of Engineers (USACE) Grants	Funding	Federal	USACE	X	X
Shore Protection Program	Funding	State	Texas General Land Office	X	X
Farmland Preservation Program	Funding	State	Texas General Land Office	X	X
Beach Maintenance Reimbursement Fund	Funding	State	Texas General Land Office	X	X
Coastal Erosion Planning and Response Act (CEPRA)	Funding	State	Texas General Land Office	X	X
Texas Coastal Impact Assistance Program	Funding	Federal	Texas General Land Office	X	X

The Port also may utilize local financial resources for hazard mitigation as described in the table below:

Table 3-4 Hazard Mitigation Local Financial Resources

Port Funding/Financing Sources Relevant to Hazard Mitigation	
Financial Resources	**Accessible or Eligible to Use**
General Fund	Yes
Development Fees	Yes
CDBG	Yes
Capital Improvements Project Funding	Yes
Authority to Levy Taxes for Specific Purposes	Yes
Fees for Water and Sewer Service	Yes
Impact Fees for Developers	Yes
Federal Hazard Mitigation Grants	Yes

3.5 Capability Improvements and Integration of Mitigation Into Existing Planning Mechanisms

The Port is also determined to integrate mitigation planning into future efforts. Integration of mitigation strategies will vary from project to project, but improved mitigation capabilities will include the following:

- Consider the implications of future development on hazard risks and risk reduction requirements.
- Integrate risk assessments into Port decision-making processes.
- Continued public input into the decision-making process.
- Incorporate the mitigation actions outlined in the HMP into future planning.
- Incorporate hazard mitigation focused construction practices when upgrading or developing new facilities.
- Continued and expanded education and outreach to Port employees and tenants.
- Coordinate mitigation projects with the City of Galveston where changes outside of the Port could have cascading impacts to the Port, or Port mitigation activities could impact properties outside of the Port.
- Coordinate mitigation activities with state and federal partners where either party could be impacted by the others' efforts.

3.5.1 Strategic Master Plan

The Port developed the Port of Galveston Strategic Master Plan (SMP) in 2019, which creates a vision and direction for the port that can be embraced by the community with a sustainable and viable business model for the Port. Throughout the planning process outreach was conducted with the community, port users and stakeholders to guide the vision accordingly.

The Master Plan identifies, examines, and positions the port for growth and expansion for the 40 years, develops principles and identifies key strategies that will guide future development opportunities.

3.6 Local Resources

3.6.1 City of Galveston Emergency Management

The Office of Emergency Management (OEM) provides a comprehensive all-hazard emergency management program in partnership with City departments, staff, administration, neighboring jurisdictions, and non-governmental organizations in order to save lives, protect property, and safeguard the environment.

3.6.2 Galveston County Office of Emergency Management

Galveston County OEM provides coordination amongst local, state, and regional partners as well as maintaining a robust stable of volunteer programs including CERT, an Emergency Communications Group, Search and Rescue, Crisis Support, and Medical Reserve personnel.

3.7 State Resources

3.7.1 Texas Department of Emergency Management (TDEM)

The Texas Department of Emergency Management separates the 254 counties into 6 regions, which are further separated into Districts. The Port of Galveston resides in TDEM Region 2, District 16B.

The Texas Division of Emergency Management, Operations Section, manages and staffs the State Operations Center (SOC), located at DPS Headquarters at 5805 N. Lamar Blvd., in Austin. The SOC serves as the state warning point and primary state direction and control facility. It operates 24/7 to monitor threats, make notification of threats and provide information on emergency incidents to local, state, and federal officials, and coordinate state emergency assistance to local governments that have experienced an emergency situation that local response resources are inadequate to deal with. During major emergencies, the State Operations Center Management Team, state agencies and volunteer groups that make up the state Emergency Management Council and federal liaison teams convene at the SOC to identify, mobilize, and deploy state and volunteer group resources to respond to the emergency.

The State Management Team (SMT) is dedicated SOC staff responsible for standardizing SOC management and operation during a disaster, developing a NIMS-based resource request process, and incorporating state agency liaisons to support operations.

During emergency SOC activations the SMT has members that serve as the lead points of contact for Operations, Logistics, and Planning.

Additionally, the SMT has state agency liaisons that support the SOC. They include representatives from:

- Texas A&M Forest Service
- Texas Military Department
- Texas Engineering Extension Service – TX Task Force 1
- Texas A&M Agrilife Extension
- Texas Highway Patrol
- Texas Parks & Wildlife Department

The Texas SOC Clock utilizes and sets the official time for the H-120 countdown (H=Hurricanes), as well as any other incident or event that needs a uniform and set time statewide. The URL is: https://clock.soc.texas.gov/

3.8 Federal Resources

3.8.1 U.S. Coast Guard (USCG)

The U.S. Coast Guard detachment that supports the Port of Galveston is the Atlantic Area Command, 8th Coast Guard District, Coastal Region, Sector Houston/Galveston.

The Atlantic Area Command Center coordinates Homeland Security, Law Enforcement, and Rescue Missions that occur on the high seas across and outside District Boundaries ranging from the Rocky Mountains to the Arabian Gulf, which spans 14 million square miles.

Within the Atlantic Area Command, the 8th Coast Guard District 8, which is headquartered in New Orleans, is responsible for U.S. Coast Guard operations spanning 26 states, including the Gulf of Mexico coastline from Florida to Mexico, the adjacent offshore waters and outer continental shelf, as well as the inland waterways of the Mississippi, Ohio, Missouri, Illinois, and Tennessee River systems. The district has four (4) air stations to support 17 aircraft, as well as 45 Cutters (>65'), and an inventory of smaller response / patrol boats. In 2020, this District conducted 5,745 foreign-flag vessel exams, and 9,123 domestic vessel inspections.

The 8th Coast Guard District 8 has three (3) regions, identified as the Inland, Coastal and Offshore regions. The Port of Galveston falls within the coastal region, with more than 900 miles of coastline. The ports within this Coastal region receive over 27,000 deep draft vessels annually. The 8th District employs more than 3,700 active-duty military personnel and over 700 military reservists.

3.8.2 U.S. Army Corps of Engineers (USACE)

The missions of the USACE most relevant to the Port of Galveston are Civil Works (which includes Navigation and Flood Risk Management), Emergency Operations, and Environmental. Military Missions, Research and Development, and Sustainability round out the USACE missions. Navigation, which was the Corps of Engineers' earliest civil works mission, provides waterborne transportation systems (channels, harbors, and waterways) for movement of commerce, national security needs, and recreation.

Related to Emergency Management, the Galveston District is prepared to respond to disasters, both within its area of responsibility and globally. FEMA missions completed by the Galveston District include providing emergency supplies of water and ice, installing emergency generators and temporary roofing on homes, removing debris from public property, and managing the

installation of mobile homes as transitional housing. In addition to FEMA missions, the Corps provides flood fighting and levee repair assistance.

The USACE Galveston District conducts flood mitigation projects throughout the region. Flood risk management projects prevent or reduce flood water damage in Texas' low-lying coastal areas, flood-prone river valleys and further inland bayous.

3.8.3 U.S. Customs and Border Protection (CBP)

The U.S. Customs and Border Protection (CBP) operates at the Port since it is classified as a 'Port of Entry.' CBP has a complex mission at ports of entry with broad law enforcement authorities tied to screening all foreign visitors, returning American citizens and imported cargo that enters the United States.

CBP has an office and several portable office trailers at the Port and has their local headquarters at the Federal Building located at 601 25th Street in Galveston.

3.8.4 Federal Emergency Management Agency (FEMA)

The Port of Galveston falls under FEMA Region 6, which is located at 800 N. Loop 288, Denton, Texas 76209. For the purposes of hazard mitigation planning, the Port is classified as a Special District and is subject to the requirements of local hazard mitigation plans.

The federal government requires local governments to have hazard mitigation plans in place to be eligible for funding opportunities through FEMA such as the Pre-Disaster Mitigation Assistance Program and the Hazard Mitigation Grant Program. The Mitigation Technical Assistance Programs available to local governments are also a valuable resource. FEMA may provide temporary housing assistance through rental assistance, mobile homes, furniture rental, mortgage assistance, and emergency home repairs. The Disaster Preparedness Improvement Grant also promotes educational opportunities with respect to hazard awareness and mitigation.

FEMA, through its Emergency Management Institute, offers training in many aspects of emergency management, including hazard mitigation. FEMA has also developed a large number of documents that address implementing hazard mitigation at the local level. Five key resource documents are available from FEMA Publication Warehouse (1-800-480-2520) and are briefly described below:

- **How-to Guides:** FEMA has developed a series of how-to guides to assist states, communities, and Tribes in enhancing their hazard mitigation planning capabilities. (http://www.fema.gov/fima/planhowto.shtm).
- **Post-Disaster Hazard Mitigation Planning Guidance for State and Local Governments.** FEMA DAP-12, September 1990. This handbook explains the basic concepts of hazard

mitigation and shows state and local governments how they can develop and achieve mitigation goals within the context of FEMA's post-disaster hazard mitigation planning requirements. The handbook focuses on approaches to mitigation, with an emphasis on multi-objective planning.

- **Mitigation Resources for Success CD.** FEMA 372, September 2001. This CD contains information about mitigation and is useful for state and local government planners and other stakeholders in the mitigation process. It provides mitigation case studies, success stories, information about Federal mitigation programs, suggestions for mitigation measures to homes and businesses, appropriate relevant mitigation publications, and contact information.
- **A Guide to Federal Aid in Disasters.** FEMA 262, April 1995. When disasters exceed the capabilities of state and local governments, the President's disaster assistance program (administered by FEMA) is the primary source of federal assistance. This handbook discusses the procedures and process for obtaining this assistance, and provides a brief overview of each program.
- **The Emergency Management Guide for Business and Industry**. FEMA 141, October 1993. This guide provides a step-by-step approach to emergency management planning, response, and recovery. It also details a planning process that businesses can follow to better prepare for a wide range of hazards and emergency events. This effort can enhance a business's ability to recover from financial losses, loss of market share, damages to equipment, and product or business interruptions.

Other federal resources include:

- **Department of Agriculture**. Assistance provided includes: Emergency Conservation Program, Non-Insured Assistance, Emergency Watershed Protection, Rural Housing Service, Rural Utilities Service, and Rural Business and Cooperative Service.
- **Department of Energy, Office of Energy Efficiency and Renewable Energy, Weatherization Assistance Program.** This program minimizes the adverse effects of high energy costs on low-income, elderly, and handicapped citizens through client education activities and weatherization services such as an all-around safety check of major energy systems, including heating system modifications and insulation checks.
- **Department of Housing and Urban Development, Office of Homes and Communities, Section 108 Loan Guarantee Programs.** This program provides loan guarantees as security for federal loans for acquisition, rehabilitation, relocation, clearance, site preparation, special economic development activities, and construction of certain public facilities and housing.

- **Federal Financial Institutions.** Member banks of FDIC, FRS or FHLBB may be permitted to waive early withdrawal penalties for Certificates of Deposit and Individual Retirement Accounts.
- **Internal Revenue Service, Tax Relief.** Provides extensions to current year's tax return, allows deductions for disaster losses, and allows amendment of previous tax returns to reflect loss back to three years.
- **United States Small Business Administration.** May provide low-interest disaster loans to individuals and businesses that have suffered a loss due to a disaster.

3.8.5 National Weather Service (NWS)

The National Weather Service (NWS) is an agency of the United States federal government that is tasked with providing weather forecasts, warnings of hazardous weather, and other weather-related products to organizations and the public for the purposes of protection, safety, and general information.

The NWS performs its primary task through a collection of national and regional centers, and 122 local Weather Forecast Offices (WFOs). As the NWS is an agency of the U.S. federal government, most of its products are in the public domain and available free of charge.

The NWS has a presence in Galveston. There is a field office at 601 25th St, Galveston, Texas, and NWS personnel have an office at the Galveston Office of Emergency Management (OEM). Besides having this resource available for weather-related activities, NWs personnel also support the OEM by developing plume modeling in case of hazardous material spills.

3.8.6 Department of Homeland Security (DHS)

The Cybersecurity and Infrastructure Security Agency (CISA) is an operational component of the Department of Homeland Security (DHS). CISA works to understand, manage, and mitigate risk to the nation's cyber and physical infrastructure in the public and private sector. CISA is the operational lead for federal cybersecurity and the national coordinator for critical infrastructure security and resilience.

Security Advisors: Within each CISA Region are local and regional Protective Security Advisors (PSAs), Cyber Security Advisors (CSAs), Emergency Communications Coordinators (ECCs), and Chemical Security Inspectors (CSIs). To build stakeholder resiliency and form partnerships, these field personnel assess, advise, and assist and provide a variety of risk management and response services.

Protective Security Advisors (PSAs): PSAs are trained subject matter experts in critical infrastructure protection and vulnerability mitigation. They facilitate local field activities in coordination with other Department of Homeland Security offices and Federal agencies. They also advise and assist state, local, tribal, and territorial (SLTT) officials and critical infrastructure

owners and operators, and provide coordination and support in times of threat, disruption, or attack.

Cyber Security Advisors (CSAs): CSAs offer cyber security assistance to critical infrastructure owners and operators and State, Local, Territorial, and Tribal (SLTT) officials. CSAs introduce organizations to various CISA cyber security products and services, along with other public and private resources, and act as liaisons to CISA cyber programs. CSAs can provide cyber preparedness assessments and protective resources, working group support, leadership, partnership in public-private development, and coordination and support in times of cyber threat, disruption, or attack.

Emergency Communications Coordinators (ECCs): Emergency Communications Coordinators support emergency communications interoperability by offering training, tools, and workshops, and provide coordination and support in times of threat, disruption, or attack. These services assist CISA stakeholders in ensuring they have communications during steady and emergency operations. Through these programs, CISA helps ensure public safety and national security and emergency preparedness communities can seamlessly and securely communicate.

Chemical Security Inspectors (CSIs): CSIs advise and assist facilities with hazardous chemicals on security measures to reduce the risk of those chemicals being weaponized. For facilities covered under the Chemical Facility Anti-Terrorism Standards (CFATS) program, this includes working with the highest-risk chemical facilities to develop security plans and inspecting to ensure that security is in place. For facilities that do not fall under the CFATS program, CSIs facilitate and provide voluntary security resources, including guidance, best practices, and training.

4 HAZARD ANALYSIS

The Port of Galveston (Port) Hazard Mitigation Planning Team (HMPT) initially identified all natural and human-caused hazards that could potentially affect the Port. This list was then narrowed to only the hazards that are most likely to impact the Port.

Eleven (11) natural hazards were identified as potential threats to the entire port: Hurricanes and tropical storms, floods, thunderstorms, tornadoes, coastal erosion and land subsidence, drought, lightning, winter storms, fog, pandemic, and navigational channels.

In regard to the impact of dams for the region, the U.S. Army Corps of Engineers (USACE) identifies the Buffalo Bayou (40+ miles away), the Addicks Dam and the Barker Dam (both 50+miles away). The associated USACE show that the Port of Galveston is outside of the bayou and dams inundation areas.

Technological hazards were also identified: hazardous materials, fire and explosives, vessel hazards, vessel support services, island egress and ingress, bulkhead failure, train derailment, and utility failure. Each of these potential hazards is addressed individually with relevant supporting data.

Six (6) malevolent risks were identified: workplace violence, active shooter, civil unrest, theft, drones, and terrorism (both domestic and international). It was determined that drones would not be individually profiled for this plan but are considered a tool for malevolent acts.

In this assessment, the hazards that have affected the Port in the past are recorded and analyzed. This information was identified using both primary and secondary research materials that include reports from local, state, and national agencies, as well as media accounts, state and local weather records, and conversations with key personnel at the Port. This analysis will include the possible severity and magnitude as well as the potential impact of damage within the Port from future hazards.

The following rating tools were adapted from FEMA and utilized to rank and prioritize hazard mitigation actions for this plan.

Table 4-1 Hazard Index Ranking Tool

Hazard Index Ranking Tool				
Impact / Frequency	Catastrophic (4)	Critical (3)	Limited (2)	Negligible (1)
Highly Likely (5)	5 (Highest)	4 (High)	4 (High)	3 (Medium)
Likely (4)	5 (Highest)	4 (High)	3 (Medium)	2 (Low)
Possible (3)	4 (High)	3 (Medium)	2 (Low)	2 (Low)
Unlikely (2)	3 (Medium)	2 (Low)	1 (Lowest)	1 (Lowest)
Highly Unlikely (1)	2 (Low)	1 (Lowest)	1 (Lowest)	1 (Lowest)

Table 4-2 Hazard Frequency Rating Tool

Hazard Frequency Rating Tool	
Highly Likely	Near 100 percent probability in the next year
Likely	Between 10 and 100 percent probability in the next year, or at least one chance in the next 10 years
Possible	Between 1 and 10 percent probability in the next year, or at least one chance in the next 100 years
Unlikely	Less than 1 percent probability in the next year, or less than one chance in the next 100 years.
Highly Unlikely	Little to no probability in the next 100 years

Table 4-3 Impact Rating Tool

Impact Rating Tool	
Catastrophic	Multiple deaths, complete shutdown of facilities for 30 days of more, more than 90 percent of property severely damaged
Critical	Multiple severe injuries, complete shutdown of facilities for at least 2 weeks, more than 10 percent of property severely damaged

Limited	Some injuries, complete shutdown of facilities for more than one week, more than 5 percent of property severely damaged
Negligible	Minor injuries, minimal quality-of-life impact, shutdown of critical facilities and services for 24 hours or less, less than 5 percent of property severely damaged

In addition to the identification and ranking of each hazard, this section used the information identified in Section 2 of this plan and compared it to the hazards identified to determine the area's vulnerability to each hazard. This assessment provides detailed information on the number of structures and the potential population that could be affected by each hazard.

Based upon the qualitative approach defined in the introduction to this section, the risk from natural hazards likely to impact the Port was weighted by the HMPT and criteria was used to assign values to the likelihood of occurrence, frequency of occurrence, and consequences of impact. These values are combined to form a total rating for each hazard.

Table 4-4 Hazard Ranking Table

Hazard	Frequency	Potential Impact	Hazard Rating
Natural Hazards			
Hurricanes / Tropical Storms	3	4	4
Cold Wave	4	2	3
Heat Wave	4	2	3
Flooding	3	4	4
Thunderstorms	4	3	4
Tornadoes	3	3	3
Coastal erosion / Land subsidence	3	3	3
Drought	3	2	2
Lightning	4	4	5
Winter Storms	1	1	1
Fog	5	1	3
Pandemic	3	4	4
Navigational Channels	3	4	4

Hazard	Frequency	Potential Impact	Hazard Rating
Human-Caused Hazards			
Hazardous materials (fixed facilities and transportation accidents)	1	4	2
Fire / Explosives	3	3	3
Vessel Hazards	3	2	2
Vessel Support Services	2	3	2
Island Egress / Ingress	2	3	2
Bulkhead Failure	1	4	2
Train Derailment	1	3	1
Utility Failure	2	2	1
Malevolent Hazards			
Cybersecurity	1	1	1
Workplace Violence	3	4	4
Active Shooter	3	4	4
Civil Unrest	3	3	3
Drones	2	1	1
Terrorism	3	4	4

4.1 Natural Hazards

In Texas, natural disasters have had devastating effects on human lives, property, the economy, and the community. While most present little danger to human well-being, some develop into hazardous situations that place life, property, economy, and community at higher risk. This section focuses on the most prevalent hazard conditions that affect the Port. Most of the natural hazards are weather-related and are treated separately for the purposes of this plan.

While Section 2.5 - Historical Hazard Events and Disasters includes a Presidentially Declared Disaster for Extreme Wildfire Threats across the State of Texas (DR-1634-TX), there is no recorded history of wildfire occurrence in Galveston. Without such history, the Port of Galveston decided not to include wildfire as a natural hazard risk to the jurisdiction in this hazard mitigation plan update.

4.1.1 Hurricanes/Tropical Storms

A hurricane is a type of tropical cyclone and is a general term for all circulating weather systems (counterclockwise in the Northern Hemisphere) over tropical waters. The way storm surge, wind, and other factors combine determine the hurricane's destructive power.

Storm surge is an abnormal rise of water generated by a storm and is often the greatest threat to life and property from a hurricane.

The maximum potential storm surge for a particular location depends on a number of different factors, as it is largely influenced by the intensity and forward speed of the storm, wind speed, and angle of approach at landfall, among others. The width and slope of the continental shelf around the area of landfall also plays a large role. A very wide and shallow continental shelf, such as that found around the Port of Galveston, has the potential to produce a greater storm surge with smaller waves, as opposed to a steep shelf that creates less storm surge with bigger waves.

The Port HMPT researched historical data from the National Centers for Environmental Information (NCEI) and the National Weather Service, as well as information from past newspaper articles relating to tropical storms and hurricanes in Galveston County that impacted the Port. Tropical storms and hurricanes bring the threat of winds, heavy rains, and flooding to the Port. High winds devastated trees and power lines. Streets and highways become extremely hazardous to motorists due to debris, flooding, and power lines obstructing travel.

Based on a 30-year period, each year on average, fourteen (14) named storms, (of which ten become hurricanes) develop over the Atlantic Ocean, Caribbean Sea, or Gulf of Mexico. Many of these remain over the ocean. However, about five hurricanes strike the United States coastline every 3 years. Of these five, two will likely be major hurricanes (category three or greater on the Saffir-Simpson Hurricane Scale).

Table 4-5 Saffir-Simpson Hurricane Wind Scale

Category	Winds	Effects
1	74-95 mph	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Some coastal road flooding and minor pier damage may occur.
2	96-110 mph	Some roofing material, door, and window damage to buildings. Considerable damage to vegetation, mobile homes, and piers. Coastal and low-lying escape routes

		flood 2-4 hours before arrival of storm center. Small craft in unprotected anchorages break moorings.
3	111-130 mph	Some structural damage to small residences and utility buildings with a minor amount of curtain wall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain continuously lower than 5 feet above sea level may be flooded inland 8 miles or more.
4	131-155 mph	More extensive curtain wall failures with some complete roof structure failure on small residences. Major erosion of beach. Major damage to lower floors of structures near the shore. Terrains continuously lower than 10 feet above sea level may be flooded requiring massive evacuation of residential areas inland as far as 6 miles.
5	>155 mph	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Major damage to lower floors of all structures located less than 15 feet above sea level and within 500 yards of the shoreline. Massive evacuation of residential areas on low ground within 5 to 10 miles of the shoreline may be required.

The Port experienced 14 events since 2001, of which four were hurricanes, and nine were tropical storms. In the last 10 years (2015-2024), there has been a tropical storm or hurricane for five (5) of those years. This recent activity equates to a 50 % chance each year that the Port will be impacted by a tropical storm or hurricane. The Port HMPT considers the consequences of impact from this hazard to be critical.

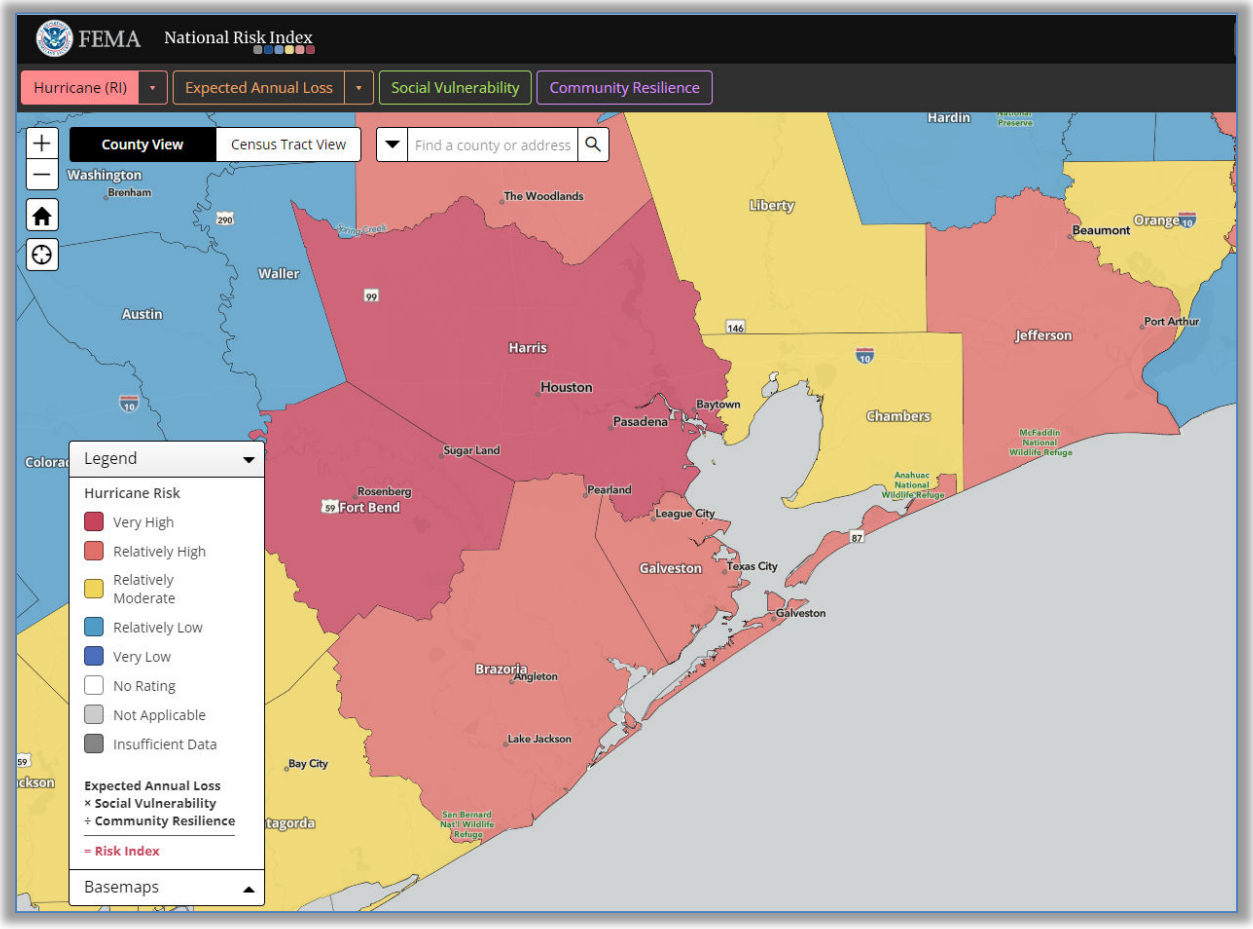
Of the hurricanes that the Port experienced, Hurricanes Ike (2008) and Harvey (2017) made the biggest impacts on the Port, Galveston, and the State of Texas. Both storms caused billions of dollars' worth of damage, with Ike being the third costliest hurricane at the time, and Harvey matching Katrina as the costliest hurricane in history.

Hurricane Ike struck Galveston's shore on September 13th, 2008, as a Category 2 storm, bringing winds of more than 105 miles per hour and inundating Galveston Island with up to 15 feet of water. There were twelve casualties associated with the severe storm surge in Galveston and Chambers.

Hurricane Harvey made landfall near Port Aransas on August 25, 2017, as a Category 4 hurricane, with winds up to 145 mph. The surge and wind damage from Harvey shut down the cruise business for four-five months.

The Atlantic hurricane season, the period of time when tropical systems typically generate, runs from June 1 to November 30 each year. The Port is highly susceptible to the occurrence and impact of hurricanes and tropical storms due to its coastal location. Bearing this in mind, in terms of extent, the Port can anticipate impacts ranging from Category 1 to Category 5 on the Saffir-Simpson Wind Scale, as well as tropical storms and depressions.

Figure 4-1 Hurricane and Tropical Storm Risk



Tropical storms and hurricanes pose a significant threat uniformly to the Port in terms of property damage, as well as injuries and loss of life. Although few events have impacted the Port like Hurricane Ike, the Port is always vulnerable to hurricanes.

4.1.1.1 Recent Hurricane/Tropical Storm Events

According to NOAA weather data, hurricane and tropical storm events in Galveston County since 2001 are:

Table 4-6 Hurricane/Tropical Storm Events

Date	Event Type
06/05/2001	Tropical Storm
09/05/2002	Tropical Storm
07/14/2003	Hurricane
08/30/2003	Tropical Storm
09/23/2005	Hurricane
09/12/2007	Hurricane
08/05/2008	Tropical Storm
09/12/2008	Hurricane
06/15/2015	Tropical Storm
06/21/2017	Tropical Storm
08/25/2017	Hurricane
10/08/2020	Tropical Storm
09/13/2021	Tropical Storm
07/08/2024	Tropical Storm

4.1.1.2 Climate Change Impact on Hurricanes

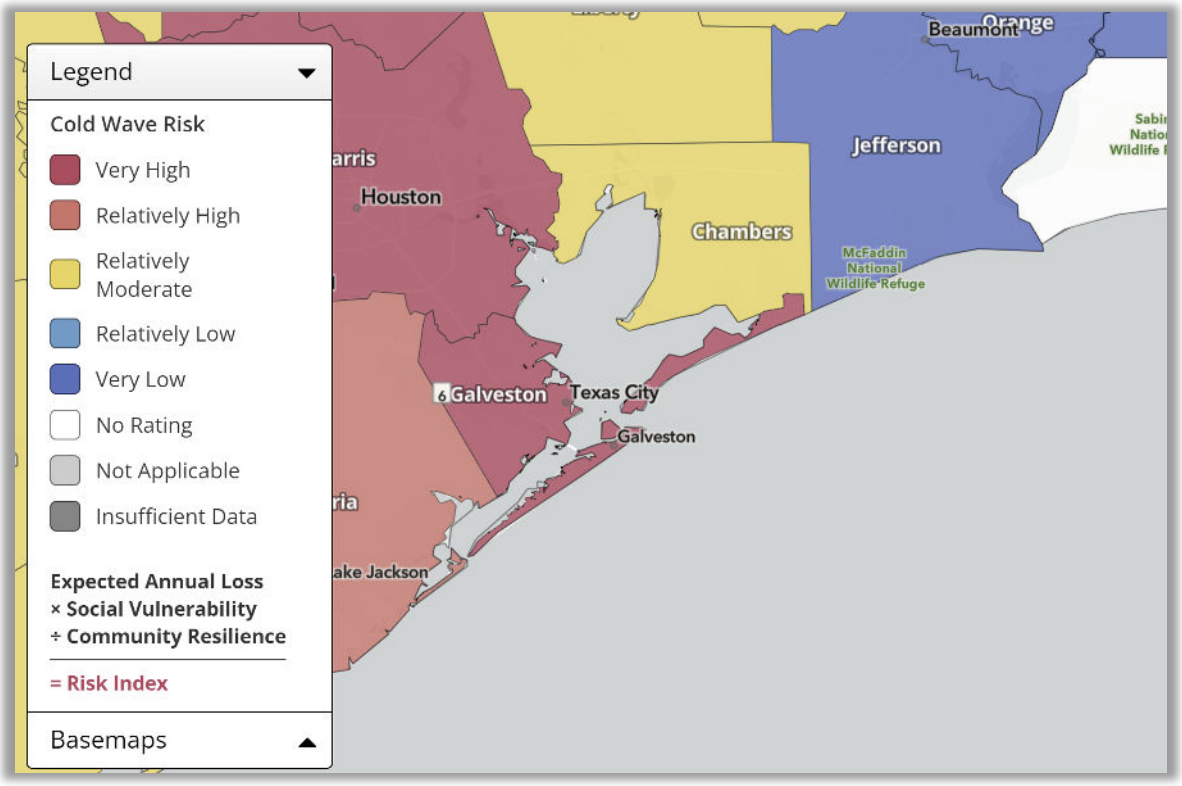
Climate change is worsening hurricane impacts in the United States by increasing the intensity and decreasing the speed at which they travel. There is also growing evidence showing that hurricanes are intensifying more quickly, turning from less serious storms to very strong ones in hours or days. Superheated ocean waters hold a lot of extra energy, and a growing storm can draw from that enormous pool.

4.1.2 Cold Wave

A Cold Wave is a rapid fall in temperature within 24 hours and extreme low temperatures for an extended period. The temperatures classified as a cold wave are dependent on the location and defined by the local National Weather Service (NWS) weather forecast office.

In the National Risk Index, a Cold Wave Risk Index score and rating represent a community's relative risk for Cold Waves when compared to the rest of the United States. A Cold Wave Expected Annual Loss score and rating represent a community's relative level of expected building, population, and agriculture loss each year due to Cold Waves when compared to the rest of the United States.

Figure 4-2 Cold Wave Risk



The hazard for a cold wave uniformly affecting the Port remains Very High due largely in part to the geological and topographical structure of the island. Given that Galveston is a barrier island, a cold wave may be worsened by winds. The extent of a cold wave can be measured by low temperatures that significantly affect the normal operation of the Port and surrounding areas. With an average winter low temperature of 49°F and a record low of 8°F in 1899, the extent of cold waves in the jurisdiction ranges from single digits to the upper 40's.

4.1.2.1 Notable Cold Wave Events

- **Record low temperature**: The record low temperature in Galveston was 8°F on February 12, 1899.
- **Notable winters**: Galveston Bay froze in 1886, and the island received 15.4 inches of snow in 1895. Galveston had its first recorded snowy Christmas in 2004.

According to NOAA weather data, only one cold wave event has occurred in Galveston County since 2001:

Table 4-7 Cold Wave Events

Date	Event Type
02/15/2021	Cold/Wind Chill

4.1.2.2 Climate Change Impact on Cold Waves

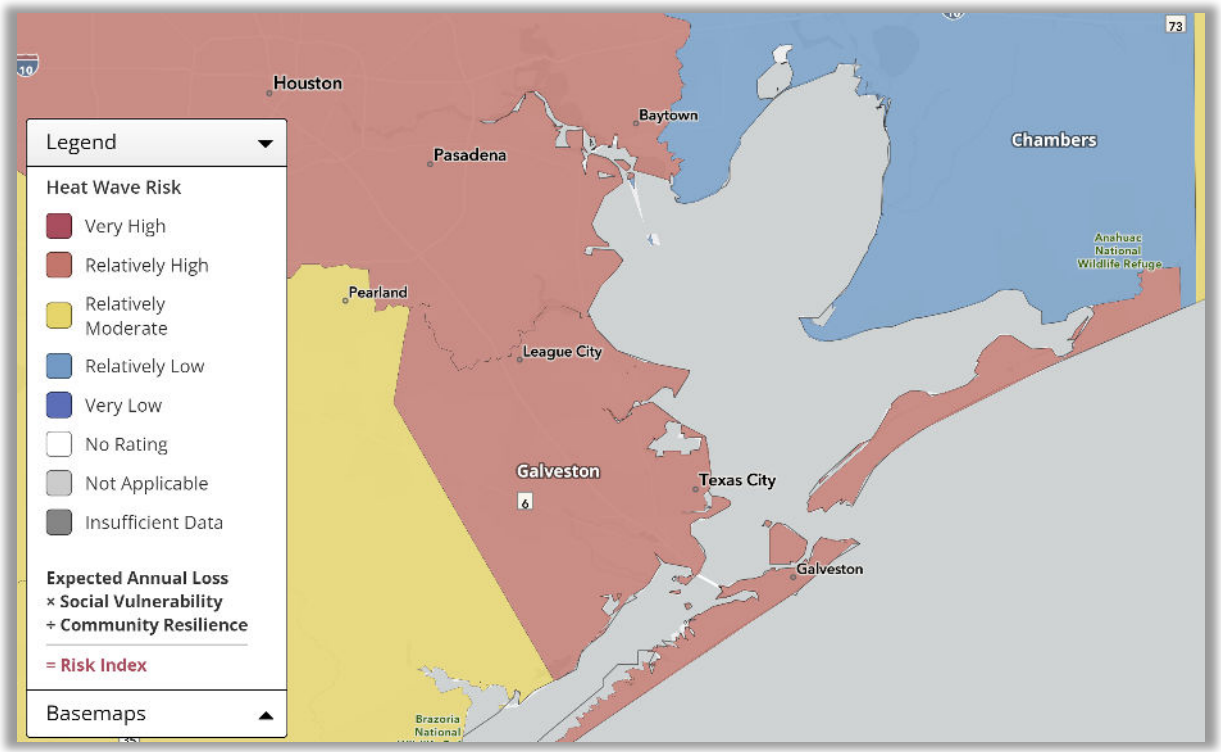
Climate change will decrease the intensity and frequency of extreme cold spells.

4.1.3 Heat Wave

A Heat Wave is a period of abnormally and uncomfortably hot and unusually humid weather typically lasting two or more days with temperatures outside the historical averages for a given area. Heat wave is relative, but it is common and expected for the Galveston area to see high temperatures and problematic heat events.

In the National Risk Index, a Heat Wave Risk Index score and rating represent a community's relative risk for Heat Waves when compared to the rest of the United States. A Heat Wave Expected Annual Loss score and rating represent a community's relative level of expected building and population loss each year due to Heat Waves when compared to the rest of the United States.

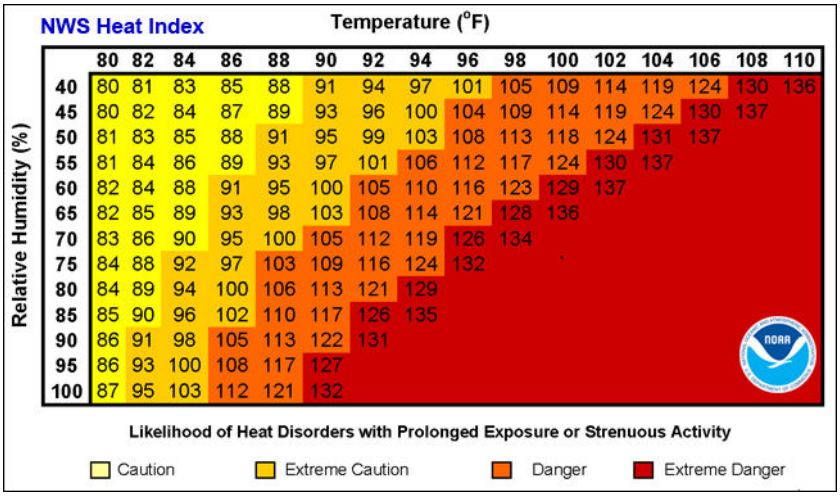
Figure 4-3 Heat Wave Risk



The National Weather Service (NWS) issues a range of watches and warnings associated with extreme heat:

- Excessive Heat Outlook: when the potential exists for an excessive heat event in the next 3 to 7 days. An outlook is used to indicate that a heat event may develop. It is intended to provide information to those who need considerable lead time to prepare for the event, such as public utilities, emergency management and public health officials.
- Excessive Heat Watch: when conditions are favorable for an excessive heat event in the next 12 to 48 hours. A watch is used when the risk of a heat wave has increased, but its occurrence and timing is still uncertain. It is intended to provide enough lead time so those who need to set their plans in motion can do so, such as established individual city excessive heat event mitigation plans.
- Excessive Heat Warning/Advisory: when an excessive heat event is expected in the next 36 hours. These products are issued when an excessive heat event is occurring, is imminent, or has a very high probability of occurrence. The warning is used for conditions posing a threat to life or property. An advisory is for less serious conditions that cause significant discomfort or inconvenience and, if caution is not taken, could lead to a threat to life and/or property.

The NWS Heat Index (HI)is sometimes referred to as the “apparent temperature”. The HI, given in degrees F, is a measure of how hot it feels when relative humidity (RH) is added to the actual air temperature. To find the HI, NWS uses the Heat Index Chart shown below.



The orange shaded zone (generally above 103°F on the Heat Index Chart) corresponds to a level of HI that may cause increasingly severe heat disorders with continued exposure and/or physical activity. The entirety of the Port of Galveston could experience the full extent of the hazard, as defined NOAA’s Heat Index Chart, though it is mostly likely that high temperatures max out in the “extreme caution” or “danger range” of the HI scale, based on NCEI data.

4.1.3.1 Recent Heat Wave Events

According to NOAA, heat wave incidents that affected the City of Galveston since 2001 are:

Table 4-8 Heat Wave Events

Date	Event Type
06/24/2009	Heat
07/09/2009	Heat
06/23/2019	Heat
06/16/2023	Excessive Heat
07/12/2023	Excessive Heat
08/05/2023	Excessive Heat
08/23/2023	Excessive Heat
09/05/2023	Heat

4.1.3.2 Climate Change Impact on Heat Waves

As previously mentioned, climate change may increase the frequency or intensity of hazards over time. The U.S. Climate Resilience Toolkit, Climate Explorer (Climate Explorer) provides projected climate conditions for counties across the United States. Projections for two long-term climate scenarios were calculated for temperature. One scenario describes a future in which humans stop increasing harmful emissions by 2040 and then continue to reduce emissions through the end of the century (Lower Emissions). The second scenario describes a future in which harmful emissions continue to increase through the end of the century (Higher Emissions). The data show that emissions can lead to extreme heat events in Galveston County over the next 80 years causing the number of 100°F days per year to steadily increase over time (U.S. Federal Government 2021)."

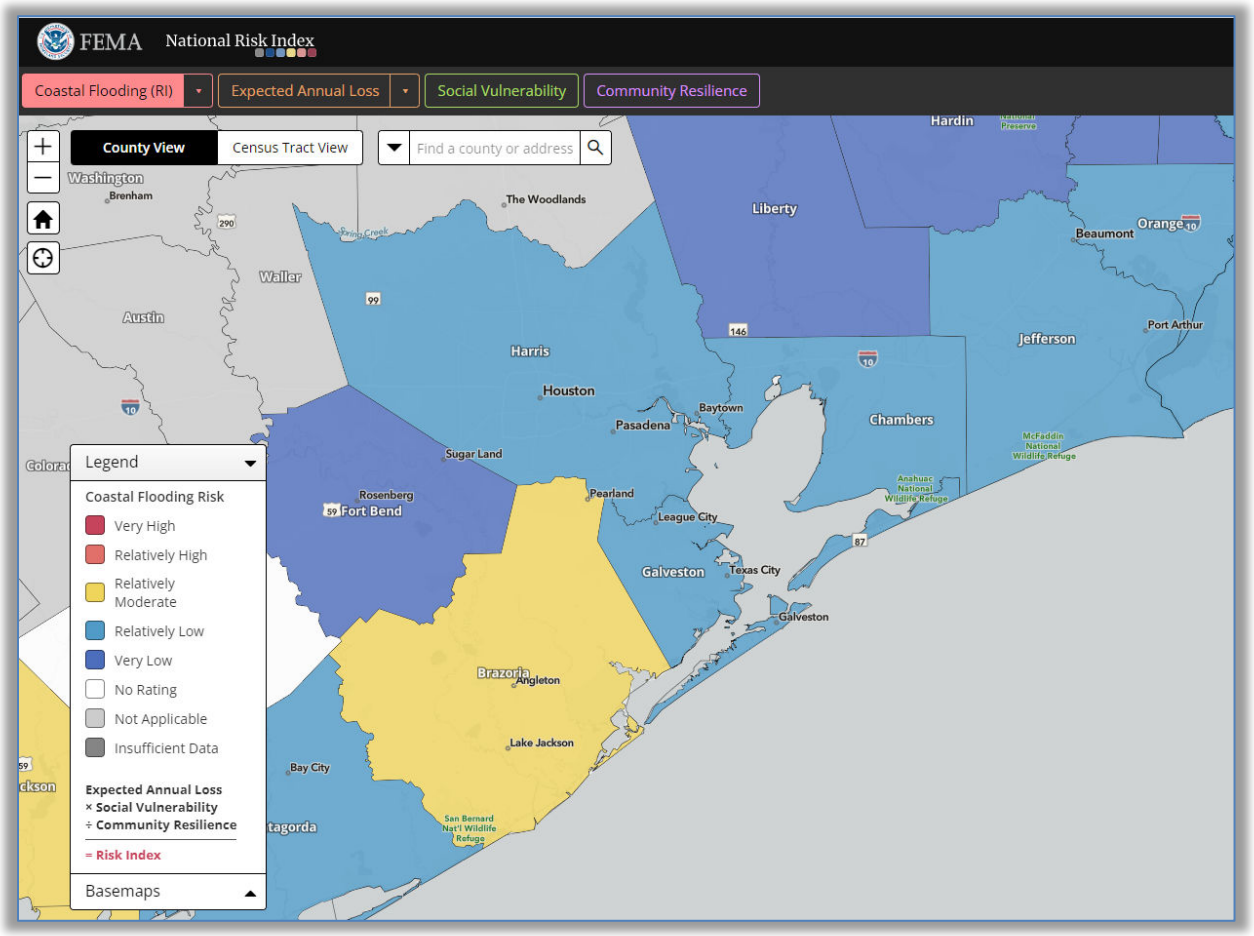
4.1.4 Flooding

Floods are one of the most common and can be one of the deadliest natural hazards in the United States. Overflow of rivers and streams due to severe storms or torrential rains may result in significant flooding. Different variables impact flooding, including topography, ground saturation, previous rainfall, soil types, drainage, basin size, drainage patterns of streams, and vegetative cover. Flooding may occur slowly or become a flash flood, such as in the case of a dam failure.

FEMA establishes flood zones by working with local county or city officials to map your area. Any area where flooding is more likely to occur is part of a Special Flood Hazard Area (SFHA). A letter designation is provided to identify the risk for homes inside the SFHA.

The Port researched designated flood plains referencing both the FEMA National Risk Index and flood maps maintained by Galveston County.

Figure 4-4 Flood Risk (FEMA National Risk Index)



The Port is predominantly in base floodplain AE, which is one of the most common high risk flood areas. AE zones are now used on new format Flood Insurance Rate Maps (FIRMs) instead of A1-A30 zones. An AE zone resides in a 100-year floodplain, so there is a 1% chance of flooding in any given year.

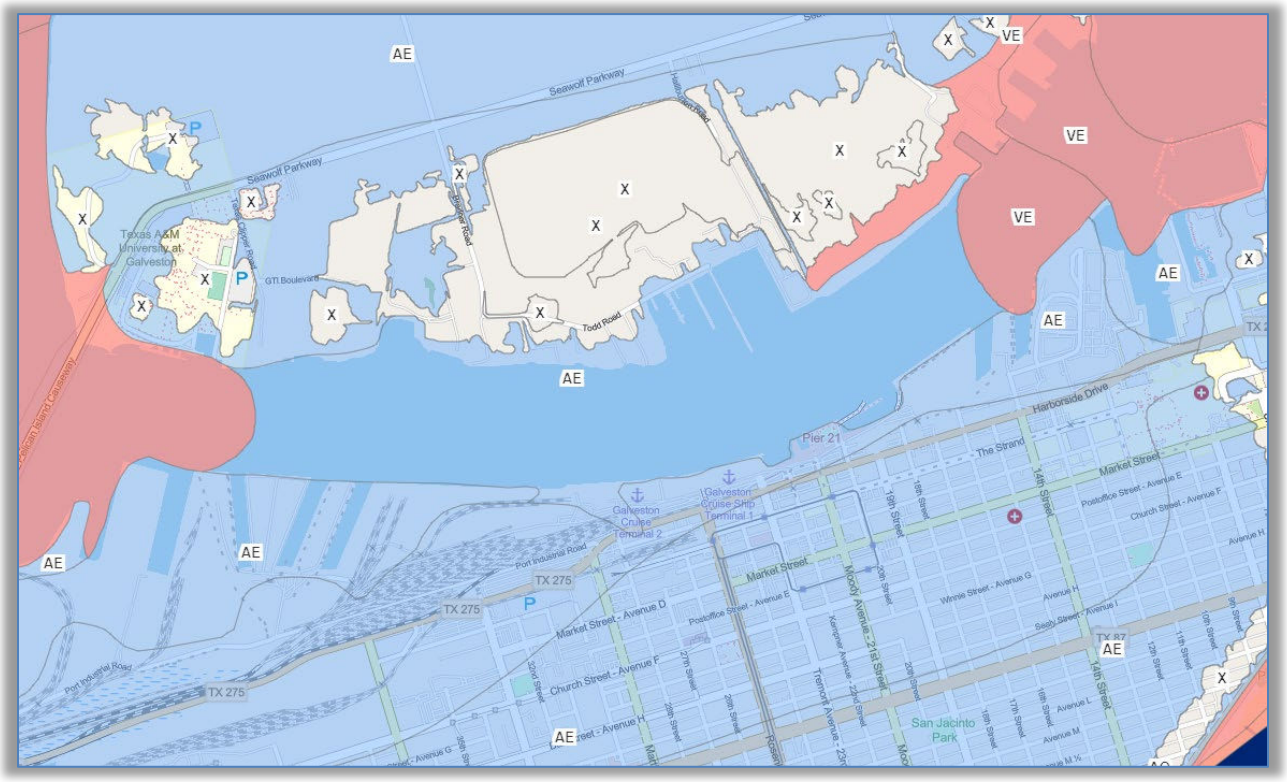
4.1.4.1 National Flood Insurance Program Participation

The National Flood Insurance Program (NFIP) defines flood as a general and temporary condition where two or more acres of normally dry land or two or more properties are inundated by water or mudflow. Floods can originate from a variety of sources including hurricanes, broken levees, outdated or clogged drainage systems, and rapid accumulation of rainfall. An NFIP repetitive loss property is any insurable building for which two or more claims of more than $1,000 were paid by the NFIP within any rolling ten-year period since 1978.

The Port of Galveston participates in the NFIP through the City of Galveston. The Port does not have any repetitive loss properties over the current rolling ten-year period.

The most recent flood map produced for the Galveston area was updated in 2019.

Figure 4-5 Port Floodplain Zones



The hazard for flooding in the Port remains high, due largely in part to the geological and topographical structure of the island. Given that Galveston is a barrier island with more than 95% of its jurisdiction located within the special flood hazard area, the probability of future occurrences of flooding is high. The Port HMPT recognized the dangers posed by flooding and has identified specific mitigation actions that will be considered for pre-disaster mitigation.

4.1.4.2 Notable Flood Events

The City of Galveston has experienced the complete extent of the flood hazard, including major flooding (Hurricane Ike, 2008) and Record Flooding (1900 Storm), and could experience the complete range in the future.

The best-known flood event in Galveston's history is, of course, the 1900 Hurricane. This hurricane, also known as The Great Storm, redefined the City and its residents, and was the impetus for both the elevation of the Island and the construction of the Seawall. At the time of the 1900 Storm, the highest point in the city of Galveston was 8.7' above sea level. The hurricane brought with it a storm surge of over 15 feet, which inundated the entire island. The

surge knocked buildings off their foundations and the surf pounded them to pieces. More than 3,600 homes were destroyed and a wall of debris faced the ocean.

As severe as the damage to the city's buildings was, the human toll was even greater. Rescuers arrived to find the city destroyed. It is believed 8,000 people – at least 20% of the island's population - lost their lives. Estimates range from 6,000 to 12,000, with no possibility of determining an actual death toll. Most had drowned or been crushed as the waves pounded the debris that had been their homes hours earlier. Many survived the storm itself but died after several days trapped under the wreckage of the city, with rescuers unable to reach them. The rescuers could hear the screams of the survivors as they walked on the debris trying to rescue those they could. A further 30,000 were left homeless. More people were killed in this single storm than the total of those killed in all the tropical cyclones that have struck the US since. As of 2009, more than 300 tropical systems have struck the US. The Galveston Hurricane of 1900 remains the deadliest natural disaster in US history.

108 years later, almost to the day, Hurricane Ike devastated Galveston Island. Ike began impacting the City on Friday, September 12, 2008. Waves began crashing along the Seawall early that morning. By later that afternoon, the storm surge began overtopping the Seawall. Widespread flooding included downtown Galveston: 6' deep inside the Galveston County Courthouse, and the University of Texas Medical Branch at Galveston was devastated by flood waters. Wide scale flooding caused failures of UTMB systems and allowed mold to invade buildings. Students were transferred to other Texas medical schools immediately after the storm while determinations were made about the future of the hospital and medical school. All emergency facilities were moved to the Houston medical center. It was not until August 1, 2009, that UTMB's emergency room was reopened.

In addition, the floodwaters of Ike also devastated the City's water and wastewater systems. The failure of both systems to function resulted in the delayed return of evacuated residents, due to unsafe and unsanitary living conditions on the Island. Most residents were prohibited from returning to their homes – those whose homes remained - for at least a week after the flood waters receded.

In 2017, Galveston was impacted by Hurricane Harvey, though this time the City dodged most of the damage from the storm, which devastated inland areas. While flooding did occur in the City and the four NOAA stations in lower Galveston Bay read approximately .8 meters above expected tides from August 25 through August 29, 2017, the majority of the devastating rainfall occurred inland and not directly over the island.

The 1900 storm produced the highest recorded surge and flood elevations on Galveston Island. This was due in part to the fact that at the time of the 1900 Storm the Island was at its natural elevation, with no portion of it having been elevated at that time. NOAA's historical archives

contain a report on the 1900 Storm written by Isaac Cline, the Local Forecast Official and Section Director for the Galveston Weather Office during the 1900 Storm. This report contains the following description from this first-hand account of the storm surge and subsequent flooding:

> *The water rose at a steady rate from 3 p.m. until about 7:30 p.m., when there was a sudden rise of about four feet in as many seconds. I was standing at my front door, which was partly open, watching the water, which was flowing with great rapidity from east to west. The water at this time was about eight inches deep in my residence, and the sudden rise of 4 feet brought it above my waist before I could change my position. The water had now reached a stage 10 feet above the ground at Rosenberg Avenue (Twenty-fifth Street) and Q Street, where my residence stood. The ground was 5.2 feet elevation, which made the tide 15.2 feet. The tide rose the next hour, between 7:30 and 8:30 p.m., nearly five feet additional, making a total tide in that locality of about twenty feet.*

Hurricane Ike produced a wide range of flood heights in the City, with official high-water marks ranging from 7.5' MSL to 12.8' MSL. The extent of the flood hazard for those portions of the Island that remain at natural elevation (the West End) is approximately 20' MSL. For those portions of the Island that were elevated after the 1900 Storm, the extent of the flood hazard is approximately 12-13' MSL, based on Hurricane Ike.

According to NOAA, flooding incidents that affected the City of Galveston since 2001 are:

Table 4-9 Flooding Events

Date	Event Type
05/17/2002	Flash Flood
08/15/2002	Flash Flood
11/05/2002	Flash Flood
09/01/2003	Flash Flood
08/19/2006	Flash Flood
10/16/2006	Coastal/Flash Flood
11/08/2009	Coastal Flood
12/01/2009	Coastal Flood
05/14/2010	Flash Flood
01/09/2011	Coastal Flood

09/01/2015	Flash Flood
10/31/2015	Coastal Flood
12/27/2015	Coastal Flood
05/09/2016	Coastal Flood
05/19/2016	Flash Flood
12/03/2016	Coastal Flood
8/29/2017	Flash Flood
9/14/2018	Flash Flood
10/24/2018	Flash Flood
12/08/2018	Flash Flood
12/27/2018	Coastal Flood
5/22/2019	Coastal Flood
9/18/2019	Flash Flood
10/24/2019	Coastal Flood
10/09/2020	Coastal Flood
9/15/2023	Flash Flood
11/30/2023	Flash Flood
6/19/2024	Coastal Flood
7/20/2024	Flash Flood
9/11/2024	Coastal Flood

4.1.4.3 Climate Change Impact on Flooding

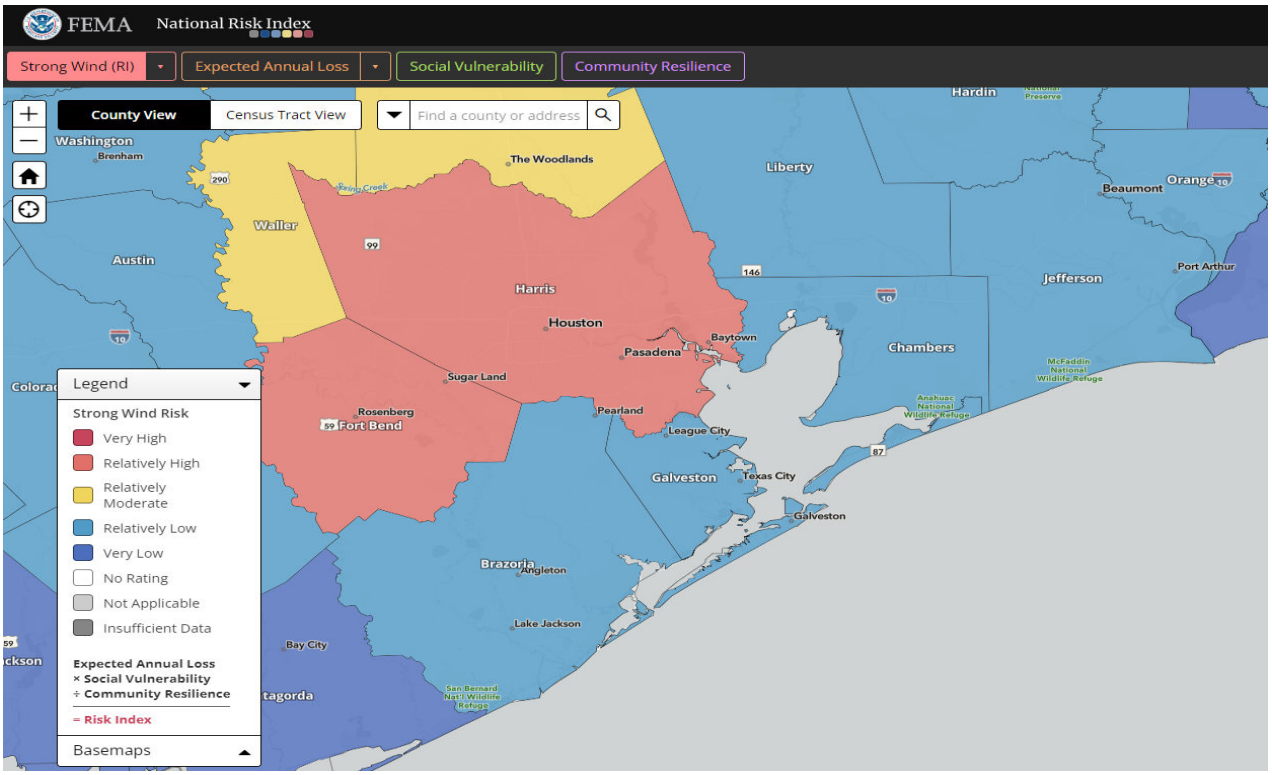
Projections for two long-term climate scenarios were calculated using Climate Explorer data (NEMAC 2023) for number of days with greater than 3 inches of precipitation. One scenario describes a future in which humans stop increasing harmful emissions by 2040 and then continue to reduce emissions through the end of the century (Lower Emissions). The second scenario describes a future in which harmful emissions continue to increase through the end of the century (Higher Emissions). Climate change is expected to exacerbate flooding in the future.

4.1.5 Thunderstorms

The Port HMPT used data from the NCEI while researching the impact of thunderstorms on the Port. Thunderstorm winds are generally short in duration involving straight-line winds and/or gusts in excess of 50 miles per hour. Thunderstorm winds tend to affect areas with exposed property and infrastructure and above-ground utilities. Thunderstorm winds can cause power outages, transportation and economic disruptions, and significant property damage.

During the spring and summer months, the Port typically experiences numerous thunderstorms, some packing significant winds. Over the course of the past 55 years, 173 severe thunderstorm wind events have been recorded within Galveston County, and 23 of these impacted the Port. On average, at least two thunderstorms each year produce winds strong enough to inflict significant property damage. While many of these thunderstorm wind events have been recorded within the past 15 years, this is primarily due to more accurate record keeping.

Figure 4-6 Thunderstorm/Strong Wind Risk



One of the most significant storms to affect the Port occurred in May of 2005. The winds from a severe thunderstorm event caused building damage near the Port, with totals from this one storm reaching approximately $175,000. While the Port HMPT regards the probability of experiencing a thunderstorm event highly likely, the consequences of impact are negligible.

In terms of extent, the Port of Galveston can uniformly expect the full range of thunderstorm effects defined on the Beaufort Wind Scale, varying from gale force winds around 39 miles per hour to violent storm winds at or above 72 miles per hour.

Overall, severe thunderstorm winds pose a great threat to the Port in terms of property damage, as well as injuries and loss of life. Based on the frequency of this hazard, as well as its ability to negatively impact the city, the pre-disaster mitigation measures identified in this plan will be pursued.

4.1.5.1 Recent Thunderstorm Events

According to NOAA, thunderstorm events in the City of Galveston since 2001 are:

Table 4-10 Thunderstorm Events

Date	Event Type
04/08/2002	Thunderstorm Wind – no speed recorded
12/30/2002	Thunderstorm Wind – 65 mph
05/08/2005	Thunderstorm Wind – 61 mph
05/22/2007	Thunderstorm Wind – 53 mph
05/27/2014	Thunderstorm Wind – 60 mph
03/29/2018	Thunderstorm Wind – 52 mph
10/31/2018	Thunderstorm Wind – 52 mph
05/24/2022	Thunderstorm Wind – 50 mph

4.1.5.2 Climate Change Impact on Thunderstorms

Scientists have evidence that climate change should increase the convective available potential energy (CAPE) by warming the surface and putting more moisture in the air through evaporation. Rising global temperatures due to climate change means warmer air, which allows it to hold more moisture, roughly 7% more moisture per 1°C of warming. This boosts the chance of thunderstorms, leading to more violent storms and more lightning strikes.

4.1.5.3 Climate Change Impact on Strong Winds

Predictions about trends in severe storm likelihood and severity are typically made at broader spatial scales than the Planning Area, or even the region. Broad predictive efforts indicate that severe storms are likely to increase in severity globally and in the U.S. due to climate change. However, predictions also indicate that frequency of strong storms may decrease. Some predictions indicate a shift in storm loci, such that strong storms that affect the Central and

South-Central U.S. may become less frequent as they become more frequent in Eastern and North-Eastern North America (Haberlie et al 2022). Other climate models consistently project environmental changes that would predict an increase in the frequency and intensity of severe thunderstorms (a category that combines Tornadoes , Hail, and Winds), especially over regions that are currently prone to these hazards such as the Southern and Eastern U.S (Trapp et al 2007). However, the confidence intervals and predictive power of many of these models are relatively low (Wuebbles et al 2017). Predictions specifically about wind are also varied. Some research points to a "global stilling," meaning a reduction in mean winds globally. Other research suggests evidence for trends of increasing wind speeds globally (Zeng et al 2019). While yet other work predicts declines in wind speed for many regions as the climate warms and a shift in high wind regions moving poleward increases in winds and wind speeds in specific locations, for example due to increases in hurricane severity in some regions (Abell et al 2021). The IPCC currently forecasts that on average, worldwide annual wind speeds are expected to drop by up to 10%. Predictions of future severe wind patterns largely rely on predictions of changes to, or increases in, thunderstorm storm frequency or severity, and are thus saddled with the same uncertainty and limits to predictive power. Given the varied and uncertain predictions regarding storm frequency, severity, and resulting effects on severe wind event frequency and severity, planners should act with the expectation that severe storm and wind conditions are likely to be similar, if slightly lower or slightly higher, in frequency and severity in the future. For the Planning Area, a reasonable baseline for planning purposes would be approximately 3 to 6 significant thunderstorms per year, several of which may be accompanied by significant wind conditions."

4.1.6 Tornadoes

The Port HMPT reviewed historical data from the NCEI in researching the past events and effects of tornadoes around Galveston. A tornado is a violently rotating column of air extending from a thunderstorm to the ground. The most violent tornadoes are capable of tremendous destruction with wind speeds of 250 mph or more. Damage paths can be more than 1 mile wide and 50 miles long. Tornado season in Texas ordinarily runs from March through August; however, tornadoes can strike at any time of the year if the essential conditions are present. The Port lies just outside the area defined as a high tornado risk area but is still vulnerable to the occurrence and impacts of tornadoes.

All of the Port is vulnerable to the threat of a tornado because one cannot predict exactly when or where a tornado might strike. Galveston Island has experienced one tornado within the last 10 years. In addition, countless tornado watches, warnings, and waterspouts have been recorded during this period. Trend analysis indicates that approximately one tornado may touchdown in this area every 10 years. This equates to a 10 percent chance of a tornado

touching down in the Port in any given year. Tornadoes tend to strike in somewhat random fashion, making the task of reliably calculating a recurrence interval extremely difficult. The damage potential associated with a tornado is extremely high. On August 30, 2009, several strong thunderstorms formed in the evening near Galveston Island and a waterspout developed off the coast near Galveston Island before moving inland and causing approximately $500,000 worth of property damages and at least three injuries.

The Port HMPT regards the probability of experiencing a tornado event possible, and the consequences of impact are considered to be limited.

Overall, the Port has a uniformly high exposure to potential damage from tornadoes. Should a tornado hit certain portions of the Port that are highly concentrated with any of the critical facilities identified, depending upon the strength and duration of the event, significant damage could occur. Due to the destructive nature of tornadoes, it is imperative that the pre-disaster mitigation measures identified in this plan receive full consideration.

Table 4-9 provides the original (now retired) Fujita Scale and the current Enhanced Fujita Scale, which determines tornadic strength by 3-second just wind speeds.

Table 4-11 Enhanced Fujita (EF) Scale

Fujita Scale			Derived EF Scale		Operational EF Scale	
F Number	Fastest ¼ Mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85	0	65-85
1	73-112	79-117	1	86-109	1	86-110
2	113-157	118-161	2	110-137	2	111-135
3	158-207	162-209	3	138-167	3	136-165
4	208-260	210-261	4	168-199	4	166-200
5	261-318	262-317	5	200-234	5	Over 200

As a barrier island, Galveston can expect to experience the entire range of tornadoes, though the historic record indicates that EF0 and EF1 are the most common category. Therefore, EF0 to EF1 is considered the extent of the hazard for the Port of Galveston.

4.1.6.1 Recent Tornado Events

According to NOAA, tornado events affecting the City of Galveston since 2001 are:

Table 4-12 Tornado Events

Date	Location
08/28/2004	Tornado – EF-0
08/30/2009	Tornado – EF-1
8/25/2017	Tornado – EF-0

4.1.6.2 Climate Change Impact on Tornados

The fourth National Climate Assessment summarizes the complicated relationship between tornados and climate change: "Some types of extreme weather (e.g., rainfall and extreme heat) can be directly attributed to climate change. Other types of extreme weather, such as tornados, are also exhibiting changes that may be linked to climate change, but scientific understanding isn't detailed enough to project direction and magnitude of future change." In other words, we still have a lot to learn about how climate change might affect tornados (U.S. Global Change Research Program 2018). There is increasing evidence linking global warming to changes in severe weather that gives rise to tornados. Observational data indicate detectable increases in tornado risk over the past few decades. There are several factors that contribute to tornados and tornado outbreaks in the last decade, which are influenced by climate change."

4.1.7 Coastal Erosion and Land Subsidence

Topography and geological attributes make the Port vulnerable to coastal erosion and land subsidence. Coastal erosion is a hazard defined as the wearing a way of land and loss of beach, shoreline, or dunes because of natural coastal processes or manmade influences. Erosion is considered episodic and sporadic, as rates of erosion can be further exacerbated by high waves, storm surge, and strong winds associated with tropical storms or hurricanes, with some areas experiencing more damage than others.

Land subsidence is the sinking of the land surface. The elevation of the land surface is lowered by compressing the many layers of clay beneath the land surface. When large amounts of groundwater are pumped from the aquifers beneath, the water is pulled out of the layers of clay, which allows it to compact under the weight of everything above them. Subsidence can occur over long periods of time, but the most hazardous and impactful rates of subsidence come from human activity. In low-lying elevation areas, generally nearest the coast, land subsidence from 1906 to today has caused as much as a 10-foot decrease in elevation. Besides a decrease in elevation, land subsidence causes many problems including changes in slopes of streams and canals, damage to transportation and sewage systems, and damage to private and public buildings.

The Port is uniformly vulnerable to the hazard and the HMPT considers the probability of experiencing coastal erosion and land subsidence highly likely.

On September 13, 2008, Hurricane Ike destroyed beachfront property along the Texas coast. High winds and a storm surge destroyed dunes and homes, resulting in debris scattered for miles across the coast of Galveston Island. This storm caused severe erosion along the island, as well as Bolivar Peninsula and Galveston County. The Port also experienced storm events, which contributed to the subsidence of Port facilities.

On August 24, 2017, Hurricane Harvey intensified into a category 4 hurricane before making landfall at Copano Bay, Texas. The storm made a slow loop late on August 26 into August 27, and drifted eastward or southeastward for the next few days, eventually making landfall a second time at the Texas - Louisiana state line. Although the center passed well south of the Houston Metro, torrential rains fell in these locations near a stationary front on the north and east side of Harvey. The associated rains caused catastrophic flooding in Harris and Galveston counties, with 9 out of the 19 official river gauges in Harris County (which includes the city of Houston) recording all-time high flood stages.

4.1.7.1 Recent Coastal Erosion Events

Historical data indicate the extent at which Galveston County's 55 miles of coastline are eroding 2 -11 feet per year.

Table 4-13 Coastal Erosion Events

County	Gulf Shoreline	Bay Shoreline	Critical Erosion	Erosion Rates**
Galveston	290,400 feet (55.0 miles)	1,536,480 feet	253,440 feet	-2 to -11 feet/year
Galveston	290,400 feet (55.0 miles)	1,536,480 feet	N/A	2.3 feet/year

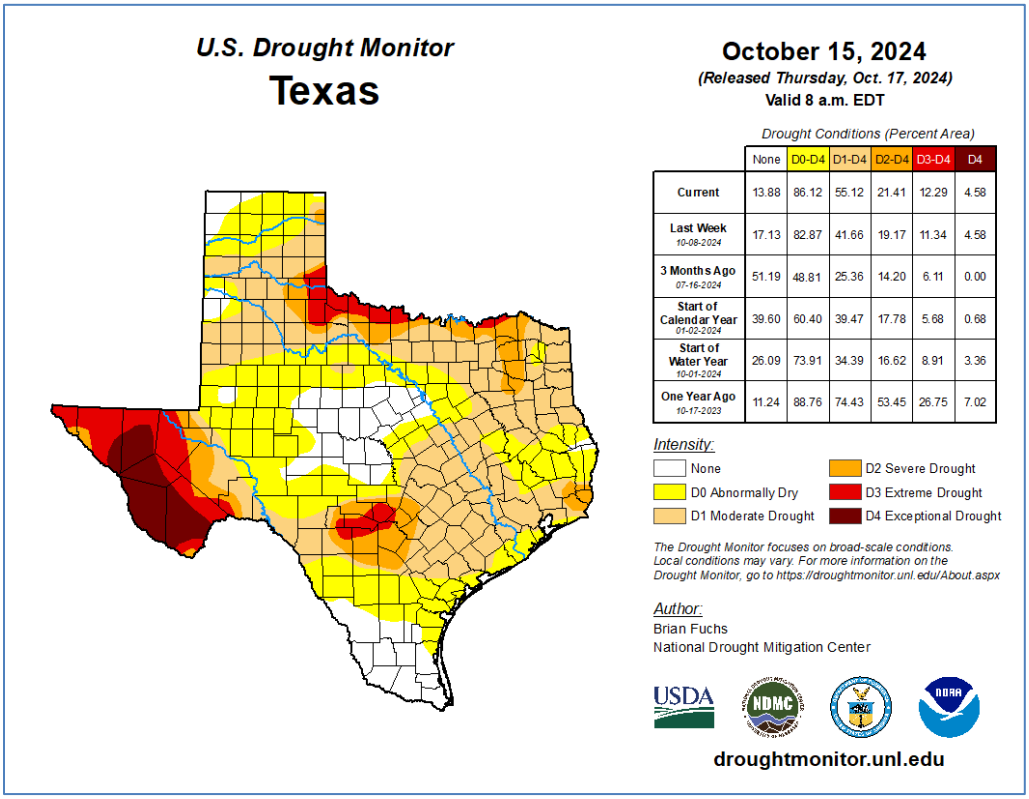
4.1.7.2 Climate Change Impact on Coastal Erosion

More storms and higher seas from climate change create more winds, waves, and floods, which leads to coastal erosion. Hurricanes can wash away sandy barrier islands, disrupt navigational waterways, leaving coastlines and islands unprotected from future storm surges. Waves and winds can eventually erode away beaches little by little, exposing human infrastructure to tides and storms. Climate change is contributing to coastal land losses, especially on the Gulf Coast. Rising sea levels can turn dry land into wetlands or open water, and existing wetlands can be at risk. As an example, since 1932, the State of Louisiana has lost more than 2,000 square miles of land area, mostly wetlands, in part due to rising sea levels.

4.1.8 Drought

By definition, a drought is a prolonged period of moisture deficiency. Drought conditions affect the cultivation of crops, as well as a water availability and water quality.

Figure 4-7 Texas Drought Monitor Map



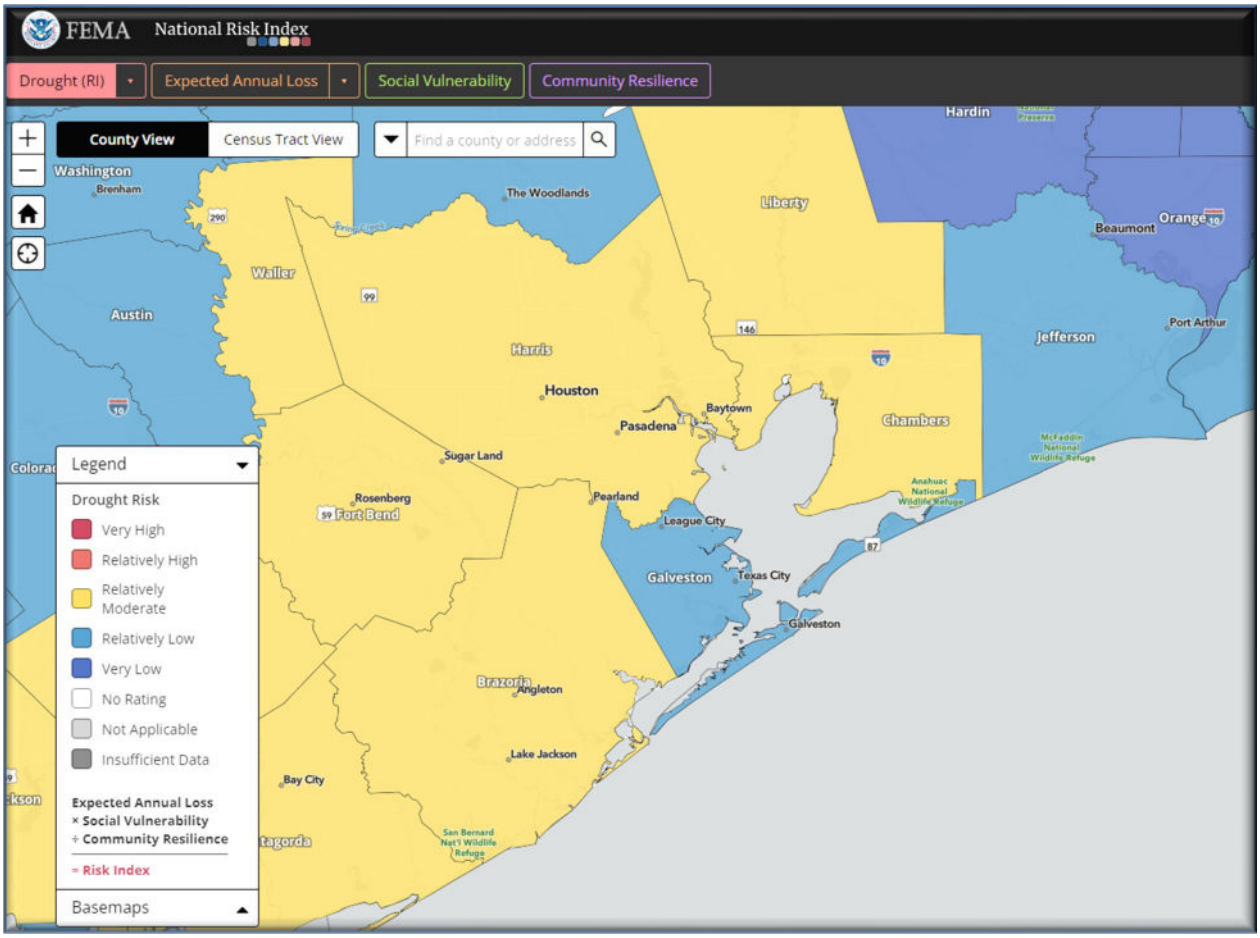
The U.S. Drought Monitor Map depicts the levels of drought intensity throughout the State of Texas. At the time this map was produced, the Port was considered to be in an area of extreme drought.

Table 4-14 Palmer Drought Severity Index

Range	Description
-4.0 or less	Extreme drought
-3.0 to -3.9	Severe drought
-2.0 to -2.9	Moderate drought
-1.9 to +1.9	Near normal
+2.0 to +2.9	Unusual moist spell
+3.0 to +3.9	Very moist spell
+4.0 and above	Extremely moist

While the Port is uniformly vulnerable to the hazard and the HMPT regards the probability of experiencing a drought event likely, the consequences of impact are considered to be negligible.

Figure 4-8 Drought Risk



Drought is common at the Port due to location and climate, but historical review places the anticipated extent at near normal to moderate. The impacts of a drought event in the Port of Galveston involve severe water restrictions and the potential for business interruption from a reduced water level in the channel.

Droughts do not have the immediate effects of other natural hazards, but sustained drought can cause severe economic stress to the agricultural interests in Galveston County, the Port, and the entire state. The potential negative effects of sustained drought are numerous. Drought can affect municipal and industrial water supplies, stream-water quality, water recreation facilities, hydropower generation, and agricultural and forest resources.

4.1.8.1 Recent Notable Drought Events

The Port's HMPT reviewed historical data from NCEI and the Natural Resources Conservation Service while researching drought conditions in Galveston County and the Port. Galveston County and the Port experienced their worst drought conditions from 1998 to 2000. To date, agricultural losses have been the primary losses associated with drought as no critical facilities have sustained any damage or functional downtime due to dry weather conditions. In between the years of 1998 and 2000, drought caused up to $270 million worth of crop damage to the area. While this is significant for Galveston County and the surrounding area, the Port's operations are not significantly impacted by crop damage. Drought is identified as a hazard to the Port due to its critical need to sustain a deep-water channel to accommodate large vessels.

According to NOAA, drought events affecting the City of Galveston since 2001 are:

Table 4-15 Drought Events

Date	Event Type
04/05/2022	Drought
5/1/2022	Drought
7/1/2022	Drought
8/1/2022	Drought
9/1/2023	Drought
10/1/2023	Drought

4.1.8.2 Climate Change Impact on Drought

Climate change may increase the frequency or intensity of hazards over time (National Environmental Modelling and Analysis Center 2023). Projections for two long term climate scenarios were calculated for dry days. Dry days are defined as the number of days in a year that receive less than 0.01 inch of rain. From 1961 to 1990, the average number of dry days per year was 243. For these projections, two harmful emissions scenarios are assessed. One scenario describes a future in which humans stop increasing harmful emissions by 2040 and then continue to reduce emissions through the end of the century (Lower Emissions). The second scenario describes a future in which harmful emissions continue to increase through the end of the century (Higher Emissions). The trend for the number of dry days per year is generally consistent over time and the two emission scenarios have only a slight impact on dry days in Galveston County over the next 80 years (NEMAC 2023)."

4.1.9 Lightning

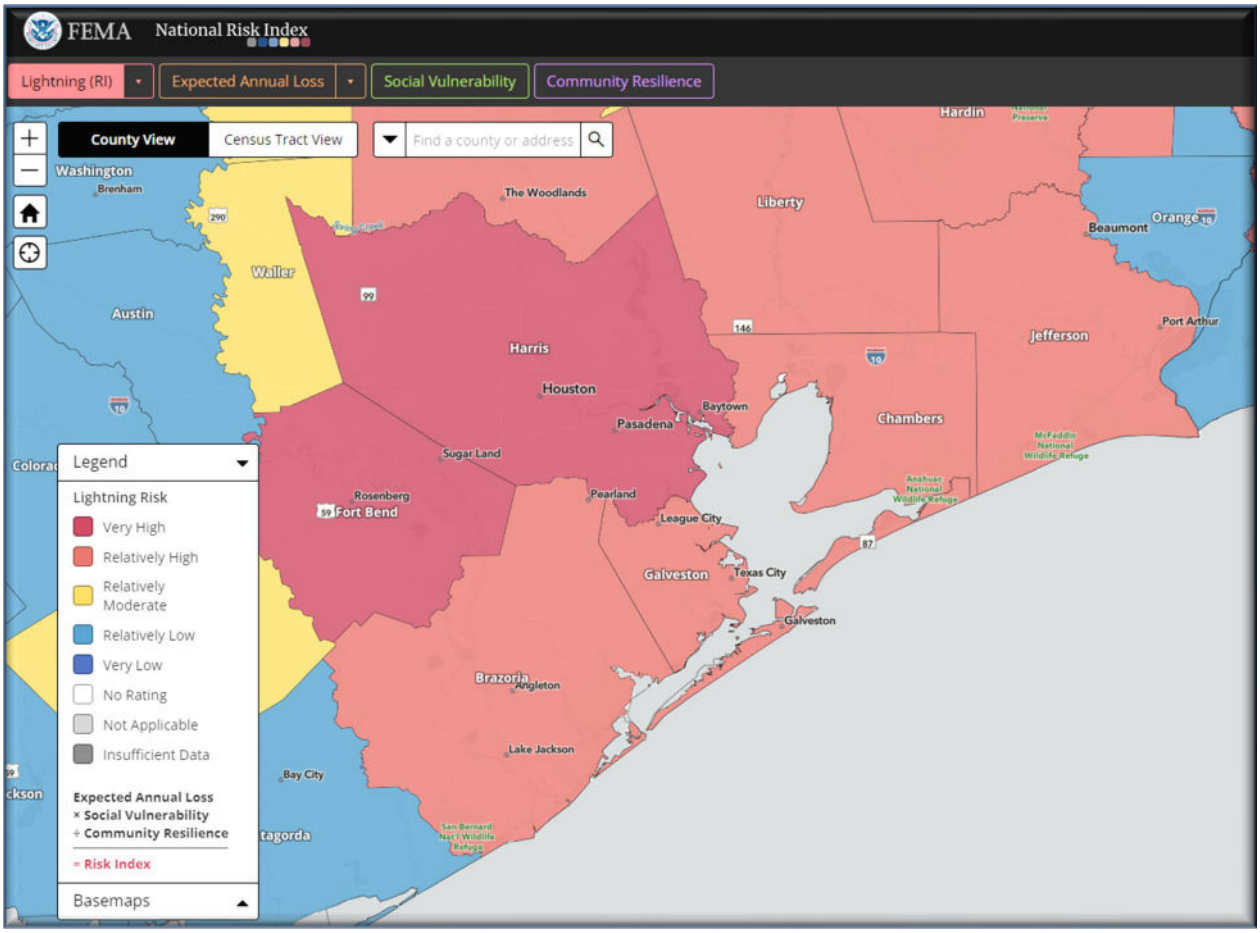
By definition, thunderstorms are accompanied by lightning. The electrical charge from lightning can potentially be as much as 100 million volts. Lightning strikes proceed from cloud to cloud, cloud to ground, or where high structures are involved, from ground to cloud. Lightning strikes in Galveston are most prevalent in July, with August being the next month of highest occurrence.

Table 4-16 Lightning Activity Level Scale

Lightning Activity Level (LAL)	Description
LAL 1	No thunderstorms.
LAL 2	Isolated thunderstorms. Light rain will occasionally reach the ground. Lightning is very infrequent, 1 to 5 cloud to ground strikes in a 5-minute period.
LAL 3	Widely scattered thunderstorms. Light to moderate rain will reach the ground. Lightning is infrequent, 6 to 10 cloud to ground strikes in a 5-minute period.
LAL 4	Scattered thunderstorms. Moderate rain is commonly produced. Lightning is frequent, 11 to 15 cloud to ground strikes in a 5-minute period.
LAL 5	Numerous thunderstorms. Rainfall is moderate to heavy. Lightning is frequent and intense, greater than 15 cloud to ground strikes in a 5-minute period.
LAL 6	Dry lightning (same as LAL 3 but without rain). This type of lightning has the potential for extreme fire activity and is normally highlighted in fire weather forecasts with a Red Flag Warning.

While the Port is uniformly vulnerable to the hazard and the HMPT regards the probability of experiencing a lightning event possible, the consequences of impact are considered catastrophic. The Port may see lightning occurrence extent between LAL 1 and LAL 5.

Figure 4-9 Lightning Hazard



Lightning strikes, although rare in occurrence, have a high danger potential associated with them. Its unpredictability along with its deadly and destructive potential is all the more reason to explore mitigation actions. The Port HMPT identified specific mitigation goals, objectives, and action items related to lightning strikes.

4.1.9.1 Recent Notable Lightning Events

The Port HMPT researched historical data from the NCEI and the National Weather Service, as well as information from past newspaper articles relating to lightning strikes in the area. Lightning, as with many natural hazards, can strike anywhere and at any time. Data from NCEI reported one incident of lightning strikes in the City of Galveston since 2001, however, local knowledge indicates many more instances have occurred but there are no other records of lightning strikes affecting lives or property. The one officially recorded instance resulted in 1 deaths, 0 injuries, and over $70,000 in damages. The Port can expect lightning strikes with charges as high as 100 million volts.

According to NOAA, lightning events affecting the City of Galveston since 2001 are:

Table 4-17 Lightning Events

Date	Event Type
08/23/2006	Lightning

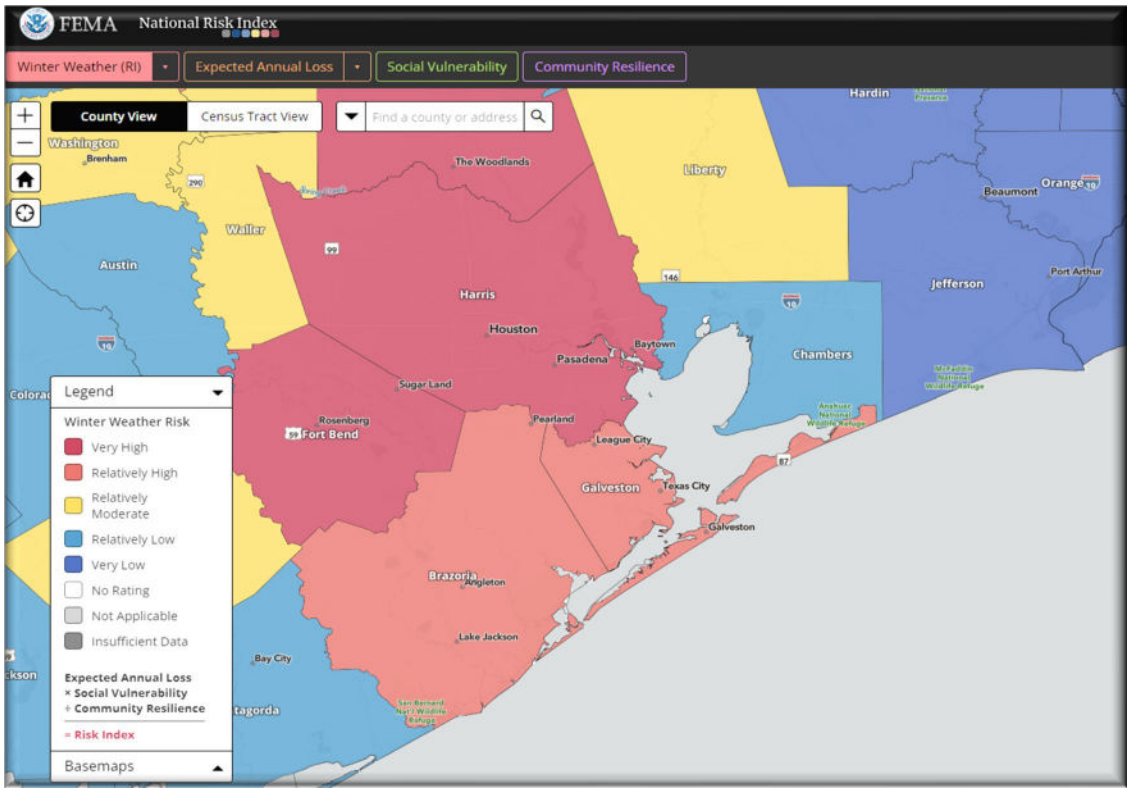
4.1.9.2 Climate Change Impact on Lightning

Because lightning is correlated with severe storm conditions but ultimately is caused by hyper-local, transitory conditions, identifying patterns and generating predictions are difficult to conduct at a local scale. Broad predictive efforts indicate that lightning strikes are likely to increase nationwide due to climate change (Romps et al 2018). Predictions of future lightning frequency largely rely on predictions of changes to, or increases in, thunderstorm storm frequency and severity, as well as the trend that lightning is more likely to occur in warmer conditions, on average. Areas with predicted increases in thunderstorm frequency or severity, and/or where temperatures are predicted to increase, can reasonably expect that lightning frequency will remain the same or increase (Price and Rind 1994). Research indicating recent short-term changes to lightning strike density (i.e., comparing 2022 to the average rates for 2015 to 2021) nationwide shows that during 2022, in Texas, strike density was down compared to the prior 6-year average. However, locally specific future predictions regarding changes to lightning frequency or location are not well understood and limited data exist to make locally specific predictions of such changes."

4.1.10 Winter Storms

Winter storms bring the threat of snow, and ice storms to the Port of Galveston. A heavy accumulation of ice, especially when accompanied by high winds, devastates trees and power lines. Sidewalks, streets, and highways become extremely hazardous to pedestrians and motorists. Severe winter storms originate as mid-latitude depressions of cyclonic weather systems and can cause snowstorms and ice storms. Winter storms can produce an accumulation of snow and ice on trees and utility lines resulting in loss of electricity and blocked transportation routes. These storms can also lead to frozen water pipes, which when erupted, can lead to extensive property damage and the depletion of a natural resource.

Figure 4-10 Winter Storm Events



Severe winter storms have a wide range of extent and severity markers and characteristics.

Snow

Various intensities of snowfall are defined differently:

- Blizzard describes winds of 35 mph or more with considerable falling and/or blowing snow that reduces visibility to less than one-quarter mile for at least three hours.
- Blowing snow describes wind-driven snow that reduces surface visibility. Blowing snow may be falling snow and/or snow on the ground that is picked up by the wind. Blowing snow if typically accompanied by drifting snow.
- Snow squall describes a brief, intense snow shower accompanied by strong, gusty winds. Accumulation from snow squalls can be significant.
- Snow shower describes snow that falls at varying intensities for short durations. Accumulations are possible but not required.

Blizzard warnings are issued for winter storms that are predicted to meet the definition of a blizzard. Blowing snow advisories are issued when such conditions are expected. Snow advisories are issued when a low-pressure system produces snow that may cause significant inconveniences, but do not meet warning criteria, and – if caution is not exercised – could lead

to life threatening situations. The threshold criterion carries from area to area. Such an advisory may be issued if the forecaster feels the situation warrants one, even if the minimum criteria is not expected to be met. For example, a snow advisory may be issued for the first snow of the season, or if snow has not fallen in some time.

Ice

Ice presents a hazard in a variety of forms:

- An ice storm is an occasion when damaging accumulations of ice during freezing rain situations. Significant amounts of ice typically damage trees and utility lines, and accumulations can make walking and driving exceptionally hazardous. Significant accumulations are typically one-quarter inch or greater.
- Sleet is rain that freezes into ice pellets before it reaches the ground. Sleet usually bounces when hitting a surface and does not stick to objects; however, it can accumulate like snow and cause roads and walkways to become hazardous.
- Freezing drizzle is a drizzle that falls as a liquid but freezes into a glaze upon contact with the cold ground or surface structures.
- Freezing rain is rain that falls onto a surface that has a temperature below freezing. The cold surface causes the rain to freeze so the surfaces—trees, utility wires, vehicles, and roads—become glazed with ice.

An ice storm warning is issued by the National Weather Service when freezing rain produces a significant and possibly damaging accumulation of ice. The criterion for this warning varies from place to place but will typically be issued any time more than one-quarter inch of ice is expected to accumulate in a given area. A sleet warning is issued when an accumulation of more than one-half inch of sleet is expected. This is a relatively rare scenario; most warnings are issued as winter storm warnings for heavy sleet. A freezing drizzle advisory or a freezing rain advisory is issued when freezing rain or freezing drizzle is forecast but significant accumulation is not expected. However, even small amounts of freezing rain or freezing drizzle can cause significant travel disruptions.

Finally, the National Weather Service may issue a winter weather advisory when a low-pressure system produces a combination of winter weather (snow, freezing rain, etc.) that presents a hazard but does not meet established warning criteria. A winter storm watch is issued when there is a potential for heavy snow or significant ice accumulations, usually at least 24-36 hours in advance; the criteria for what defines a winter storm varies from place to place. A winter storm warning is issued when a winter storm is actively producing or is forecast to produce heavy snow or significant ice accumulations; the criteria for what defines a winter storm varies from place to place.

Severe winter weather is a rare occurrence at the Port Galveston. Because of this, when it does occur, it does not take a great deal of accumulation to have a significant impact on the Port. These events show the extent of the severe winter storm hazard that the City can expect to experience.

A Severe winter event would uniformly affect the Port but the likelihood of a severe winter storm occurring at or near the Port of Galveston is minimal. Should a severe winter storm occur, Port operations could be impeded or suspended for a period of time. Mitigation strategies provided in this plan should be considered to reduce the potential for business interruption due to this type of event.

4.1.10.1 Recent Notable Winter Storm Events

Research from the NCEI indicates there have probably been 3 severe winter storm occurrences recorded for the Port of Galveston since 2001. Although severe winter storms occur infrequently, they have the potential to wreak havoc to the community when they do strike. Statistically, the Port of Galveston can expect a severe winter storm every 6-7 years. This equates to a 14% percent chance of a severe winter storm occurring in any given year. In 2004, Galveston Island received four inches of snow in a 24-hour period and in 2011, an ice storm coated the City of Galveston with one tenth and two tenths of an inch of ice. According to historical records, the Port can anticipate the potential for up to four inches of snow or two tenths of an inch of ice from a severe winter storm.

According to NOAA, winter storm events affecting the City of Galveston since 2001 are:

Table 4-18 Winter Storm Events

Date	Event Type
12/24/2004	Heavy Snow
02/03/2011	Ice Storm
12/08/2017	Winter Weather

4.1.10.2 Climate Change Impact on Winter Storms

Temperatures are warming during all seasons. In many regions, winters are warming faster than any other season. Climate Central reports that winters across the contiguous United States have warmed by an average of nearly 3°F over the last half of the century (Climate Central 2023). Extreme precipitation events appear to be increasing in frequency in Texas, and more broadly across other parts of the U.S. Consequently, the increasing temperatures that lead to increase evaporation and thus increased precipitation, can also be expected to lead to increased snowfall as well." Additionally, Research suggests that increases in average global

temperatures and average Arctic temperatures, the jet stream may also change, slowing down and growing wavier. Changes in the jet stream may allow extremely cold Arctic air to advance farther south than usual in the winter months and may affect areas that are not accustomed to low temperatures for longer periods of time. Though on average winters are predicted to be shorter and warmer, many areas are predicted to continue to experience significant cold weather over time (Climate Reality Project 2022)."

4.1.11 Fog

Fog is heavily influenced by nearby bodies of water, topography, and wind conditions. In turn, fog affects many human activities, such as shipping, and travel. Sea fog, which shows up near bodies of saline water, is formed as water vapor condenses on bits of salt.

A fog index is a weather forecast that predicts when and where fog will occur. The National Weather Service (NWS) issues fog advisories when widespread fog is expected.

Fog advisory types

- **Dense Fog Advisory** – When widespread fog is expected to reduce visibility to a quarter of a mile or less
- **Freezing Fog Advisory** – When fog is expected to develop and surface temperatures are at or below freezing

From November through March, Galveston County typically gets 6-7 days of dense fog, with lesser occurrences of fog several days each month. Historically, the western and northern Gulf coast is the fourth foggiest region in the U.S.

In the past, fog has been dense enough to concern pilots navigating to the Port. There have been times in the past when pilots have requested Port vehicles to park on the dock with either their headlights pointed towards the navigational waters, or for Port police to activate their light bars.

A fog event could uniformly affect the Port but would likely be much more significant in the channels. Fog occurring at or near the Port of Galveston is highly likely. Should a dense fog event occur, Port operations could be impeded or suspended for a period of time.

4.1.11.1 Notable Recent Fog Events

Fog, especially marine fog, is common in maritime areas and the Port sees fog frequently. However, it is not a hazard that is tracked by NOAA and thus reflects no formal hazard history. Tracking notable fog events may be considered in the future as a planning activity for the Port of Galveston.

4.1.11.2 Climate Change Impact on Fog

Scientists have conducted studies that shown that since the 1950's, fog has declined about 30% during certain seasons. There is data that suggest that the lower relative humidity, increased air temperatures, and warming waters are contributing to the reductions in fog.

Until scientific information is available that proves otherwise, there is no action needed by the port.

4.1.12 Pandemic

A novel virus is a virus, or variant of, that has not been seen before or is a virus that is known but has not infected humans before. To understand a pandemic, one must first understand what an outbreak is, which is defined by the Center for Disease Control (CDC) as a higher number of cases than expected in an area within a certain time period." As the impact of the virus widens, it becomes an epidemic, which is similar to an outbreak, but with a larger number of cases occurring over a greater area or both. If the exposure continues to spread, and reaches several countries or continents, and affects many people, it is then classified as a pandemic.

Pandemic origins of some viruses have been controversial, and can be argued that instead of naturally occurring, they could be human caused. For the purpose of this HMP, we are considering pandemic incidents to be natural, understanding that an individual virus may prove otherwise.

Globally, the recent COVID-19 pandemic led to a dramatic loss of human life worldwide and presented an unprecedented challenge to public health, food systems and the world of work. The economic and social disruption caused by the pandemic was devastating, with tens of millions of people falling into extreme poverty. Compared to 2020 mobility levels to those in previous years, a decrease in mobility between 19.57% and 42.77% was witnessed for cruise and passenger ships. In addition, many cruise ports around the world closed down to prevent the spread of the coronavirus.

Besides the devastating impact on business, the pandemic affected the public's mental health and well-being in a variety of ways, including through isolation and loneliness, job loss and financial instability, and illness and grief.

Regarding COVID's impact on the Port of Galveston, keep in mind that the cruise industry is about leisure and vacation, so overall, amongst the global maritime shipping industry, cruise and passenger ships were the most affected maritime segment. In a Houston Chronicle article on July 16, 2023, they quoted Port Director/CEO Rodger Rees, "*Cruising accounts for about 65 percent of the Port of Galveston's business, meaning that the plunge in cruise travel from 2020 through 2021 cost the Port of Galveston about $58 million in revenue."*

4.1.12.1 Notable Recent Pandemic Events

Table 4-19 Pandemic Events

Pandemic	Year	Deaths (globally)	Deaths (U.S.)	Cases (globally)
Swine Flu (N1H1)	2009	150,000+	12,469	60M+
Ebola	2014-2016	11,000+	0 (estimated)	27,000+
COVID-19	2019-2023	6.9M+	1,127,152	767M+

To address the COVID pandemic, the Board of Trustees of the Galveston Wharves ("Port of Galveston") and staff worked with local and state responding agencies to operate under Federal guidelines, including those issued by the U.S. Department of Health and Human Services ("HHS") Centers for Disease Control and Prevention ("CDC") and the U.S. Coast Guard, including Coast Guard Marine Safety Information Bulletin (MSIB 02-21).

The Port of Galveston has a long-established relationship with the local health authorities, hospital systems (including but not limited to the Galveston County Health District, the University of Texas Medical Branch at Galveston, and the Galveston Area Ambulance Authority), offices of emergency management and local, state and federal agencies.

The **Port of Galveston COVID-19 Safety Procedures** document remains on file internally, for further use (Exhibit 1 Port of Galveston CCO (APB rev 05.18.2021)).

The recovery of the cruise industry continues, with a Travel Weekly article dated July 31, 2023, citing "The port estimates it will see 1.3 million passengers this year, its busiest ever, steadily rising from 861,000 in 2016 and surpassing its previous record of 1.09 million cruisers in 2019. It has quickly recovered from a pandemic decline, growing to 1.04 million passengers last year. Thirty percent growth is unheard of in this business, but, you know, people are cruising now" said Rodger Rees, Port Director of Galveston Wharves, which manages the port.

A pandemic would uniformly affect the Port and the HMPT recognizes that the likelihood is possible.

4.1.12.2 Climate Change Impact on Pandemic

Many of the root causes of climate change can have an effect on increasing the risk of pandemics. As an example, deforestation, which occurs mostly for agricultural purposes, is the largest cause of habitat loss worldwide. The loss of this habitat forces animals to migrate and potentially contact other animals or people, which increases the sharing of germs. Climate change can also force the migration of people, introducing individuals to unfamiliar regions, and leading to overpopulation in areas not designed for this new level of population saturation.

The fact that the port hosts foreign vessels and vessel workers, as well as cruise-goers that have visited many corners of the world, likely increases their potential exposure to this hazard.

4.1.13 Navigational Channels

Navigational channels are created and maintained by dredging (human activity). For the purpose of this HMP, we are considering the risk that is to be mitigated as being caused naturally.

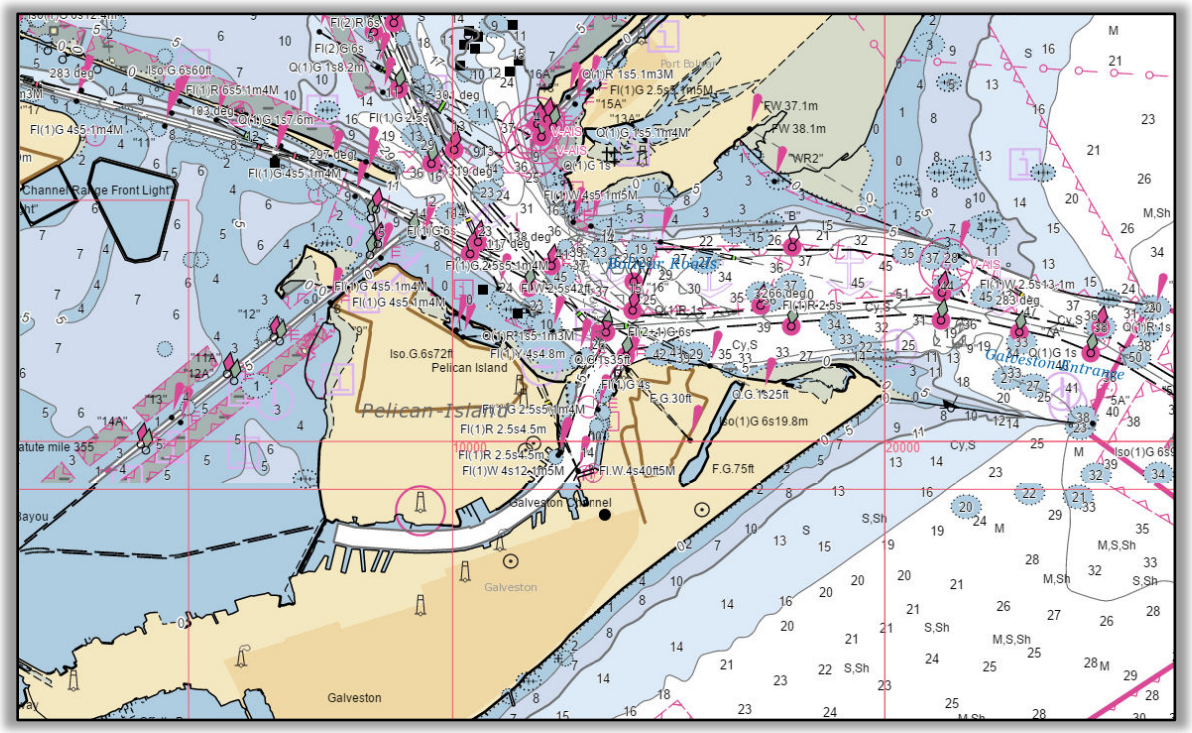
With their increased size, ships need improved navigation channels to enter and leave ports efficiently, quickly, and safely. However, few rivers or harbors are naturally deep. Therefore, they require underwater excavation or "dredging." After the initial excavation establishes a channel, periodic or "maintenance" dredging must be done to keep that channel clear and safe for navigation. Once sediments are dredged from the waterway, they are referred to as "dredged material."

Without dredging, many harbors and ports would be impassable for cargo ships and passenger liners. Periodic maintenance dredging as well as occasional enlarging and deepening of navigation channels are essential to accommodate commercial and recreational vessels. Consumer product prices stay low when ships can transport their goods directly into the port. The forces of nature, namely hurricanes, can wreak havoc on communities and coastlines. What is less visible is how natural processes cause a shifting and debris underwater, backfilling dredged navigational routes that are critical to enabling vessels ingress and egress into bays, and channels.

When this occurs coastal communities and maritime industries along these routes turn to the dredging industry to recover these shipping lanes, being sensitive to the ecosystems that have also been impacted by nature. The dredging that is required involves removing material from the bottom of the water environment, first loosening the material at the bottom of the surface, then removed by suction or mechanical means. Once removed, it is transported and disposed of or used for another purpose. In bay areas the dredged material is usually sand but can include building material and sunken vessels as well.

Besides the channels, navigation aids such as buoys and beacons aid vessels navigate the channels, so their recovery and accurate placement need to be conducted with a level of urgency. A vessel that becomes stuck in a channel, or runs aground due to navigating off-track, could further complicate the maritime flow for the Port.

Figure 4-11 Galveston Bay Navigational Channel



After an incident that could impact the navigational channel, it is important for the Port to work closely with the USCG to determine any degraded integrity of the navigational routes, or damage or misalignment of the navigation aids.

During this period of time, the Port will need to ensure that any vessels in port are made aware of the potential hazards, and if requested, communicate with vessels requesting to berth at the Port.

An incident that impacts the navigational channels would only directly affect the waterway access to the Port. However, the HMPT recognizes that inoperable channels directly affect Port operations, which could be impeded or suspended for a period of time.

4.1.13.1 Notable Recent Navigational Channel Events

Navigational channels are constantly dynamic and as such don't occur in events such as a more traditional hazard such as a tropical storm does. Instead, navigational channels require constant monitoring and analysis to be maintained.

The Port of Galveston typically budgets more than $2 million a year to maintain depths of 35-45 feet in its portion of the waterway, from its berths to 115 feet into the channel. These funds come from port-generated operating revenues. They conduct hydrographic surveys semi-annually to measure channel depths, more often if issues arise. In 2022, a special dredging

project in the turning basin east of Pier 10 was completed to maintain required dimensions of 1,500 feet wide and 37 feet deep. In the last two decades, the port has placed more than 7 million cubic yards of dredge in the spoil area.

Also in 2022, the US Armey Corps of Engineers spent more than $20 million to bring the federally owned 800-foot-wide channel to its authorized depths. The project included dredging and raising levees in federal spoil areas on Pelican Island and behind the eastern tip of the seawall to accommodate spoils.

Less than a year later, shoaling had reduced the depth at the entrance of the Galveston Harbor, restricting the entire harbor to ship drafts of no more than 42 feet.

For 2024, the Corps requested $30.6 million in federal funding for maintenance but received only $8.9 million.

4.1.13.2 Climate Change Impact on Navigational Channels

Increased rainfall and storm activity, stronger and more frequent hurricanes, and accelerated coastal erosion will continue to create challenges in navigational channels. The irregular shifting of sediment in the bay and channels may require increased monitoring and dredging.

4.2 Technological / Human-Caused Hazards

Technological hazards are distinct from natural hazards primarily in that they originate from human activity. In contrast, while the risks presented by natural hazards may be increased or decreased as a result of human activity, they are not inherently human induced. The term “technological hazards” refers to the origins of incidents that can arise from human activities such as the manufacturing, transportation, storage, and use of hazardous materials.

4.2.1 Hazardous Materials

A hazardous material is a biological, chemical, or physical agent with the potential to cause harm to the environment or people on its own or when combined with other factors or materials. These materials can cause death, serious injury, and long-lasting conditions, as well as damage to buildings, homes, vessels, and other structures. Hazardous materials come in many forms and may include chemicals found in homes on a regular basis. These materials are also transported daily by highways, railroads, waterways, and pipelines.

Table 4-20 Classification of Hazardous Materials

Class	Description
Class 1: Explosives	Materials in this category include projectiles, as well as sensitive and insensitive explosives. All must be handled with extreme caution. They should never be shaken or dropped and should be kept away from open flames.
Class 2: Hazardous Gases	This class includes flammable and nonflammable compressed gases, as well as poisonous gases.
Class 3: Flammable Liquids	This class includes both flammable liquids with a flashpoint below 140 degrees Fahrenheit and combustible liquids with a flashpoint between 141- and 200-degrees Fahrenheit.
Class 4: Flammable Solids	This includes spontaneously combustible and “dangerous when wet” solids that become combustible when brought into contact with water.
Class 5: Oxidizers and Organic Peroxides	This class includes organic peroxide. These substances can become catalysts for fire hazards.
Class 6: Poisons and Etiologic Materials	This includes inhalation hazards, other poisons, and infectious substances. Swallowing, bodily contact, or inhalation of gases released by toxic substances may cause irritation of skin and mucous membranes, or in more severe cases, serious illness. Contact a physician immediately if exposed.
Class 7: Radioactive Materials	Waste incidental to reprocessing refers to certain waste byproducts that result from reprocessing spent nuclear fuel, which the U.S. Department of Energy has distinguished from high-level waste. High-level waste is “irradiated” or used nuclear reactor fuel. Uranium mill tailings are the residues remaining after the processing of natural ore to extract uranium and thorium.
Class 8: Corrosive Materials	Corrosive materials can harm living tissue and nonliving matter, such as steel, on contact.
Class 9: Miscellaneous	This is a catch-all category for any other materials that could present a hazard during shipment.

EPA Toxic Release Inventory: Hazardous materials are monitored and recorded by the U.S. Environmental Protection Agency through the Toxics Release Inventory, which contains information in a data base on toxic chemical releases and hazardous materials activities. This database was created under the Emergency Planning and Community Right-to-Know Act of 1986 and the Pollution Prevention Act of 1990. Every year, facilities that meet specified criteria for their releases and other management activities for listed toxic chemicals report to the U.S. Environmental Protection Agency and to the State of Texas.

Tier II Chemical Reporting Program: The mission of the Texas Tier II Chemical Reporting Program in the Department of State Health Services is to protect the public health and environment by providing current and accurate information about hazardous chemicals and their health effects and by ensuring that the regulated community complies with the requirements of the state and federal community right-to-know laws.

The Port has the potential to experience hazardous materials incidents from the variety of hazardous chemicals that are transported or stored at Port facilities. Any leak or spill from these chemicals has the potential to cause health problems for public safety, damage Port property, or impede daily operations at the Port.

Table 4-21 Hazardous Materials Incidents

Incident	Impact	Property Damage
Current	In certain areas of the Port, there are abandoned underground pipes that may contain creosote-type oil products. During an excavation, and a derailment, these pipes are sometimes exposed, with oil seeping to the surface. When this occurs, it must be contained and mitigated per the applicable EPA regulations.	Unknown
Hurricane Ike, September 7, 2008	Hurricane Ike swept barrels of oil and other hazardous materials up in a surge, and deposited them on Port property. Since these hazardous materials were located on Port property, this because part of the clean-up operation.	Unknown

April 4, 2008—Port crew unearthed railcar filled with liquid substance	Port crews unearthed a railcar about 40 by 10 feet in diameter, as they were removing track to install a storm drain for a parking lot west of cruise terminal 2, north of Harborside Drive near pier 27. Initial analysis detected Dichlorodiphenyldichloroethylene, a breakdown product of Dichlorodiphenyltrichloroethane (a pesticide) which was banned in the 1970s.	$55,000

While the Port deals with a high number of hazardous materials, the Port follows the appropriate safety procedures associated with each of them; therefore, the likelihood of a hazardous materials incident occurring at the Port is low. Should a hazardous materials incident impact any of the critical facilities identified, there would be a significant health and safety concern.

When there is a release of hazardous materials, once the Galveston Emergency Management Agency (EMA) is notified, with the support of the National Weather Service (NWS) staff co-located in their facility, they develop and communicate a mapped plume model derived from the chemical identified and the immediate area weather.

This information is either used to activate the extent and path for evacuations or activate shelter-in-place procedures. The Galveston EMA has mobile Chemical Aid Monitors that they deploy to the outskirts of the plume to verify that the plume footprint was accurate.

4.2.2 Fire / Explosion

The risk of fire at a port is on most seafaring Texans' minds due to the state's relevant disaster history. In 1947, the freighter Grandchamp, loaded with 2,300 tons of ammonium nitrate, exploded after a fire broke out in a cargo hold while in port.

In all, 568 firefighters, dock workers, bystanders and shift workers in a nearby chemical plant were killed, and 3,500 individuals were injured. The explosion caused a 15-foot wave throughout the harbor area and ignited bales of cotton and sisal, bombarding Texas City with a rain of shrapnel.

The fire spread to another freighter with a load of sulfur and another 1,000 tons of ammonium nitrate, which detonated the following morning. One third of Texas City’s over 1,500 houses were damaged or destroyed after the disaster, making more than 2,000 people homeless.

This is an example of what could happen if maritime malevolent actors could explode a chemical tanker or an ammonium nitrate carrier in a U.S. port. In comparison, the amount of ammonium nitrate used in the Oklahoma City Bombing was 4,800 pounds (2.4 tons).

3.2.3.1 Fuel

Marine gas is specifically produced for use in vessels and boats. It is typically blended with a corrosion inhibitor to help protect the engine from the harsh marine environment.

Pier 19 has two (2) fueling pumps. One is an above-ground tank that has 20,000 gallons of marine diesel fuel, and the other is an above-ground tank with 7,000 gallons of marine gasoline.

Bunkering, or the refueling operation, is conducted from refueling barges, while the vessel is at the Port of Galveston dock or at the Bolivar Roads Anchorage area in the bay. On rare occasions, bunkering is conducted via trucks.

The Port should continue to coordinate and monitor any truck bunkering operation, considering the proximity of personnel, visitors, vessels, cruise ships, and flammable cargo.

All applicable federal, state and generally accepted industry safety rules, regulations, and standards should be complied with, and enforced during any bunkering, fueling and/or storage operation. These include, but are not limited to:

- United State Coast Guard
- Occupational Safety and Health Administration (OSHA), 1917.156, Liquid Fuel.
- Environmental Protection Agency (EPA)
- American Petroleum Institute (API) promotes “Staying safe at the Pump.”

3.2.3.2 Explosives

Explosives are any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion. The term includes, but is not limited to, black powder, pellet powder, initiating explosives, ammonium nitrate fuel oil (ANFO) mixtures, safety fuses, squibs, mixed binary explosives, and igniters. Explosives are also present in items such as automotive air bag inflators, special industrial tools, fire extinguishers, some pest control devices, some model rocket engines, fireworks, and special effects in the entertainment industry.

The Port of Galveston is a shipping and receiving port of explosives. Pier 34 is rated to handle #100,000 net explosive weight, while Pier 37 is rated at #140,000 net explosive weight.

Calculating explosive distances using the UN SaferGuard calculator recommends that #100,000 of explosives, which equates to roughly 45,360 kg, have a distance between the explosives and a vulnerable building inhabited by civilians of 1,583.46 meters or .98 miles.

Calculating #140,000 of explosives, which equates to roughly 63,503 kg, have a distance between the explosives and a vulnerable building inhabited by civilians of 1,789.79 meters or 1.11 miles.

The Port of Galveston regularly handles division 1.1, 1.2 and 1.5 cargo under approved regulations authorized by the City of Galveston and the U.S. Coast Guard. A copy of the U.S. Coast Guard Marine Safety Information Bulletin can be obtained by request from the port police department or harbormaster.

All applicable federal, state and generally accepted industry safety rules, regulations, and standards should be complied with, and enforced during the loading, unloading and storage of explosives. These include, but are not limited to:

- United States Coast Guard
- Occupational Safety and Health Administration (OSHA), 1910.109, Explosives and blasting agents.
- State Fire Marshal, Texas Department of Insurance

3.2.3.4 Fertilizer

Although it is not technically classified as an explosive or flammable material, under certain conditions, ammonium nitrate can present a significant explosive threat because it is an oxidizer - an oxygen-rich compound that can accelerate fires or explosions. Ammonium nitrate, however, needs another element to destabilize it for such a reaction to begin. Exposure to elements such as fire or heat can start the process of destabilizing ammonium nitrate, making it self-reactive and prone to releasing flammable and ignitable gases. Code enforcers, business owners, and facility managers can help protect buildings before an incident occurs or before it becomes an enforcement issue by knowing what can make ammonium nitrate dangerous.

In August of 2020, surveillance cameras captured an explosion and its resulting damages at the Port of Beirut, Lebanon. The explosion, which began with a fire, ignited 3,031 short tons of ammonium nitrate stored in Warehouse 12. The amount of ammonium nitrate was calculated to be equivalent to 1.1 kilotons of TNT. The blast, which was left a crater 140’ wide, and 125’ across, damaged homes as far away as 6 miles away from the blast. In all, 218 individuals lost their lives, and over 7,000 were injured. The financial impact was estimated to be over $15 billion dollars and left 300,000 homeless.

As mentioned above, the amount of ammonium nitrate used in the Oklahoma City Bombing was 4,800 pounds (2.4 tons) packaged into 50-gallon plastic barrels and driven into position while in the back of a rental truck. Damage extended throughout downtown Oklahoma City (48-square-block area).

All applicable federal, state and generally accepted industry safety rules, regulations, and standards should be complied with, and enforced during the transferring and storage of fertilizers, especially ammonium nitrate. These include, but are not limited to:

- Occupational Safety and Health Administration (OSHA), 1910.109(i).
- Environmental Protection Agency (EPA)
- National Fire Protection Association (NFPA)

3.2.3.5 Ethanol

Ethanol is a renewable fuel made from corn and other plant materials. Ethanol use is widespread, and more than 98% of gasoline in the U.S. contains some ethanol. The most common blend of ethanol is E10 (10% ethanol, 90% gasoline).

Ethanol is highly flammable and reacts explosively (fire and explosion hazard) with strong oxidants such as nitric acid, silver nitrate, mercuric nitrate, and magnesium perchlorate. It reacts slowly but can still result in fire and explosions with calcium hypochlorite, silver oxide and ammonia. The vapor mixes well with air and explosive mixtures are easily formed.

3.2.3.6 Liquefied Natural Gas (LNG)

The Port of Galveston is authorized to handle liquid natural gas (LNG). Pier 34 is designated as a 33 CFR 127, subpart A and C facility and operates under an approved U.S. Coast Guard, facility security plan annex.

Liquefied Natural Gas (LNG) is cooled, and not pressurized as some may think. LNG is produced by purifying natural gas and super-cooling it to -260°F to turn it into a liquid. During the process known as liquefaction, natural gas is cooled below its boiling point, removing most of the extraneous compounds found in the fuel. LNG is a significant hazard and requires careful planning to transport and store safely.

4.2.3 Vessel Hazards

The nature of the Port and its day-to-day business operations creates hazards that other municipalities and areas would not normally consider. This includes the hazards associated with the vessels that operate in and out of the Port's facilities every day. The Port experiences traffic in and out of the channel frequently. The table below illustrates vessel traffic by type of vessel and year.

Table 4-22 Port of Galveston Vessel Traffic

Fiscal Year	2022	2021	2020	2019	2018
Cargo ships	283	347	283	349	324
Cruise ships	234	124	69	297	268
Lay Ships	318	472	461	377	248
Ship Calls – Total	835	943	813	1,023	840

In any significant matter involving vessels, the cargo of the ship is as important as the vessel itself. In the event of a sinking, fire, or change in direction, the cargo may ultimately end up in the water or affect the surrounding area.

Table 4-23 Vessel Cargo (in short tons)

Fiscal Year	2022	2021	2020	2019	2018
Wind	53,055	190.397	126,883	163,725	N/A
Fertilizer	229,295	390,868	273,569	540.096	603,701
Fruit	559,084	594,012	606,624	568,860	247,987
General cargo	22,688	22,387	59,661	2,601	7,847
Grains	729,203	1,246,542	1,473,271	647,328	839,395
Liquid	1,965,982	1,989,260	1,393,261	1,574,339	1,541,103
Ro-ro cargo	438,091	387,295	314,790	495,027	218,971
Total Cargo (in short tons)	4,018,996	4,846,320	4,267,622	4,017,838	4,103,390

Approximately 15 vessels go through the Port channel every day. Although the possibility of a vessel sinking is unlikely, if such an event occurred, the effects could be disastrous to the Port. Depending on the location the vessel sank and what type of vessel, all operations at the Port could be interrupted. The sinking vessel could leak hazardous substances into the water and be a hazard for other vessels that might hit the debris when traveling through the channel until the cleanup can be completed. In the event of a cruise ship sinking in the Port, not only would property be lost, but search and rescue efforts would be needed in the channel in order to assist the passengers of the vessel.

In the Port of Houston in 2011, a tugboat sunk in the ship channel, causing the channel to close for a week. The tugboat also slowly leaked up to 10,000 gallons of diesel fuel into the channel.

The occurrence of fire on a vessel could also impede Port operations. Depending on the severity and the type of ship, a vessel fire in the Port and the effects could vary significantly. Should a fire break out on a vehicle carrier, or one carrying explosive material or fuel, there is the possibility of the ignition of gas tanks.

There is also the potential for the collision of vessels in the channel, which would impact the ability of the Port to remain open for business. The table below details the vessel-related incidents that have previously occurred at the Port.

Table 4-24 Vessel-Related Incidents

Date	Type of Incident	Location	Incident
11/1/1979	Vessel collision	Galveston Bay	Burmah Agate—on the morning of November 1, 1979, the Burmah Agate and the Mimosa collided at the entrance to Galveston Harbor. The Mimosa struck the Burmah Agate on its starboard side, tearing an 8- by 15-foot hole in the hull near Cargo Tank No. 5. An explosion occurred upon impact, and the leaking oil ignited. An estimated 2.6 million gallons of oil were released into the environment, and another 7.8 million gallons were consumed by the fire. Ultimately, 2,100 barrels impacted various beaches and marshes (NOAA).
6/8/1990	MegaBorg Oil Spill/Lightning accident	60 miles south-southeast of Galveston	The Mega Borg released 5.1 million gallons of oil as the result of a lightning accident and subsequent fire. The incident occurred 60 nautical miles south-southeast of Galveston on June 8, 1990.
1/28/2010	Cruise ship collision with Port property	Port of Galveston	Carnival Cruise Line's Ecstasy struck the passenger gangway at the Texas cruise terminal at Pier 25, knocking the $1.8 million structure out of commission for weeks.
3/24/2014	Bulk carrier collided with an oil tank-barge	Galveston Bay	Bulk carrier M/V *Summer Wind* collided with the oil tank-barge *Kirby* 27706. The barge contained approximately 1,000,000 gallons of intermediate fuel oil in multiple tanks and spilled 168,000 gallons. The collision and spill closed ship

Date	Type of Incident	Location	Incident
			traffic in the Houston Ship Channel and Intercoastal waterway.
3/5/2015	Containership and chemical tanker collide.	Houston Ship Channel	The Hamburg Süd-owned containership *Monte Alegre* and the chemical tanker *Chembulk Houston* collided. There were no spills or injuries as a result of this collision.
10/29/2011	Tankship and Containership collision	Houston Ship Channel, Upper Galveston Bay	A Greek-flag tankship, the Elka Apollon, and the MSC Nederland, a Panamanian-flag containership, collided, structurally damaging both vessels. No injuries resulted in the collision.
5/10/2019	Liquefied gas carrier collided with a tank barge.	Houston Ship Channel, Upper Galveston Bay	The 754-foot-long liquefied Genesis River collided with a 297-foot-long tank barge. The collision breached two cargo tanks in the barge, spilling approximately 473,600 gallons of reformate, a gasoline blending stock. There were no injuries.

While the likelihood of a vessel-related incident occurring at the Port is low due to the extensive safety measures in place, the Port has the potential to sustain significant physical damage from these types of events. Should a vessel sinking, fire, or collision occur in the Port channel, there would be a serious business continuity concern.

4.2.4 Vessel Support Services

The Port provides several support services, such as welding repairs, general ship maintenance, and refueling. Logistics is also offered, such as loading food, material, and bulk potable water, and unloading trash and waste. For the Port cruise clients, up to 12,000 cruise goers per day, as well as luggage, may be embarking or disembarking through passenger terminals via gangways.

Three distinct concerns were identified during this HMP update:

First is the cruise ship fueling operation that occurs. Unlike many ports which utilize fuel trucks and conduct fueling operations at the dock, near the vicinity of embarking / disembarking operations, cruise ships visiting the Port of Galveston fuel these ships from fuel barges away from the Port docks.

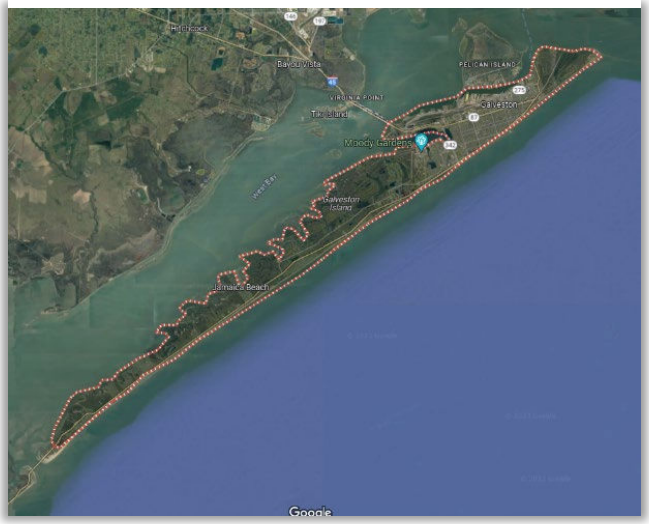
Secondly was the loading of potable water that the Port provides via a connection with the City of Galveston Water Department. The concern was the impact contaminated potable water could have on the passengers on a Gulf-bound cruise ship. The Port has taken the initiative to test the water in the past. Regarding water quality, the City of Galveston is recognized as a "Superior Water System" by the Texas Commission on Environmental Quality TCEQ). This award recognizes overall excellence in all aspects of operating a public water system (PWS). To be recognized, a PWS must go above and beyond the minimum standards in protecting public health and ensuring reliable operation.

Lastly are the hazards related to gangway operations. There was a concern voiced during the interviews that some gangways are aged, and their condition may warrant major upgrades or replacement.

Gangways are an area that needs to be evaluated. Replacing gangways would be a large investment, so the repair and upgrading of this equipment instead of replacing it needs to be considered.

This evaluation should identify the increased costs of operations due to frequent breakdowns, safety concerns, reduced port productivity, increase in port labor costs, and an inability to meet the scheduled cruise timelines.

Figure 4-12 Galveston Island



4.2.5 Island Egress / Ingress

Galveston Island is a barrier island on the Texas Gulf Coast approximately 50 miles southeast of Houston. The entire island, with the exception of Jamaica Beach, is within the city limits of the City of Galveston in Galveston County.

The island is 27 miles long and 3 miles wide at its widest point. The island is oriented generally northeast-southwest, with the Gulf of Mexico on the east and south, West Bay on the west, and Galveston Bay on the north.

The island's main vehicle access point from the mainland is the Interstate Highway 45 causeway that crosses West Bay on the northeast side of the island. The southwestern end of the island is connected to the mainland by the San Luis Pass-Vacek Toll Bridge, which connects San Luis Pass Road on Galveston Island with the Bluewater Highway that leads south into the town of Surfside Beach.

The farthest north end of the island is separated from the Bolivar Peninsula by Galveston Harbor, the entrance to Galveston Bay and the Houston Ship Channel. There is a Ferry service that is available between Galveston Island and the Bolivar Peninsula.

Railroad access is on the north part of the island, via a separate causeway that runs parallel with the Interstate Highway 45.

Medical helicopter access to the island is available via the heliport located on Harborside Drive, diagonal from the University of Texas Medical Branch (UTMB) Health Emergency Room.

Pelican Island is accessed via the Pelican Island Causeway, which connects to Galveston Island.

For Galveston Island, although much of the waters surrounding the Interstate Highway 45 causeway, and San Luis Pass-Vacek Toll Bridge, are fairly shallow (3'-7'), there are some channels that allows for deeper keel vessels. Storm surge in advance of a hurricane could increase these depths by pushing waters into these bays. In any case, access could be possible if shallow barges were improperly navigated, or were unsecured, making contact with these causeways. This would make access via the damaged causeway restricted, potentially overwhelming the remaining causeway.

For Pelican Island, the maintained navigational channel between Galveston and Pelican Islands comes to within .15 nautical miles (900') of the causeway, with the waters the remaining distance deep enough to accommodate many deeper keel vessels. Factoring in navigational issues, fog, or failure to recognize the causeways presence, makes this causeway extremely susceptible to contact.

History has demonstrated that causeways can be susceptible to damage and collapses related to collisions by vessels and barges, hazardous material spills, and natural disasters.

- In 2022, Sanibel Causeway (Florida), which is a three-mile causeway that connects the island with the mainland, had portions of the bridge destroyed during Hurricane Ian.
- In 2001, four (4) loaded barges crashed into the Queen Isabella Causeway (Texas Park Road 100), which connects Port Isabel to South Padre Island. The result was two (2) 80-foot spans fell into the water below.
- 2019, the I-10 bridge over the San Jacinto River (Texas) was damaged when nine (9) barges broke free, and two of them.

- 2018, the Courtney Campbell Causeway (Florida) was closed due to the spilling of 150 gallons of a chlorine solution.
- 2002, the Interstate 40 bridge (Arkansas), was struck by barges when the captain lost control. The result was a 580-foot section collapsed.
- 1980, the Sunshine Skyway Bridge (Florida) was struck by a freighter blinded by a severe thunderstorm, when it collided with a support column, causing a 1,200-foot span of the bridge to collapse into the bay.

For Galveston Island, the hazards associated with a causeway being struck by a vessel or barge should continue to be socialized to keep this topic in the spotlight. Consideration may want to be given to request that Texas DOT reduce the causeway speed limits for all trucks hauling hazardous materials across the causeway.

For Pelican Island, every possible navigational aid and lighting option should be utilized to highlight this causeway located at the end of the navigational channel.

4.2.6 Bulkhead Failure

The Port of Galveston wharves are predominantly designed as marginal wharves. A marginal wharf has a bulkhead on the shore side to retain fill above the intersection of the bulkhead line and dredge slope beneath the wharf.

The wharf is constructed on piling over the dredge slope from the bulkhead line to the vessel breasting line. The bulkheads are generally tied into the wharf structure. Many of the Port of Galveston bulkheads are constructed with concrete sheet piling that are not mechanically interlocked. In some areas, large structures or warehouses are constructed at the bulkhead/wharf interface.

Large storm surges may cause excessive forces to be transmitted into the bulkheads through the structures above it. The receding surge waters may cause excessive scouring on the water side of the bulkhead, causing excess stress in the bulkhead. Storm surges will completely saturate the soil behind the bulkhead to the top of the bulkhead. The receding water from the storm surge will exit the water side of the bulkhead much faster than the water that has built up behind the bulkhead. This rapid draw down effect will cause excess water pressure to build up behind the bulkheads that they were not designed to sustain. The result may be a damaged bulkhead and/or loss of fill behind the bulkhead.

The damaged bulkhead and/or loss of fill will cause further damage to pavement or structures above the top of the bulkhead, adversely affecting Port of Galveston operations.

Galveston Wharves authorized a 20-Year Master Plan", which was submitted to the Port in June 2019 as "20 Year Master Plan Draft".

Within the Master Plan:

- Infrastructure Assessment: includes a thorough pier bulkhead health report, including a recommended timeline, budget, and detailed notes.

Figure 4-13 Galveston Wharves 20-Year Master Plan Graphic

4.2.7 Train Derailment

There are two (2) active railway systems that service the Port, Union Pacific (UP) and Burlington Northern Sante Fe (BNSF). Of the three railroad classes (I, II, or III), both are classified as Class I railroads being part of the one of the largest in the railroad networks.

A train derailment is an accident on a railway or tramway in which a rail vehicle, or part or all of a train, leaves the tracks on which it is travelling, with consequent damage and in many cases injury and/or death.

There are several main causes of derailment: broken or misaligned rails, excessive speed, faults in the train and its wheels, and collisions with obstructions on the track. Derailment can also occur as a secondary effect in the aftermath of a collision between two or more trains. Trap points protect main lines from runaway vehicles by deliberately derailing them to bring them to a stop. Flangeless wheels make it easier for a locomotive to negotiate curves but make them more prone to derailment. Rerailing a train after it has derailed is not an easy task and often requires the use of a large rail-mounted crane.

Railroad accidents involving train derailments, equipment failure, or collisions with other trains, pedestrians, or vehicles seem to be more and more frequent and can result in catastrophic injuries, large numbers of deaths, and a tremendous amount of property damage.

The Federal Railroad Administration (FRA), the Pipeline and Hazardous Materials Safety Administration (PHMSA), and the Department of Homeland Security (DHS) oversee the transportation of hazardous material (hazmat) by rail, and work with other local, state, and federal entities to ensure safe train movements, including effective tank car designs.

The current oversight system for rail tank cars is multi-faceted, with federal minimum standards sometimes being exceeded by industry best practices. In this system, the DOT, specifically PHMSA, retains regulatory authority over the safety of rail transportation, including regulations covering product classification, operating rules, and minimum specifications for tank cars. The Texas Department of Emergency Management (PDEM) monitors the movement of hazardous materials. Due to the sensitive nature of this information, information related to this hazardous material will not be part of this report.

Although the Port has not experienced any damaging effects from railroad derailments, the City of Galveston fire department responded to 15 incidents involving train derailments between January 2004 and December 2009.

Table 4-25 Train Derailment Events in Texas (last 10 years)

Date of Incident	Incident Details
8/31/2022	El Paso, Texas – A Union Pacific train crashed into a derailment device that was on the tracks near the Alfalfa railroad yard. Two (2) cars derailed killing a train conductor. One (1) car broke a household gas line, prompting an evacuation of nearby houses.
12/29/2020	Dallas, Texas - Two (2) people were injured after a Dallas Area Rapid Transit northbound orange line train derailed and collided with a southbound red line train downtown.
10/29/2020	Mauriceville, Texas - A 25-car Kansas City Southern freight train derailed. Five (5) tank cars were punctured, with one (1) tank car containing a "corrosive material" that caused the evacuation of those within a mile (1600 m) of the crash site while those within a half mile (800 m) of the evacuation zone were told to stay indoors. No injuries were reported.
1/25/2019	Athens, Texas - A Union Pacific autorack train collided into a school bus, killing a child and injuring another.

8/25/2018	Euless, Texas - An outbound Trinity Railway Express train collided with a dump truck at a railroad crossing, killing two (2) people from inside the truck and injuring eleven (11) others in the train.
5/28/2016	Panhandle, Texas – Two BNSF freight trains collided head-on. Three (3) crew members were killed, and one (1) was injured after jumping from one of the trains. The wrecked locomotives caught fire following impact.
1/14/2015	Odessa, Texas - A Texas Department of Criminal Justice bus carrying twelve (12) inmates and three (3) officers collided with a train, killing ten (10).
10/9/2013	Odessa, Texas – A Union Pacific train hit a stalled tractor trailer carrying pipes, causing the pipes to go flying and 100 US gallons (380 L) of diesel fuel from the locomotive to leak.
11/29/2013	Amarillo, Texas - An empty BNSF intermodal train rear-ended another BNSF train, causing multiple empty intermodal cars to block the adjacent track which derailed a third BNSF train subsequently injuring 4 crew members

While the likelihood of a train derailment occurring at or near the Port is low, the Port has the potential to sustain damage from these types of events. Should a train derailment impact any of the critical facilities identified, there would be significant health and safety concerns.

4.2.8 Utility Failure

Electric power is provided by CenterPoint Energy, which is based in Houston. CenterPoint serves the island via double-circuit 138 kV steel lattice towers that are located within the waters of Galveston Bay, positioned between the Galveston Causeway, and the railroad causeway.

Traditionally, towers foundations located in water can pose significant challenges, such as degraded foundations caused by erosion associated with tide movement, and foundation misalignment, caused by the shifting of the soil at the bay's bottom. In this case though, CenterPoint has foundations with an advanced anchoring system that minimizes the impact of both.

Although a loose or mis piloted barge or vessel can pose a significant hazard to this water-located infrastructure, the causeway designs restrict vessel traffic and therefore protect many of towers. There is a limited hazard if a vessel were able to access and drift loosely between the causeway, or if a surge was significant enough to allow a shallow hull barge to pass over the causeway.

CenterPoint has one (1) substation located at the northwest intersection of Post Office Street, and the Pelican Island Causeway. Immediately at the rear of this substation are two (2) train rails. A train derailment could damage the substation itself, as well as the transmission lines located parallel with the rai line.

Utility failure constitutes a short term or long-term loss of electric power. Many things can cause a loss of power including faults at power stations, damage to transmission lines or distribution systems, or the overloading of electricity mains, known as a short circuit. Utility failure can also be the result of a naturally occurring hazard such as hurricanes or tropical storms, thunderstorms, tornadoes, or severe winter storms.

The most significant utility failure to affect the Port in recent history occurred as a result of Hurricane Ike in September 2008. This event resulted in the largest power outage in Texas history, affecting over 2 million residents for multiple days.

Sporadic utility failures occur throughout the year at the Port. Events of extended duration, usually 8 hours or more, have the potential to significantly disrupt Port operations.

While short term utility failures occasionally occur, impacts are minimal. Longer-term events could present a serious business continuity concern.

4.2.9 Cyber Incidents

In the recently released 2022 Internet Crime Report produced by the FBI's Internet Crime Complaint Center (IC3), the numbers confirm that cyber actors continue to plague Americans by targeting U.S. networks, attacking critical infrastructure, holding our money and data for ransom, facilitating large-scale fraud schemes, and threatening our national security. IC3 received a total of 800,944 reported complaints, with losses exceeding $10.3 billion. Interestingly, while the total number of complaints decreased by 5%, dollar losses increased significantly by 49%. Phishing schemes were the number one crime type with 300,497 complaints and, for the first time, investment schemes reported the highest financial loss to victims. Victims aged 30-39 were the largest reporting group, while the greatest dollar loss was incurred by citizens aged 60 and older.

Among the complaints received in 2022, phishing, personal data breach, and non-payment/non-delivery are the top incidents reported. And while phishing ranked number one, the associated dollar loss of $52 million is small in comparison to investment fraud, which resulted in a $3.3 billion loss— increasing a staggering 127% from the previous year. Within those complaints, cryptocurrency investment fraud rose from $907 million in 2021 to $2.57 billion in 2022, with the most targeted age group reporting this type of scam being 30-49.

In a May 2023 article in the Harvard Business Review, the author stated the following: "Although sophisticated hackers and AI-fueled cyberattacks tend to hijack the headlines, one

thing is clear: The biggest threat is human error, accounting for over 80% of incidents. This, despite the exponential increase in organizational cyber training over the past decade, and heightened awareness and risk mitigation across businesses and industries."\\

Critical Infrastructure (CI) sectors, such as ports, need to prepare for cyber scenarios that could impact their operation, and have proven recovery plans in place to minimize the impact and recover the operation.

CISA has developed Cybersecurity Performance Goals (CPGs) to align to the National Institute of Standards and Technology's (NIST) Cybersecurity Framework (CSF) functions:

1. **Identify**: Develop an organizational understanding to manage cybersecurity risk to systems, assets, data, and capabilities.
2. **Protect:** Develop and implement the appropriate safeguards to ensure delivery of services.
3. **Detect:** Develop and implement the appropriate activities to identify the occurrence of a cybersecurity event.
4. **Respond:** Develop and implement the appropriate activities to act regarding a detected cybersecurity event.
5. **Recover:** Develop and implement the appropriate activities to maintain plans for resilience and to restore any capabilities or services that we impaired due to a cybersecurity event.

The Port should complete these CPGs to determine their ability to Identify, Protect, Detect, Respond, and Recover from the cybersecurity risks that could negatively impact the Ports operations, reputation, and financial security.

4.3 Malevolent Hazards

Malevolent hazards are the intentional actions of a human(s) to harm people, property and/or the environment. There can be many motivations for such acts, but the fact remains that the Port needs to understand these risks, and have plans in place to prepare for, respond to, recover from, and mitigate each of these.

4.3.1 Workplace Violence

The Occupational Safety and Health Administration (OSHA) passed the Occupational Safety and Health Act of 1970 (OSH Act) to prevent workers from being killed or otherwise harmed at work. The law requires employers to provide their employees with working conditions that are free of known dangers. The OSH Act sets and enforces protective workplace safety and health standards. OSHA also provides information, training and assistance to employers and workers.

Workplace violence is any act or threat of physical violence, harassment, intimidation, or other threatening disruptive behavior that occurs at the place of work. It can range from threats and verbal abuse to physical assaults and even homicide. It can affect and involve employees, clients, customers, and visitors. Acts of violence and other injuries is currently the third-leading cause of fatal occupational injuries in the United States. According to the Bureau of Labor Statistics Census of Fatal Occupational Injuries (CFOI), of the 5,333 fatal workplace injuries that occurred in the United States in 2019, 761 were cases of intentional injury by another person.

Many American workers report having been victims of workplace violence each year. Unfortunately, many more cases go unreported. Research has identified factors that may increase the risk of violence for some workers at certain worksites. Such factors include exchanging money with the public and working with volatile, unstable people. Working alone or in isolated areas may also contribute to the potential for violence. Providing services and care, and working where alcohol is served may also impact the likelihood of violence. Additionally, time of day and location of work, such as working late at night or in areas with high crime rates, are also risk factors that should be considered when addressing issues of workplace violence.

Workplace Violence falls into four broad categories, which are:

- Violent acts by criminals who have no other connection with the workplace, but enter to commit robbery or another crime;
- Violence directed at employees by customers, clients, vendors, contractors, or any other for whom an organization provides services;
- Violence against coworkers, supervisors, or managers by a present or former employee;
- Violence committed in the workplace by someone who does not work there, but has a personal relationship with an employee, such as an abusive spouse or domestic partner.

In most workplaces where risk factors can be identified, the risk of assault can be prevented or minimized if employers take appropriate precautions. One of the best protections employers can offer their workers is to establish a zero-tolerance policy toward workplace violence. This policy should cover all workers, patients, clients, visitors, contractors, and anyone else who may encounter company personnel.

By assessing their worksites, employers can identify methods for reducing the likelihood of incidents occurring. OSHA believes that a well-written and implemented workplace violence prevention program, combined with engineering controls, administrative controls and training can reduce the incidence of workplace violence in both the private sector and federal workplaces.

This can be a separate workplace violence prevention program or can be incorporated into a safety and health program, employee handbook, or manual of standard operating procedures.

It is critical to ensure that all workers know the policy and understand that all claims of workplace violence will be investigated and remedied promptly. In addition, OSHA encourages employers to develop additional methods as necessary to protect employees in high-risk industries.

The Port will continue to develop their Workplace Violence program, policies, and training, incorporating recommendations by OSHA and the FBI.
Some industry best practices:

- Adopting a workplace violence policy and prevention program and communicating the policy and program to employees
- Providing regular training in preventive measures for all new/current employees, supervisors, and managers
- Supporting, not punishing, victims of workplace or domestic violence
- Adopting and practicing fair and consistent disciplinary procedures
- Fostering a climate of trust and respect among workers and between employees and management

4.3.2 Active Shooter or Armed Assailant

An active shooter or *armed assailant* incident could occur on or near the Port with little or no warning. This type of incident could involve one or more individuals with a firearm or other dangerous weapon(s), intent on injuring or killing people. Since many of these individual perpetrators perish at their own hands, escaping may not be a factor for them.

In many cases, there is no pattern or method to the selection of victims by an active shooter, and these situations are by their very nature unpredictable and evolve quickly. On the other hand, there are incidents where a particular person(s) is the primary focus of the attack, and others are simply collateral damage, which is any death, injury, or other damage inflicted that is an incidental result of an activity.

Due to active shooter or armed assailant situations often being over within 10 to 15 minutes, before law enforcement can arrive on the scene, individuals must be prepared both mentally and physically to deal with an active shooter or armed assailant situation.

During the HMP process, the concern of an armed assailant/active shooter was raised during most interviews with Port personnel. In particular, two (2) scenarios were mentioned.

The first scenario was an armed assailant entering the Port, disguised as someone about to board a cruise, on a day when three (3) cruise ships were in the Port. In this scenario, the cruise Port visitors could be as many as 30,000 people. If this imposter were to get inside while cruise-

goers were being processed, and opened fire with a firearm, the assault and the ensuing stampede would likely lead to mass casualties and injuries.

The second scenario was an armed assailant taking a perch across the street, in the multi-level Port parking garage. Again, being on a day with 30,000 visitors walking and driving to the port, the noise of a silenced firearm being fired could be drowned out. Concert noise was a contributing factor in the 2017 Las Vegas shooting, where the shooter was able to fire over 1,000 rounds of ammunition. Such an assailant could park a vehicle at the higher levels of the parking garage, position themselves inside a van, or lay down in the back of a covered truck bed, and selectively open fire at those visitors lined up or waiting outside the Port terminals. This covert method was used in 2002 by the "D.C. Sniper", who fired at people through a hole cut into the rear of his 1990 Chevrolet Caprice, which allowed him to remain hidden and escape the scene following his attacks.

For the imposter scenario above, the hazards exist for the areas of the Port outside of the metal detectors that cruise visitors have to walk through, since this is the point where technology would likely alert security to a firearm. The Cybersecurity & Infrastructure Agency (CISA), a federal agency, has developed an extensive series of materials to assist businesses, government offices, schools, and communities in preparing for and responding to an active shooter incident. Training personnel on this information is critical in being prepared for such an occurrence.

For the parking garage scenario, a combination decorative hurricane-resistant facades (panels or screens), and large evergreen trees, could obstruct the line of sight for a shooter. The panels and screens could be strategically installed on the exterior to the parking garage floors that offer a line of sight, while the large evergreen trees could be planted near the terminal to obscure the shooter's view.

CPTED principles would need to be considered during any façade design to ensure that the solution to this issue does not create another problem related to the ability to observe potential criminal activities through having an open design.

4.3.3 Civil Unrest

Any number of issues may cause civil disorder, whether it is a single cause or a combination of causes. The catalyst of these incidents can be political grievances, anti-government beliefs, perceived inequalities, social discord, and/or economic disparities.

Civil unrest protests arise from political grievances can include a range of events, from a simple protest to a mass civil disobedience. These events can be spontaneous, but as of late, they are being planned. Recent events have turned violent when agitators and law enforcers have engaged with the protesters.

4.3.4 Terrorism

Terrorism is defined in the CFR as "the unlawful use of force and violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives." A major terrorism incident is rarely predictable in any given circumstance, but given the Port's vulnerability to the hazard, it will be evaluated in this plan. The Port is inherently vulnerable because of the geographic location and characteristics that make it accessible by land or sea, and close to areas of high populations. The ships that travel through the Port are also vulnerable because of the predictable, preplanned routes that they take and the nature of the vessel that will not allow them to maneuver away from possible attacks. Since so many factors and suppliers are involved in normal Port operations, terrorists may be able to find ways around security measures for their attacks. A successful attack on a vessel near or in the Port could have substantial and significant public safety and environmental concerns, as well as disastrous economic impact.

Terrorist incidents in this country prior to the September 11, 2001, attacks have included bombings of the World Trade Center (1993) in New York City, the U.S. Capitol Building in Washington, D.C., Mobil Oil corporate headquarters in New York City, and the 1995 bombing of the Murrah Federal Building in Oklahoma City. Terrorist incidents outside of the U.S prior to September 11 include the USS Cole attack on October 12, 2000, on a Navy Destroyer stationed in Yemen. In the U.S., most terrorist incidents have involved small extremist groups using terrorism to further a designated objective or obtain publicity for a cause. Bombings have been the most frequent method of attack in the U.S. Other possibilities include attacks against transportation facilities, utilities, or other public services, or an incident involving chemical or biological materials.

The primary objectives of most terrorist groups are to:

- Gain publicity
- Stimulate loss of confidence in the government
- Attract recruits
- Get public support
- Gain support from financial institutions
- Weaken and overthrow the government

Techniques used to gain an audience for their platform include hostage-taking, product-tampering, criminal extortion, arson, sabotage, threats against individual family members, assassinations, kidnapping, explosive bombings, and armed attacks. The most likely targets of these forms of terrorism are political leaders, key military personnel, foreign missions, military

facilities, corporate executives and facilities, and celebrities. Terrorist attacks can take a wide variety of forms, ranging from a verbal threat to sabotage to biological weapons to a bomb.

The most frequently used terrorist methods in the U.S. include, but are not limited to:

Bombs, guns, and explosives—these are the "traditional" weapons used by terrorists worldwide. Typically, these weapons are less technical and resource demanding.

Biological weapons—these weapons use infectious microbes or toxins to produce illness or death in people, animals, or plants. Potential biological weapons include anthrax, botulism, smallpox, viral hemorrhagic fevers, water safety threats (e.g., cholera), and food safety threats (e.g., salmonella). Biological weapons are relatively difficult to cultivate and disseminate.

Chemical weapons—chemical weapons cause severe health reactions designed to incapacitate or cause death. There is a wide array of potential chemical agents that could be used as weapons. These agents vary in effects on the body, required dose, exposure mechanism, length of exposure, toxicity, origination, and form (e.g., liquid, gas). Examples of chemical agents include sarin, mustard agent, VX, and cyanide. Stockpiles of many of these agents are held at the Umatilla Chemical Depot, pending destruction.

Radiological and nuclear weapons—although there has been much speculation by media and various governmental agencies regarding the potential for a terrorist to obtain fissionable material or a nuclear bomb, there are no known unclassified cases of any such organization or group actually obtaining weapons grade material. Constructing a nuclear bomb would be relatively difficult and require special resources, training, and materials.

Port-specific attack—terrorist attacks that are most likely to affect the Port include attacks on the supply chain of cargo, which include suicide attacks, such as explosive- laden vessels, "standoff attacks" with long-range weapons, and armed assaults from a tanker. Vessels carrying highly combustible materials and causing fire or explosion pose the highest threat to public safety.

Terrorism incidents have occurred in the United States but not in the Port. A terrorism incident occurring at the Port would be a significant local incident, cause public safety and security concerns, and would also bear national implications.

5 VULNERABILITY ASSESSMENT AND LOSS ESTIMATION

The hazards that present the greatest risk to the Port's staff, assets, and operations are flood (primarily storm surge) and hurricane winds. This section addresses potential losses related to these two significant hazards. The most significant hazard to which the Port is exposed is storm surge, although wind could also cause significant losses.

The Port is located on the north side of Galveston Island (and includes Pelican Island). This offers some protection from the direct effects of wind and water from the Gulf of Mexico, but the island is very flat, at a low elevation, and quite narrow in its reach from the Gulf to the channel between Pelican Island and Galveston Island. The Port is also near Galveston Bay at both ends of the channel. The Port owns and operates a variety of buildings and infrastructure on the Galveston Island side and owns and/or leases many more facilities on the Galveston Island and Pelican Island sides. Buildings are generally engineered industrial facilities while the infrastructure is a range of assets typical of ports, including piers/docks, utilities, roads, bulkheads, and cranes.

There is always a wide range of material on site, and goods being on- or off-loaded onto ships. These goods, which are owned and managed by tenants of the port range from heavy equipment to fruits and vegetables. The potential vulnerability and the value of these goods vary markedly over the year, depending on the season and whatever assets happen to be on-site waiting for shipping or off-loading. In addition to its function as a shipping operation, the Port is also a cruise terminal, and this source provides a significant percentage of the Port's annual revenue. It is important to note that for the purposes of this plan, tenants are responsible for mitigating the risk to their operations and goods. The Port maintains responsibility for the structures and infrastructure it owns and operates.

A list of Port assets including location, value, construction features, age, size, and lease status is provided in Section 9: Appendix B – 2024 Statement of Value.

The following tables summarize various measures of Port operations from 2018 to 2022. Note that total operating revenue has fluctuated, due largely to COVID-related travel restrictions and fears.

Table 5-1 Summary of Port of Galveston Operations, Fiscal Years 2018 to 2022

Fiscal Year	2022	2020	2020	2019	2018
Total Operating Revenue	$52,911,432	$31,172,106	$27,358,135	$51,474,109	$43,514,516

Table 5-2 Port of Galveston Vessel Traffic

Fiscal Year	2022	2021	2020	2019	2018
Cargo ships	283	347	283	349	324
Cruise ships	234	124	69	297	268
Lay Ships	318	472	461	377	248
Ship Calls – Total	**835**	**943**	**813**	**1,023**	**840**

Table 5-3 Vessel Cargo Categories (in short tons)

Fiscal Year	2022	2021	2020	2019	2018
Wind Turbines / Blades	53,055	190.397	126,883	163,725	N/A
Fertilizer	229,295	390,868	273,569	540.096	603,701
Fruit	559,084	594,012	606,624	568,860	247,987
General cargo	22,688	22,387	59,661	2,601	7,847
Grains	729,203	1,246,542	1,473,271	647,328	839,395
Liquid	1,965,982	1,989,260	1,393,261	1,574,339	1,541,103
Ro-ro cargo	438,091	387,295	314,790	495,027	218,971
Total Cargo (in short tons)	**4,018,996**	**4,846,320**	**4,267,622**	**4,017,838**	**4,103,390**

5.1 Underserved Communities / Socially Vulnerable Populations

The Port of Galveston recognizes the need for HMPs, when applicable, to address underserved communities and socially vulnerable populations. The port is a special district with no residential populations; however, the HMPT recognizes that as a major cruise ship port, a large population of transient vacationers may be present in the Port at any given time. This population is expected to have various levels of self sufficiency, mobility, and preparedness, and for the purposes of hazard mitigation planning will be considered a socially vulnerable population. The Port requires all tenants, including cruise ship companies, to maintain and keep on file safety plans addressing the endemic hazards to their operations, and cruise ship companies are expected to maintain contingency plans for managing passengers and guests during times of disaster.

5.2 Hazard Exposure

One basic measure of vulnerability is the total exposure of assets (i.e., the value of all assets). According to Port's Statement of Value, the current total value of these assets is $335,863,206.

Section 9: Appendix B – Statement of Value details 73 listed assets, ranging from small infrastructure elements such as security cameras to major assets such as the cruise terminals and piers. The highest value asset is Cruise Terminals 1 and 2, which houses the emergency operations center (EOC), followed by Piers 10, 16–18, and 23–26.

Although exposure is a useful metric for insurance purposes, it is useful in a vulnerability assessment only when it can be combined with specific measures of potential damage, known as damage functions. These functions indicate the level of expected damage when assets are exposed to the stresses of natural hazards, such as high winds, hail, or storm surge. There are a range of established damage functions for standard asset classes such as residential structures and typical office buildings. The Port, however, has many, varied assets for which there are no established damage functions due to their unusual nature (e.g., structural characteristics, use, and deterioration over time), which can significantly affect potential damage when an asset is exposed to a hazard. For that reason, the damage estimates are associated with total asset value and measured against the assigned vulnerability to the hazard. Since port assets are vulnerable to all profiled hazards except Navigational Channels (which is only vulnerable in the waterways), the damage estimates can assume a percentage of damage across all assets.

5.3 Risk and Vulnerability by Hazard

Assessments of vulnerability and risk are required by FEMA as an indication of potential future damages. The Hazard Mitigation Planning Team (HMPT) conducted a risk assessment exercise to determine the vulnerabilities to assets using hazard profiles as the basis to determine the vulnerability of and risk to port assets.

All profiled hazards received a qualitative risk assessment. The risk assessment in this section describes and analyzes the vulnerabilities and risks to the port from the profiled hazards in the plan. The assessment includes the identified risk to people, buildings, infrastructure, and service delivery.

Prioritizing the potential impacts of hazards on the port was based on a qualitative analysis of the identified hazards. The HMPT used historical data, local knowledge and experience to rate the exposure, probability and impact of each of these hazards. The anticipated impact of the hazards was then assigned a value of Low, Moderate, or High. The table below describes the definitions assigned to these terms.

Table 5-4 Definitions of Risk Assessment Terminology for Qualitative Risk Assessment

Definitions of Risk Assessment Impact Terminology for Qualitative Risk Assessment				
Term	**Potential Impact to People (Life Safety/Livelihood)**	**Potential Impact to Buildings/Critical Facilities**	**Potential Impact to Infrastructure**	**Potential Impact to Service Delivery**
Low	Some injuries possible, but significant injuries unlikely	Cosmetic damages to structures; <1 day Loss of Function	Some systems temporarily down; restoration in <1 day	Services / operations suspended or interrupted; <1 day loss of function
Moderate	Injuries expected (some significant); some fatalities possible	Some structural damages; 1-2 days Loss of Function	System failures / utility loss; restoration in 2-3 days	Services / operations temporarily unavailable; 2-3 day loss of function
High	Several fatalities expected	Some structures significantly damaged; 3+ days Loss of Function	Long-term system damage / utility loss; restoration 3+ days	Cancellation of services / operations until repairs are made; 4+ day loss of function

These ratings were assigned and used to determine the ranking of the hazards, the port's risk of exposure to the hazard, the probability of the hazard occurring, and the potential impact of that hazard to the port. This data is shown in Table 5-5. Table 5-6 shows the hazards ranked by hazard category and risk.

Table 5-5 Qualitative Risk Assessment Ranking by Hazard

Qualitative Risk Assessment Ranking, by Hazard				
Hazard	**Impact to People (Life Safety /Livelihood)**	**Impact to Buildings /Critical Facilities**	**Impact to Infrastructure**	**Impact to Service Delivery**
Natural Hazards				
Coastal Erosion and Land Subsidence	Low	Moderate	Moderate	Low
Cold Wave	Low	Low	Low	Low

Drought	Low	Low	Low	Low
Flooding	Low	High	Moderate	Moderate
Fog	Low	Low	Low	Low
Heat Wave	Low	Low	Low	Low
Hurricanes/ Tropical Storms	Low	High	High	High
Lightning	Moderate	Moderate	Low	Low
Navigational Channels	Low	Low	Moderate	Moderate
Pandemic	Low	Low	Low	Low
Thunderstorms	Low	Low	Low	Low
Tornadoes	Moderate	High	Moderate	Low
Winter Storms	Low	Low	Low	Moderate
Technical and Human-Caused Hazards and Malevolent Hazards				
Cyber Incidents	Low	Low	Low	Moderate
Bulkhead Failure	Low	Moderate	Moderate	Moderate
Fire/Explosion	Moderate	High	Low	Low
Hazardous Materials	Moderate	Low	Low	Low
Island Egress/Ingress	Low	Low	Low	Low
Train Derailment	Low	Low	Moderate	Moderate
Utility Failure	Low	Low	Low	Low
Vessel Hazards	Moderate	Low	Low	Moderate
Vessel Support Services	Low	Low	Low	Low
Workplace Violence	High	Low	Low	Low
Active Shooter and Armed Assailant	High	Low	Low	Low
Civil Unrest	Low	Low	Low	Low
Terrorism	High	High	Moderate	High

Table 5-6 Qualitative Risk Assessment by Ranking by Risk Determination

Qualitative Risk Assessment Ranking, by Risk Determination				
Hazard	**Impact to People (Life Safety /Livelihood)**	**Impact to Buildings /Critical Facilities**	**Impact to Infrastructure**	**Impact to Service Delivery**
Natural Hazards				
Hurricanes/ Tropical Storms	Low	High	High	High
Flooding	Low	High	Moderate	Moderate
Tornadoes	Moderate	High	Moderate	Low
Coastal Erosion and Land Subsidence	Low	Moderate	Moderate	Low
Lightning	Moderate	Moderate	Low	Low
Navigational Channels	Low	Low	Moderate	Moderate
Winter Storms	Low	Low	Low	Moderate
Pandemic	Low	Low	Low	Low
Thunderstorms	Low	Low	Low	Low
Cold Wave	Low	Low	Low	Low
Drought	Low	Low	Low	Low
Fog	Low	Low	Low	Low
Heat Wave	Low	Low	Low	Low
Technical and Human-Caused Hazards and Malevolent Hazards				
Bulkhead Failure	Low	Moderate	Moderate	Moderate
Fire/Explosion	Moderate	High	Low	Low
Train Derailment	Low	Low	Moderate	Moderate
Vessel Hazards	Moderate	Low	Low	Moderate
Workplace Violence	High	Low	Low	Low
Cyber Incidents	Low	Low	Low	Moderate

Hazardous Materials	Moderate	Low	Low	Low
Island Egress/Ingress	Low	Low	Low	Low
Utility Failure	Low	Low	Low	Low
Vessel Support Services	Low	Low	Low	Low
Terrorism	High	High	Moderate	High
Active Shooter and Armed Assailant	High	Low	Low	Low
Civil Unrest	Low	Low	Low	Low

Hazard rankings range from Very High to Very Low on a scale of 1-5:

- 5: Very High
- 4: High
- 3: Moderate
- 2: Low
- 1: Very Low

These rankings are provided in detail in Section 4: Vulnerability Analysis. Vulnerability rankings range from High to Low as provided in the tables above. Loss estimates are provided as a damage function and determined by the vulnerability ranking with a percentage of overall damages to port assets factored as follows:

- High – 20% value of assets
- Moderate – 10% value of assets
- Low – 5% value of assets

Overall risk is the average of the hazard ranking, vulnerability ranking, and loss estimate that weights the vulnerability.

The risk assessment for natural hazards is provided below.

Table 5-7 Natural Hazards Risk Assessment

Hurricanes/Tropical Storms	
Hazard Ranking	High
Vulnerability Ranking	High
Loss Estimate	High (20%) - $67.2 M
Overall Risk	High
Assets and Property at Risk	All

Flooding	
Hazard Ranking	High
Vulnerability Ranking	Moderate
Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	Moderate
Assets and Property at Risk	All
Tornadoes	
Hazard Ranking	Moderate
Vulnerability Ranking	Moderate
Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	Moderate
Assets and Property at Risk	All
Lightning	
Hazard Ranking	Very High
Vulnerability Ranking	Moderate
Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	High
Assets and Property at Risk	All
Navigational Channels	
Hazard Ranking	High
Vulnerability Ranking	Moderate
Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	Moderate
Assets and Property at Risk	Channels Only
Winter Storms	
Hazard Ranking	Very Low
Vulnerability Ranking	Low
Loss Estimate	Low (5%) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All
Pandemic	
Hazard Ranking	High
Vulnerability Ranking	Low
Loss Estimate	Low (5%) – $16.8 M

Overall Risk	Low
Assets and Property at Risk	All
Thunderstorms	
Hazard Ranking	High
Vulnerability Ranking	Low
Loss Estimate	Low (5%) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All
Coastal Erosion/Land Subsidence	
Hazard Ranking	Moderate
Vulnerability Ranking	Moderate
Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	Moderate
Assets and Property at Risk	All
Cold Wave	
Hazard Ranking	Moderate
Vulnerability Ranking	Low
Loss Estimate	Low (5%) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All
Drought	
Hazard Ranking	Low
Vulnerability Ranking	Low
Loss Estimate	Low (5%) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All
Fog	
Hazard Ranking	Low
Vulnerability Ranking	Low
Loss Estimate	Low (5%) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All
Heat Wave	
Hazard Ranking	Moderate

Vulnerability Ranking	Low
Loss Estimate	Low (5%) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All

The risk assessment for human caused/technical hazards and malevolent hazards is provided below.

Table 5-8 Human Caused/Technical and Malevolent Hazards Risk Assessment

Bulkhead Failures	
Hazard Ranking	Low
Vulnerability Ranking	Moderate
Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	Moderate
Assets and Property at Risk	All
Fire/Explosives	
Hazard Ranking	Moderate
Vulnerability Ranking	Moderate
Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	Moderate
Assets and Property at Risk	All
Train Derailment	
Hazard Ranking	Very Low
Vulnerability Ranking	Moderate
Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	Moderate
Assets and Property at Risk	All
Vessel Hazards	
Hazard Ranking	Low
Vulnerability Ranking	Moderate
Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	Moderate
Assets and Property at Risk	All
Workplace Violence	
Hazard Ranking	High
Vulnerability Ranking	Moderate

Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	Moderate
Assets and Property at Risk	All
Cyber Incidents	
Hazard Ranking	Very Low
Vulnerability Ranking	Low
Loss Estimate	Low (5$) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All
Hazardous Materials	
Hazard Ranking	Low
Vulnerability Ranking	Low
Loss Estimate	Low (5$) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All
Island Egress/Ingress	
Hazard Ranking	Low
Vulnerability Ranking	Low
Loss Estimate	Low (5$) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All
Utility Failures	
Hazard Ranking	Very Low
Vulnerability Ranking	Low
Loss Estimate	Low (5$) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All
Vessel Support Services	
Hazard Ranking	Low
Vulnerability Ranking	Low
Loss Estimate	Low (5$) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All

Terrorism	
Hazard Ranking	High
Vulnerability Ranking	High
Loss Estimate	High (20%) - $67.2 M
Overall Risk	High
Assets and Property at Risk	All
Active Shooter and Armed Intruder	
Hazard Ranking	High
Vulnerability Ranking	Moderate
Loss Estimate	Moderate (10%) – $33.6 M
Overall Risk	Moderate
Assets and Property at Risk	All
Civil Unrest	
Hazard Ranking	Moderate
Vulnerability Ranking	Low
Loss Estimate	Low (5$) – $16.8 M
Overall Risk	Low
Assets and Property at Risk	All

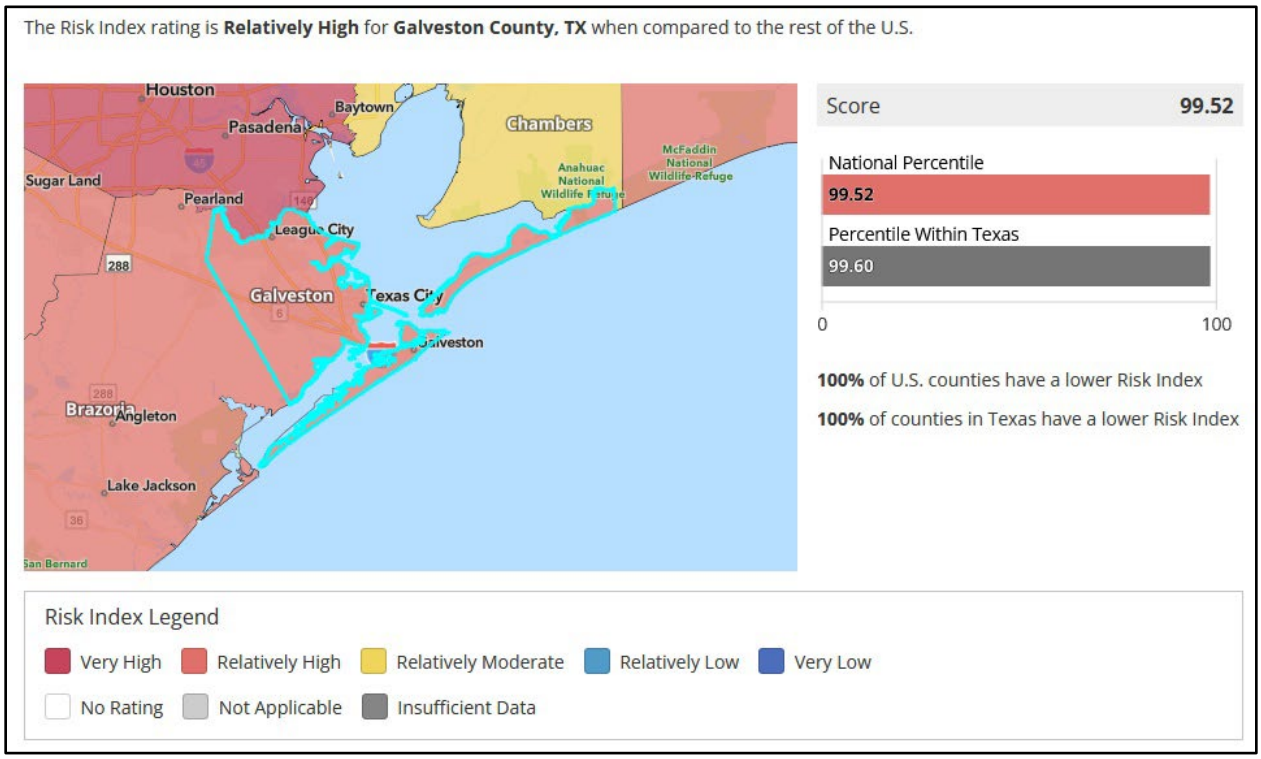
5.4 Risk Index

This section describes the risks to the Port, including its staff, physical plants, and operations. The hazards include flooding and storm surge, hurricane winds, and tornadoes. As noted above, risk is an expression of expected future monetary losses that result from the impacts of natural hazards.

Southeast Texas is particularly susceptible to hurricanes and tropical storms from the Gulf of Mexico, and these are the source of potential damages from flooding and storm surge and high winds. The Galveston area has endured numerous storms since records have been kept. Hurricane and tropical storm probability is fairly well understood, at least in a broad sense, so it is possible to estimate the probabilities of various wind intensities and surge levels.

Galveston County, Texas has a relatively high-risk index when compared to the rest of the United States.

Figure 5-1 Risk Index



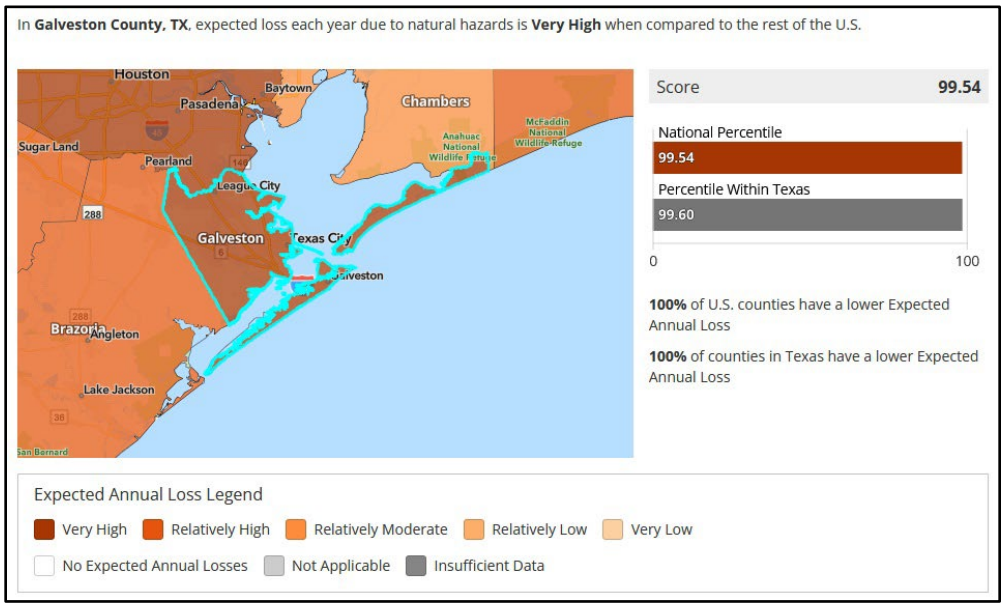
For the Port of Galveston, and Galveston County Texas, of particular concern are the following Hazards, which have a relatively high-risk index rating. These include:

- Heat wave
- Hurricane
- Lightning
- Tornado
- Winter Storms

5.5 Expected Annual Loss

Galveston County, TX, has a very high probability of expected loss due to natural hazards when compared to the rest of the United States. The Port of Galveston is included in this risk assessment.

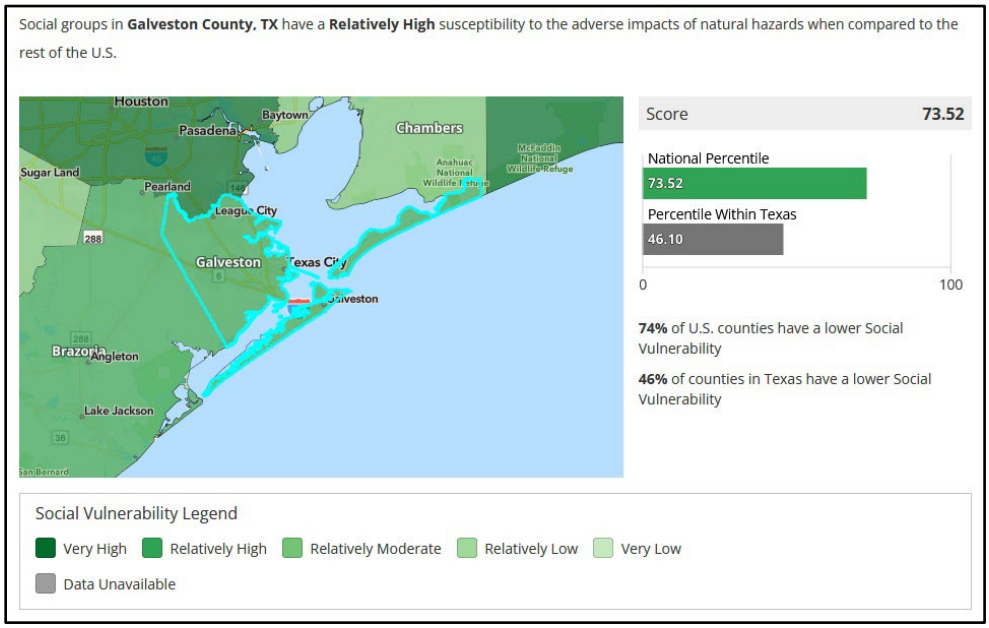
Figure 5-2 Expected Annual Losses



5.6 Social Vulnerability

Galveston County, Texas, including the Port of Galveston is susceptible to the adverse impacts of natural hazards for social groups and this poses a relatively high risk for social vulnerability.

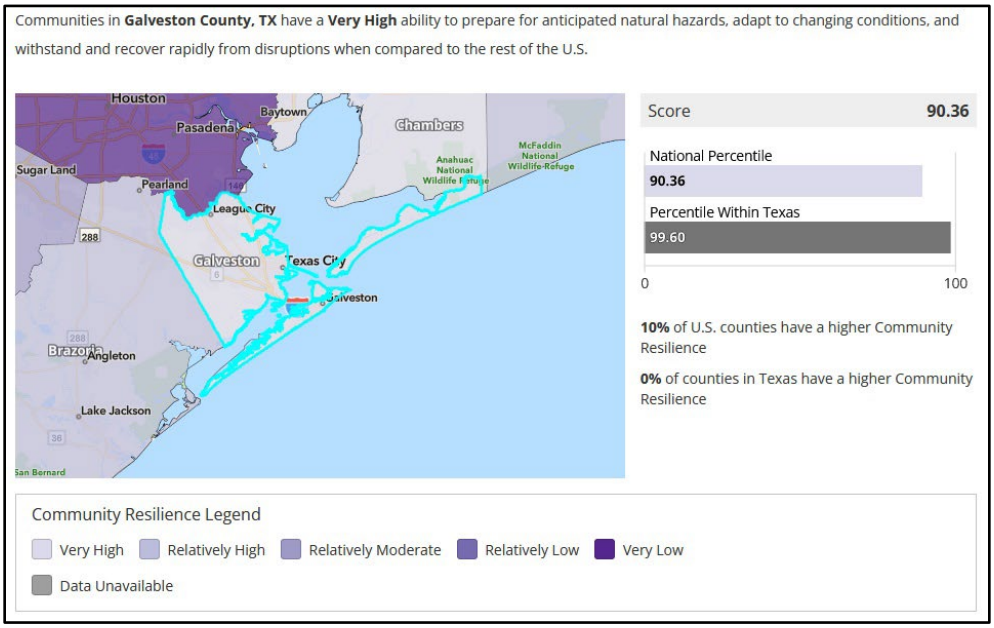
Figure 5-3 Social Vulnerability



5.7 Community Resilience

Galveston County, Texas, including the Port of Galveston have the very high ability to prepare for anticipated natural hazards, adapt the conditions that change and recover quickly from any disruptions that may occur because of a natural hazard.

Figure 5-4 Community Resilience



The risks above were identified and illustrated utilizing the National Risk Index to show the 18 natural hazards most at risk for communities in the United States, including Galveston County Texas and the Port of Galveston.

6 MITIGATION STRATEGIES

6.1 Mitigation Goals

The mitigation goals represent what the Port seeks to achieve through mitigation planning and implementation. The goals are general in nature and provide a framework for identification and development of more detailed objectives and mitigation actions. The foundation of this plan is the identification of strategies through which the Port can implement natural, technological and malevolent hazard mitigation goals, objectives, and actions. The Port's hazard mitigation planning team (HMPT) has a clear understanding of the Port's hazards and risks. The next step is to develop mitigation strategies to go along with the hazard vulnerability assessment. The HMPT developed the following goals for the HMP:

- **GOAL 1:** Maximize use of all resources by promoting interagency and interdepartmental coordination and partnerships in the public and private sectors.
- **GOAL 2:** Harden the Port against the effects of disasters through the development of mitigation strategies, updated and exercised response plans, and strict enforcement of current regulations that have proven effective.
- **GOAL 3:** Reduce repetitive damage, loss of life, and loss of property caused by disasters.

6.2 Mitigation Priorities

The hazard mitigation goals, objectives, and actions discussed in this section have been prioritized by the HMPT for each hazard. The methodology used to determine the priority of projects was based on repetition of the event, monetary loss, anticipated costs, and the potential for loss of life.

- Priority 1 (High) - Funding, design and permitting should begin in the next 12 months, and construction completed within the next 24 months.
- Priority 2 (Medium) - Funding, design and permitting should begin in the next 24 months, and construction completed within the next 36 months.
- Priority 3 (Low) - Funding, design and permitting should begin in the next 36 months, and construction completed within the next 60 months.

For each of the hazards identified, the HMPT has outlined goals and objectives as part of the mitigation strategy.

The FEMA Limited Data Module for Benefit-Cost Analysis was used to calculate project benefits and costs for proposed hazard mitigation projects based on two or more historic damage events. The main advantage of the Limited Data Module for Benefit-Cost Analysis is its flexibility, which makes it useful for a wide range of hazards and mitigation projects. Unlike

FEMA's Full Data Modules for flood, wind, and earthquake, the Limited Data Module for Benefit-Cost Analysis does not require specific hazard and building site data. For each of the hazards identified, the HMPT has outlined goals and objectives as part of the mitigation strategy.

For brevity in the table below, the HMPT has indicated "all" for actions that could benefit the port's resilience to every hazard it identified as affecting the port in Table 4-1 of this plan.

Actions listing "weather" in the Hazards Addressed column, addresses actions that can effectively mitigate damage from any weather-based phenomenon discussed in detail in the plan:

- Hurricane/Tropical Storm
- Heat Wave
- Fog
- Tornadoes
- Cold Wave
- High Wind/Thunderstorm
- Lightning
- Winter storm

6.3 Mitigation Actions

A mitigation action is a specific action, project, activity, or process taken to reduce or eliminate long-term risk to people and property from hazards and their impacts. Implementation of mitigation actions helps achieve the Port's mitigation goals and reduce vulnerability to threats and hazards identified in the plan. Mitigation plan regulations require the Port to identify and analyze a comprehensive range of specific mitigation actions and projects to reduce the impacts identified in the Port's risk assessment. All actions listed are under the Port's sole jurisdiction.

The HMPT reviewed existing mitigation actions to determine which ones have been completed and which are still viable projects. They also reviewed the vulnerability analyses and asset data to identify new actions for the mitigation strategy. Existing actions that were identified for continuation are provided in italicized text in Table 6-1; existing actions that were completed or otherwise removed from mitigation strategy are provided in Table 6-2.

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Table 6-1 Current Mitigation Actions

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Conduct workshop(s) for all Port employees for the purpose of educating them on this Hazard Mitigation Plan, and relevant Port plans.	All	1, 2, 3	Administration	$5,000	$50,000	Internal budget, Grants (BRIC, HMGP, SHSP, PSGP)	New and existing	High
Conduct an Armed Assailant / Trespasser exercise, coupled with site-specific evacuation drills. Includes pre-exercise training session and post-exercise hotwash.	All	1, 2	Engineering, construction and maintenance, administration, operations	$30,000	$300,000	Internal budget, Grants (BRIC, HMGP, SHSP, PSGP)	New and existing	High (Annually)

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Conduct a Hurricane-scenario tabletop exercise, embedded with a human-caused component. Includes pre-exercise training session and post-exercise hotwash.	All	1, 2	Engineering, construction and maintenance, administration, operations	$30,000	$300,000	Internal budget, Grants (BRIC, HMGP, SHSP, PSGP)	New and existing	High (Annually)
Develop a Training Matrix for all key Incident Management positions to take a combination of FEMA Independent Study (IS) online courses, which are free. (i.e., IS-100, IS-200, IS-700, and IS-800).	All	1, 2	Administration	$8,000	$80,000	Internal budget	New and existing	High

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Conduct a full-scale exercise related to the highest risk the Port has at the time. Includes pre-exercise training session and post-exercise hotwash.	All	1, 2	Port, tenants, partners	$50,000	$500,000	Internal budget, Grants (BRIC, HMGP, SHSP, PSGP)	New and existing	Medium
Update and maintain the Incident Management Team structure to ensure all key staff know their roles and responsibilities.	All	1, 2, 3	Administration	$5,000	$50,000	Internal budget	New and existing	Medium (Annually)

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Develop a disaster recovery plan to ensure minimal disruption from hurricanes/tropical storms, floods, thunderstorms, tornadoes, coastal erosion and land subsidence, drought, lightning, earthquakes, and winter storms, with separate annexes to address security, operations, finance, and administration.	*All*	*1, 2, 3*	*All Port Departments*	*$130,000*	*$5M*	*Internal budgets, Grants (BRIC, HMGP, SHSP, PSGP)*	*New and existing*	*Medium*

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Develop and implement a public awareness campaign pertaining to flood impacts and recommendations for personal, family and business preparedness best practices.	*Flooding*	*1, 2*	*Port administration, Port public relations, City emergency management*	*$5,000*	*$75,000*	*HMGP, internal maintenance budget*	*New and existing*	*High*
Purchase and install breakaway doors at piers 15, 37, and 27; cruise terminals 1 and 2; and plant 14.	*Flooding*	*2, 3*	*Engineering, construction and maintenance, administration, operations*	*$1M*	*$5M*	*Internal maintenance budget, Hazard Mitigation Grant Program (HMGP)*	*Existing*	*Medium*
Install impact ready glass on cruise terminals 1 and 2,	Hurricane/Tropical Storm	2, 3	Engineering, construction and maintenance, administration, operations	$150,000	$5M	HMGP	Existing	High

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Install hurricane proof windows on new construction.	*Hurricane/ Tropical Storm*	*2, 3*	*Engineering, construction and maintenance, administration, operations*	*$1M*	*$5M*	*HMGP*	*New*	*Medium*
Continue project to bring flat roofs on plants 12 and 14, cruise terminal 1, and the pier 15 warehouse up to code.	Tornado	2, 3	Engineering, construction and maintenance, administration, operations	$40,000	$2M	Internal maintenance budget, HMGP	Existing	High
Construction of FEMA-compliant Community Safe Rooms for Tornados and Hurricanes. Refer to FEMA-361, April 2021 (Fourth Edition)	Tornado	1, 2, 3	Engineering, construction and maintenance, administration, operations	$3.0M per Safe Room	FEMA estimates value of a statistical life at $7.5 million.	FEMA Hazard Mitigation Grant Program (HMGP)	Existing	Medium

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Continue to replace older water system as construction or remodeling occurs, which are less likely to crack.	Drought	2, 3	Port administration, Port engineering, Port police	$10,000	$50,000	Port internal maintenance budget, HMGP	New and existing	High
Continue to mitigate and implement water conservations efforts before, during, and after times of drought	*Drought*	*2, 3*	*Port administration, City public works, Port engineering*	*$2,500*	*$50,000*	*City internal maintenance budget, Port internal maintenance budget, HMGP*	*New and existing*	*Medium*
Continue to install new bollards at piers , as funding allows and 37 (approximately 14 bollards every 600 feet). Piers 10, 25, 39 and 40 completed.	*Weather*	*2, 3*	*Engineering, construction and maintenance, administration, operations*	*$1M*	*$5M*	*Internal maintenance budget, HMGP*	*New and existing*	*High*

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Install new compression fender panels at pier 10.	*Weather*	*2, 3*	*Engineering, construction and maintenance, administration, operations*	*$50,000*	*$250,000*	*Internal maintenance budget, HMGP*	*New and existing*	*Medium*
Ensure that mobile fire suppression equipment is available via mutual aid with the city.	Vessel Fire/ Sinking	1, 2, 3	Administration, operations	$100,000	$1M	Internal maintenance budget, HMGP	New and existing	High
Implement training program for mobile fire suppression equipment via a mutual aid training agreement with the city.	Vessel Fire/ Sinking	1, 2, 3	Administration, operations	$50,000	$1M	Internal maintenance budget, HMGP	New and existing	Medium

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Ensure that a mutual aid agreement is in place with the City of Houston for two (2) Fire Boats when needed.	Vessel Fire/ Sinking	1, 2, 3	Administration, operations	Pay if utilized	$500,000	Internal maintenance budget, HMGP	New and existing	High
Develop a rogue vessel and sinking response plan if sunken in slip.	*Vessel Fire/ Sinking*	*1, 2*	*Engineering, construction and maintenance, administration, operations*	*$150,000*	*$1M*	*Internal maintenance budget, HMGP*	*New and existing*	*Medium*
Enter into pre-positioned contracts for vessel salvage.	*Vessel Fire/ Sinking*	*1, 2, 3*	*Administration, operations*	*$25,000*	*$1M*	*Internal maintenance budget, HMGP*	*New and existing*	*High*
Ensure that a mutual aid agreement is in place with the city, TNT Marine, and GH Towing, for marine response.	Vessel Fire/ Sinking	1, 2, 3	Administration, operations	Pay if utilized	$500,000	Internal maintenance budget, HMGP	New and existing	High

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Implement a formal maintenance and inspection schedule based on condition and age.	Bulkhead Failure	2, 3	Engineering, construction and maintenance, administration, operations	$2,000	$20,000	Internal maintenance budget, HMGP	New and existing	High
Enter pre-positioned contract for diving services with remote camera capability for surveying condition of the bulkhead and pilings.	*Bulkhead Failure*	*1, 2, 3*	*Engineering, construction and maintenance, administration, operations*	*$50,000*	*$5M*	*Internal maintenance budget, HMGP*	*New and existing*	*Medium*
Utilize Blue Ray Simulation Data to perform studies on the feasibility of mitigating stagnant silt.	*Erosion*	*2, 3*	*Engineering, administration, operations*	*$150,000*	*$2M*	*Internal maintenance budget, HMGP*	*New and existing*	*Medium*

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Continue to conduct annual ground-penetrating radar studies throughout the Port.	*Erosion*	*2, 3*	*Engineering, administration, operations*	*$100,000*	*$5M*	*Internal maintenance budget, HMGP*	*New and existing*	*High*
Continue to identify areas where flowable fill may be used to address voids identified through ground-penetrating radar.	*Erosion*	*2, 3*	*Engineering, administration, operations*	*$30,000*	*$5M*	*Internal maintenance budget, HMGP*	*New and existing*	*Medium*
Install bulkhead at piers 29-30 (Pelican Island) to hold back eroding materials (approximately 3,300 linear feet). Must address historical issues.	*Erosion*	*2, 3*	*Engineering, construction and maintenance, administration, operations*	*$82.5M*	*$82.5M*	*Internal maintenance budget, HMGP*	*Existing*	*Med-Low*

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Purchase additional warning signage, including signage needed for the new LNG assets.	Hazardous Materials	2, 3	Administration, operations	$50,000	$1M	Internal maintenance budget, HMGP	New and existing	High
For Dock 37, for LNG storage, identify and install an additional alert system for emergencies. U.S. Coast Guard has accepted silent flashing beacons with an audible signal.	*Hazardous Materials*	*2, 3*	*Administration, police, and construction and maintenance*	*$50,000*	*$1M*	*Internal maintenance budget, HMGP*	*New and existing*	*High*
Evaluate the expansion of infrared security cameras, and if warranted, procure and install infrared security cameras.	*Terrorism*	*2, 3*	*Administration, police, and construction and maintenance*	*$6,000*	*$500,000*	*Internal maintenance budget, HMGP, Port security grants*	*New and existing*	*High*

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Update the antiquated portal monitors for scanning vehicles at Port entrance gates.	*Terrorism*	*2, 3*	*Administration, police, and construction and maintenance*	*$50,000*	*$1M*	*Internal maintenance budget, HMGP, Port security grants*	*New and existing*	*Med-Low*
Evaluate silent alarm technology and if warranted, acquire this system for the Port entrance gates.	Terrorism	2, 3	Administration, police, and construction and maintenance	$25,000	$2M	Internal maintenance budget, HMGP, Port security grants	New and existing	Medium
Utilizing the Ports existing QR Code safety reporting program, update this to include “See Something, Say Something” reporting capabilities. Reporting drone activity should be included.	Terrorism	2, 3	Administration, police, and construction and maintenance	$5,000	$50,000	Internal maintenance budget, HMGP, Port security grants	New and existing	High

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Purchase a commercial-quality infrared drone that can be used for security and surveillance. Train enough officers that an FAA-certified officer is on each shift.	Terrorism	2, 3	Administration, police, and construction and maintenance	$10,000	$50,000	Internal maintenance budget, HMGP, Port security grants	New and existing	Medium
Continue to evaluate each construction job, and if feasible, procure and install generators for critical Port facilities experiencing severe power loss during winter storms	*Weather*	*2, 3*	*Engineering, construction and maintenance, administration, operations*	*$675,000*	*$1M*	*Internal maintenance budget, HMGP*	*New and existing*	*High*

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Continue adding building insulation to walls and attics at critical Port facilities to protect against the impacts of winter storms.	*Weather*	*2, 3*	*Engineering, construction and maintenance, administration, operations*	*$100,000*	*$500,000*	*Internal maintenance budget, HMGP*	*New and existing*	*Medium*
Create and implement an employee education program for severe winter storms	*Weather*	*2, 3*	*Engineering, construction and maintenance, administration, operations, port police*	*$5,000*	*$50,000*	*Internal maintenance budget, HMGP*	*New and existing*	*High*
Harden infrastructure and install lightning arrestors for antennas on remote communications systems, cameras, security network, and radars.	*Weather*	*2, 3*	*Engineering, construction and maintenance, administration, operations*	*$40,000*	*$1M*	*Internal maintenance budget, HMGP*	*New and existing*	*High*

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Explore, identify, and install lightning protection methods for vital electronic equipment at Port administration offices.	*Weather*	*2, 3*	*Engineering, construction and maintenance, administration, operations*	*$10,000*	*$200,000*	*Internal maintenance budget, HMGP*	*New and existing*	*High*
Install short-range lightning prediction / detector notification and warning system.	Weather	2, 3	Engineering, construction and maintenance, administration, operations	$10,000	FEMA estimates value of a statistical life at $7.5 million.	Internal maintenance budget, HMGP	New and existing	High
Purchase portable industrial heaters to be deployed where needed.	Weather	2, 3	Engineering, construction and maintenance, administration, operations, port police	$500 per unit	$10,000 per avoided incident	Internal maintenance budget, HMGP	New and existing	High

Action/Project Description	Hazard(s) Addressed	Goal(s) Supported	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority
Purchase portable cooling fan / misters that can be deployed where needed.	Weather	2, 3	Engineering, construction and maintenance, administration, operations, port police	$6,000 per unit	$10,000 per avoided incident	Internal maintenance budget, HMGP	New and existing	High

Table 6-2 Old Mitigation Actions

Action/Project Description	Hazard	Goal(s)	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority	Status
Purchase and implement quick disconnect and locking mechanisms for bull rails that could be anchored to prevent additional damage due to movement from flood water at piers 41, 37, and 35; cruise terminals 1 and 2; and piers 16, 18, 15, and 10.	Flooding	1	Engineering, construction and maintenance, administration, operations	$60,000	$1M	Internal budget, HMGP	New and existing	3	Completed

Action/Project Description	Hazard	Goal(s)	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority	Status
Conduct a drainage study that would explore the feasibility of flood water collection and diversion methods from State Highway 275 and implement resulting recommendations.	Flooding	1	Port administration, City public works, University of Texas medical branch, Port engineering	$500,000	$2.5M	HMGP	New and existing	1	Completed
Construct parking garages that could withstand hurricane force winds to house Port and private assets along Harborside Drive.	Hurricanes/ Tropical Storms	2	Engineering, construction and maintenance, administration, operations	$8M	$10M	Internal maintenance budget, HMGP	New and existing	3	Deleted. Not feasible.

Action/Project Description	Hazard	Goal(s)	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority	Status
Install roll-down hurricane shutters on cruise terminals 1 and 2, the administration building at Gulf Copper, and passenger-loading bridges.	Hurricanes/ Tropical Storms	2	Engineering, construction and maintenance, administration, operations	$150,000	$5M	HMGP	Existing	1	Completed
Reinforce piers 19 and 9 with concrete and/or hardy plank, a breakwater dike, berths, and bollards to accommodate small vessels seeking safe harbor during hurricanes and tropical storms.	Hurricanes/ Tropical Storms	2	Engineering, construction and maintenance, administration, operations	$2M	$5M	Internal maintenance budget, HMGP	Existing	4	Deleted. Addressed through other actions and programs.

Action/Project Description	Hazard	Goal(s)	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority	Status
Develop a hurricane response plan.	Hurricanes/ Tropical Storms	2	All Port Departments	$130,000	$5M	Internal maintenance budget	New and existing	2	Deleted. Coordinate through the City plan.
Install pavers on facilities with flat roofs to prevent membrane lifting on plants 12 and 14, cruise terminal 1, and the pier 15 warehouse.	Tornadoes	3	Engineering, construction and maintenance, administration, operations	$40,000	$2M	Internal maintenance budget, HMGP	Existing	1	Completed
Install tornado-resistant windows at cruise terminal 2.	Tornadoes	3	Engineering, construction and maintenance, administration, operations	$100,000	$1M	HMGP	Existing	3	Completed

Action/Project Description	Hazard	Goal(s)	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority	Status
Stabilize gutter system at cruise terminals 1 and 2 with tie-down straps.	Tornadoes	3	Engineering, construction and maintenance, administration, operations	$4,000	$1M	HMGP	Existing	4	Completed
Purchase and implement an internal mass notification system for emergencies.	Tornadoes	3	Administration, police	$18,000	$100,000	Internal maintenance budget, HMGP	New and Existing	2	Completed
Analyze previous drought events and their impacts to the Port, and identify methods to limit similar future impacts	Drought	4	Port administration, Port engineering, Port police	$2,000	$50,000	Port internal maintenance budget, HMGP	New and existing	1	Completed

Action/Project Description	Hazard	Goal(s)	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority	Status
Install protective guard on mooring lines to prevent breakage.	Thunderstorms	5	Engineering, construction and maintenance, administration, operations	$200,000	$1M	Internal maintenance budget, HMGP	New and existing	4	Completed
Purchase mobile fire suppression equipment.	Vessel Hazards	6	Administration, operations	$100,000	$1M	Internal maintenance budget, HMGP	New and existing	1	Deleted. Coordinate with City/County assets.
Implement training program for mobile fire suppression equipment.	Vessel Hazards	6	Administration, operations	$50,000	$1M	Internal maintenance budget, HMGP	New and existing	2	Deleted. No longer relevant.

Action/Project Description	Hazard	Goal(s)	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority	Status
Purchase a fire boat for emergency fire response, and work with Galveston marine response agencies to fund appropriate training, maintenance, exercising, and berthing facilities.	Vessel Hazards	6	Administration, operations	$450,000	$1M	Internal maintenance budget, HMGP	New and existing	5	Deleted. Coordinate with City/County assets.
Implement a schedule for maintenance inspections.	Bulkhead Failure	7	Engineering, construction and maintenance, administration, operations	$2,000	$20,000	Internal maintenance budget, HMGP	New and existing	1	Completed

Action/Project Description	Hazard	Goal(s)	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority	Status
Procure a side scan sonar for survey condition of the bulkhead and pilings.	Bulkhead Failure	7	Engineering, construction and maintenance, administration, operations	$20,000	$5M	Internal maintenance budget, HMGP	New and existing	3	Completed
Conduct awareness-level hazardous materials training for appropriate staff.	Hazardous Materials Spill	9	Administration, operations	$100,000	$1M	Internal maintenance budget, HMGP	New and existing	1	Completed
Acquire a silent alarm system for the Port entrance gates	Terrorism	10	Administration, police, and construction and maintenance	$25,000	$2M	Internal maintenance budget, HMGP, Port security grants	New and existing	2	Completed

Action/Project Description	Hazard	Goal(s)	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority	Status
Conduct an earthquake vulnerability study and implement recommended retrofits at critical facilities	Earthquake	13	Engineering, construction and maintenance, administration, operations	$500,000	$15M	Internal maintenance budget, HMGP	New and existing	1	Deleted. No longer relevant.

Action/Project Description	Hazard	Goal(s)	Responsible Department	Estimated Cost	Estimated Benefit	Funding Sources	Reduces Impact to New or Existing Buildings	Priority	Status
Purchase proven current technology loaded with the completed disaster recovery plan to enable continuity operations from alternate locations if and when hurricanes/tropical storms, flood, thunderstorms, tornadoes, coastal erosion and land subsidence, drought, lightning, earthquakes, and winter storm impact the Port's ability to remain in their facilities.	All-Hazards	15	Administration, finance	$300,000	$2M	Internal maintenance budget, HMGP	New and existing	2	Deleted. Other mitigating actions addressed the need.

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7 Program Implementation

The HMP is intended to be a "living" document that will help inform all interested parties about the Port's hazard mitigation policies and projects. It will be reviewed and updated on a regular basis. The mitigation strategy identified will act as a guide for Port departments in determining projects for which to seek FEMA assistance and other mitigation funds from outside sources.

7.1 Plan Adoption

44 CFR §201.6(c)(5) requires that the Port HMP be formally adopted by the Port Board of Directors. The plan was approved by the Board on 5/27/2025.

This plan was approved by FEMA on 5/2/2025.

See the front matter of this plan for adoption and approval materials.

7.2 Plan Monitoring and Evaluation

7.2.1 Annual Review

The HMPT will evaluate the plan throughout the five-year planning cycle. On an annual basis the evaluation should assess, among other things, whether:

- The goals and objectives address current and expected conditions.
- The nature, magnitude and/or types of risks have changed.
- The current resources are appropriate for implementing the mitigation projects in Chapter 4.
- There are implementation problems, such as technical, political, legal or coordination issues with other agencies.
- The outcomes have occurred as expected (a demonstration of progress).
- The agencies and other partners participated as originally proposed.

When needed, the HMPT will convene to consider:

- Progress made on plan recommendations during the previous 12 months.
- Mitigation accomplishments in projects, programs, and policies.
- Actual losses avoided by implementation of mitigation actions.
- Emerging disaster damage trends and repetitive losses.
- Identification of new mitigation needs.
- Cancellation of planned initiatives, and the justification for doing so.

7.2.2 Following a Major Disaster

Within a reasonable period after a major disaster warranting a Presidential Disaster Declaration, and as determined necessary for a smaller event, the HMPT will convene. Because recovery is a long process and the full impact of a disaster may not be known for many months, this initial meeting may be followed by additional meetings over time.

The annual update process described above will also be used following a major disaster. However, post-disaster deliberations will also consider the following:

- "Lessons Learned" from the disaster and what new initiatives should be added to the plan to help reduce the likelihood of similar damage in the future.
- Follow-up needed on items relevant to mitigation from any after-action reports produced by the Port.
- Integration of mitigation into the recovery process and coordination with Port recovery planning efforts.

7.2.3 Updating the Plan

The mitigation planning regulations at §201.6(d)(3) direct the update of Mitigation Plans. Plans must be updated and resubmitted to FEMA for approval every five years in order to continue eligibility for FEMA hazard mitigation assistance programs. Plan updates must demonstrate that progress has been made in the past five years to fulfill commitments outlined in the previously approved plan. This involves a comprehensive review and update of each section of the plan and a discussion of the results of evaluation and monitoring activities described above. Plan updates may validate the information in the previously approved plan or may involve a major plan rewrite. Each update produces a complete, stand-alone plan based on the previous iteration when appropriate.

Every five years, the plan will be re-submitted for adoption to the Port Board of Directors. Prior to this, the HMPT will use the following process to make sure that all relevant parties are involved:

- Conduct regular reviews of the plan as described above and incorporate feedback from those reviews into the planning document.
- Conduct public engagement activities and initiate meetings with identified groups of interested parties and outside organizations to gain input and feedback.
- Integrate relevant feedback and circulate revised plan for approval.
- Submit Plan to the Board of Directors for adoption by resolution.
- Submit the revised plan to FEMA.

7.2.4 Mitigation Action Status and Tracking Loss Reduction

All Departments are tasked with tracking the ongoing status of those mitigation actions for which they are the lead. Departments should track the following:

- Project progress including status of project funding and ongoing needs.
- Actual losses mitigated by project implementation.
- Project needs that may be addressed in the next mitigation planning cycle.

8 Appendix A Public Involvement

8.1 Public Meeting #1 – April 16, 2024

Attendees signed in at the registration desk and were seated in the presentation area.

The meeting was advertised to start at 4:30 pm central and actually began at 4:35 pm central.

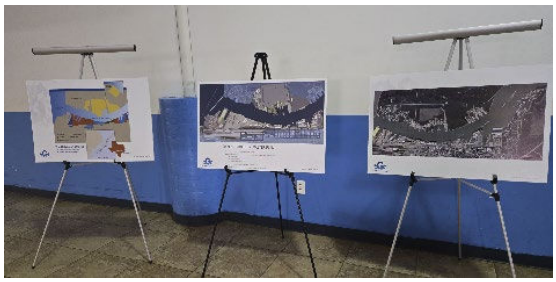
The meeting was kicked off by Anthony Hurley, of AG Witt.

Attendees were:

- Briefed on the location of safety exits, fire extinguisher and first aid kit.
- Informed that copies (binder) of the Hazard Mitigation Plan were available.
- Given copies of a "Galveston Wharves Hazard Mitigation Plan Update" flyer.
- Informed that copies of HMP Feedback cards were available.

Anthony Hurley of AG Witt delivered a 27-slide presentation that AG Witt and the Port developed, outlining:

- Hazard Mitigation Plan (HMP)
- Results from employee interviews
- Hazards that have been identified for the HMP
- Improvements to this version of the HMP
- Next steps
- Q&A / Link to the HMP



The presentation ended at 5:00 pm Central. AG Witt and Port of Galveston staff remained onsite to answer any questions until 6:00 pm as advertised.

8.2 Public Meeting #2 – May 21, 2024

Attendees signed in at the registration desk and were seated in the presentation area.

The meeting was advertised to start at 4:30 pm central and began at 4:30 pm central.

The meeting was kicked off by Clifton Hebert, of AG Witt.

Attendees were:

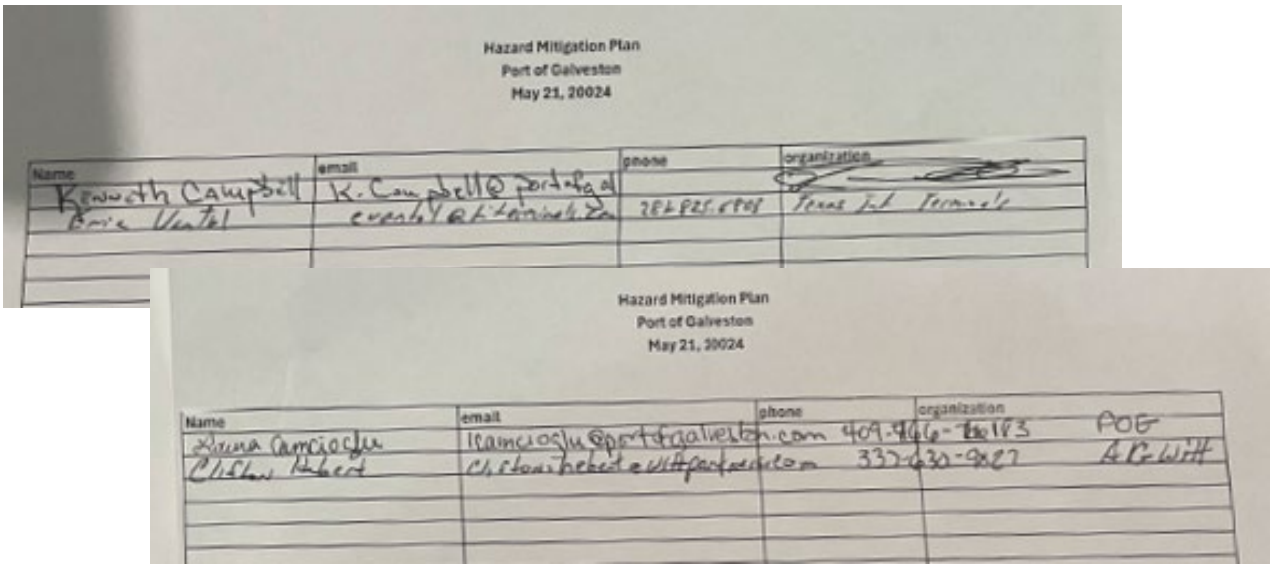
- Briefed on the location of safety exits, fire extinguisher and first aid kit.
- Informed that copies (binder) of the Hazard Mitigation Plan were available.
- Given copies of a "Galveston Wharves Hazard Mitigation Plan Update" flyer.
- Informed that copies of HMP Feedback cards were available.

Clifton Hebert, AG Witt Project Manager, delivered a 27-slide presentation that AG Witt and the Port developed, outlining:

- Hazard Mitigation Plan (HMP)
- Results from employee interviews
- Hazards that have been identified for the HMP
- Improvements to this version of the HMP
- Next steps
- Q&A / Link to the HMP

The presentation ended at 5:00 pm Central. AG Witt and Port of Galveston staff remained onsite to answer any questions until 6:00 pm as advertised.

Attendance rosters are provided below:



Hazard Mitigation Plan
Port of Galveston
May 21, 20024

Name	email	phone	organization
Kenneth Campbell	K.Campbell@portofgal		
Eric Vantel		281.825.6908	Texas A&M Transp.

Hazard Mitigation Plan
Port of Galveston
May 21, 20024

Name	email	phone	organization
Ileana Camciogl	Icamciogl@portofgalveston.com	409.966-6183	POG
Clifton Hebert	Chebert@agwitt.com	337-630-9827	AG Witt

8.3 Meeting Announcement

GALVESTON COUNTY
The Daily News.

See Proof on Next Page

AFFIDAVIT OF PUBLICATION

State of Florida, County of Orange, ss:

Yuade Moore, being first duly sworn, deposes and says: That (s)he is a duly authorized signatory of Column Software, PBC, duly authorized agent of The Galveston County Daily News, a newspaper printed and published in the City of Texas City, County of Galveston, State of Texas, and that this affidavit is Page 1 of 2 with the full text of the sworn-to notice set forth on the pages that follow, and the hereto attached:

PUBLICATION DATES:
Mar. 15, 2024

Apr. 19, 2024

NOTICE ID: jm6nn6yLAEhycRcww7f5
PUBLISHER ID: 1207218
NOTICE NAME: Hazard Mitigation Plan Public Notice
Publication Fee: $1234.03

I declare under penalty of perjury that the foregoing is true and correct.

(Signed) Yuade Moore

VERIFICATION

State of Florida
County of Orange

PAMELA BAEZ
Notary Public - State of Florida
Commission # HH 186700
Expires on October 14, 2025

Subscribed in my presence and sworn to before me on this: 04/23/2024

Notary Public
Notarized remotely online using communication technology via Proof.

Hazard Mitigation Plan Public Notice - Page 1 of 2

Legal Notice

GALVESTON WHARVES

NOTICE OF PUBLIC MEETING TO SOLICIT PUBLIC COMMENTS ON THE PORT OF GALVESTON'S UPDATED HAZARD MITIGATION PLAN (HMP)

The Port of Galveston (Galveston Wharves) will hold two public meetings to gather public comments on the port's updated Hazard Mitigation Plan.

DATES: Tuesday, April 16, 2024, and Tuesday, May 21, 2024
MEETING TIMES: 4:30-6 p.m.
LOCATION: Cruise Terminal 28, 2702 Harborside Dr., Galveston, TX 77550

Free parking will be provided. Attendees DO NOT need to register in advance. Port of Galveston staff and its consultant will present an overview of the updated Hazard Mitigation Plan (HMP).

All public comments will be collected in writing at the public meetings and via an online public feedback form through the port website – www.portofgalveston.com/HMP.

The DRAFT Hazard Mitigation Plan is available for public comment on the Port of Galveston website –www.portofgalveston.com/HMP. A printed copy of the draft plan is available for public review at the Galveston Wharves administrative offices, 123 25th Street, 8th Floor, Galveston, Texas 77550, during office hours, 8 a.m.-5 p.m. Monday-Friday.

ABOUT THE HAZARD MITIGATION PLAN
Hazard Mitigation Plans (HMPs) are prepared and adopted with the primary purpose of identifying, assessing and reducing the long-term risk to life and property from hazard events. HMPs are most effective when they are based on comprehensive, long-term plans developed before a disaster occurs.

The HMP update is required of the Galveston Wharves to be eligible for future mitigation funding from the Federal Emergency Management Agency (FEMA).

The HMP includes a risk assessment and a hazard mitigation strategy. The primary hazards of concern at the port are levee failure, erosion, extreme temperature, hurricanes, land subsidence, pandemic, wind, and winter weather. The study focuses on existing buildings and potential future development and infrastructure.

For more information about this process, please contact:
Laura Camcioglu
lcamcioglu@portofgalveston.com

Published: March 15; April 19, 2024

9 Appendix B Statement of Value

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
Pier 10 Galveston Island Channel	Pier 10	No	$21,640,197	$21,640,197	100% Reinforced Concrete	1971-72/ 1983 Ext.	107,680	Yes	Yes
Pier 12 Galveston Island Channel	Pier 12	No	$6,818,709	$6,818,709	100% Reinforced Concrete	1938	26,000	No	Yes
Pier 14 Galveston Island Channel	Pier 14	No	$11,119,736	$11,119,736	100% Reinforced Concrete	1938	38,584	No	Yes
Pier 15 Galveston Island Channel	Pier 15	No	$8,721,135	$8,721,135	100% Reinforced Concrete	1959	70,500	No	No
Piers 16-18 Galveston Island Channel	Del Monte (Terminal 16)	Yes	$14,789,724	$14,789,724	100% Reinforced Concrete	1960	130,000	No	Yes
Pier 19 - Galveston	Pier 19 - Small Boat Basin	No	$6,884,207	$6,884,207	Wooden Piers - Concrete Bulkhead	1999	N/A	No	54 Boat Slips Leased

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
Pier 19 - Galveston	Pier 19 - Joes Crab Shack	Yes	$1,473,500	$1,473,500	Wooden Piers - Concrete Bulkhead	1999	9,300	No	Yes
Pier 21 Galveston Island Channel	Pier 21	No	$4,433,493	$4,433,493	100% Reinforced Concrete	1938	32,000	No	Yes
Pier 22 Dolphin Galveston Island Channel	Pier 22 - Dolphin	No	$1,790,239	$1,790,239	100% Reinforced Concrete	1938	38,584	No	Yes
Piers 23-26 Galveston Island Channel	Piers 23-26	No	$14,918,913	$14,918,913	Fire Resistive	1926/1971	80,000	No	N/A
Piers 27-28 Galveston Island Channel	Piers 27 & 28	No	$5,371,725	$5,371,725	Fire Resistive	1971 Recon.	28,000	No	N/A
Piers 29-33 Galveston Island Channel	Piers 29 & 33	No	$5,294,950	$5,294,950	Fire Resistive	1957 Recon.	110,000	No	N/A
Pier 34 Galveston Island Channel	Pier 34	No	$1,238,234	$1,238,234	100% Reinforced Concrete	1950	21,978	No	No

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
Pier 35-36 T-Head Galveston Island Channel	Pier 35-36 T-Head	No	$1,080,257	$1,080,257	Fire Resistive	1923	18,000	No	N/A
Pier 36 Galveston Island Channel	Pier 36 (ACV)	No	$2,689,703	$2,689,703	100% Reinforced Concrete	1923	39,798	No	No
Pier 37 Galveston Island Channel	Pier 37	No	$1,987,882	$1,987,882			68,000		
Pier 38 Galveston Island Channel	Pier 38 (ACV)	No	$1,960,258	$1,960,258	Fire Resistive	1923	76,700	No	N/A
Pier 39 Galveston Island Channel	Pier 39	No	$2,393,359	$2,393,359	Steel Sheet Pile with Tie Back	1912	46,920	No	No
Pier 40 Galveston Island Channel	Pier 40	No	$1,538,187	$1,538,187	Sheet Pile with Tie Back	1912	46,520	No	No
Pier 41 Galveston Island Channel	Pier 41	No	$3,595,084	$3,595,084	100% Reinforced Concrete	1912	41,825	No	No

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
Channel	Port's portion of the channel, including the turning basin		$2,169,127	$2,169,127					
1900 Wharf Road	Public and Tenant Restroom	Yes	$46,185	$46,185	Concrete Block / Fire Resistive	2000	450	No	
1512 Wharf Road	Pier 15 Warehouse	Yes	$6,410,492	$6,410,492	100% Fire Resistive	1959	94,000	Yes	No
2803 Wharf Road	New Port Police Office	Yes	$596,911	$636,978	Concrete Block & Steel Frame / Masonry Non-Combustible	2005	2,400	Yes	No
3306 Wharf Road	Plant No. 14	Yes	$1,934,989	$1,934,989	Metal Frame / Non-Combustible	1957	45,000	Yes	Yes
3820 Wharf Road	Piers 37 - 38 Warehouse	Yes	$3,899,310	$3,899,310	100% Non-Combustible	1974	75,000	Yes	No
3902 Wharf Road	Rail/Barge Office Building	No	$66,984	$66,984	Wood Frame	1990	2,000	No	Yes
3908 Wharf Road	Rail/Barge Terminal 39	No	$529,870	$529,870	Masonry Non-Combustible	1990	2,016	No	

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
3929 Wharf Road	Gear Shed Building	No	$78,833	$78,833	Non-Combustible	Prior 1981	2,400	No	Yes
3920 Old Port Industrial Blvd.	Security Guard House, Canopy & Entry Lanes (West Entrance)	No	$353,921	$364,796	Metal Frame / Non-Combustible	2005	3,200	No	No
4001 Old Port Industrial Blvd.	Engineering Construction Garage	Yes	$208,805	$417,610	Non-Combustible	2008	3,000	No	
4002 Old Port Industrial Blvd.	Plant No. 12-3 C&M Garage	Yes	$4,568,177	$5,519,443	Metal Frame / Non-Combustible	1960	50,205	Yes	No
4002 "A" Old Port Industrial Blvd.	Plant No. 12-3 Office	Yes	$222,581	$285,373	Wood Frame	2008	7,800	No	No
1502 Harborside Drive	Security Guard House, Canopy & Entry Lanes (East Entrance)	No	$209,908	$220,783	Metal Frame / Non-Combustible	2007	3,200	No	No
1620 Harborside Drive	Veritas Building (Packing Shed)	No	$208,489	$208,489	Non-Combustible	1960	6,000	No	Yes

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
2502 Harborside Drive	Cruise Ship Terminal 1 and Emergency Operations Center	Yes	$80,680,186	$81,142,565	100% Non-Combustible Loading Ramp steel & glass with rubber wheels	1927	231,000	Yes	No
2502 Harborside Drive	Cruise Terminal 1 - FMT Passenger Loading Ramp	No		$4,266,679	Steel and glass with rubber wheels	2000			
2702 Harborside Drive	Cruise Terminal No. 2 and two FMT Passenger Loading Ramps valued at $1,822,968 each	Yes	$28,003,598	$28,138,335	100% Non-Combustible Loading Ramps steel & glass with rubber wheels	1995	149,400	Yes	N
2702 Harborside Drive	Cruise Terminal 2 - FMT Passenger Loading Ramp 1	No		$1,896,329					
2702 Harborside Drive	Cruise Terminal 2 - FMT Passenger Loading Ramp 2	No		$1,869,684					
1402 Harborshide Drive	Ct 10 Roads, Drainage, Lights, and Traffic Signals	No	$6,788,802	$6,836,274					

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
1402 Harborshide Drive	CT 10 Parking Lots and Equipment	No	$9,403,644	$10,556,268					
1402 Harborshide Drive	CT 10 Pier 10 & Pier 12 Wharf Improvements	No	$11,128,504	$11,128,504					
Old Port Industrial Road 28th Street to 33rd Street	OPI East Street Construction	No	$642,467	$642,467					
East End Cruise Corridor 10th Street to 19th Street	East End Cruise Corridor Street Construction	No	$6,335,878	$6,335,878					
2702 Harborside Drive	Storage/Loading Area`	No	$98,280	$98,280					
14 - 16th Street	Daly Building (Galveston Wharves Storage)	No	$368,600	$368,600	100% Non-Combustible	1959	9,600	No	No

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
120 Rosenberg Avenue - A	Passenger Walkway to Cruise Terminal 1	No	$1,457,842	$1,457,842			7,000	No	
120 Rosenberg Avenue - B	Parking Garage	Yes	$3,477,964	$3,477,964			108,000	No	
123 Rosenberg Avenue	Port Administrative Offices 123 Rosenberg Ave., 8th Floor	Yes		$481,558				Yes	
2818 Strand	Transit Building	Yes	$8,282,518	$8,282,518			70,000	Yes	
2702 Harborside Drive	1 - FMT Passenger Loading Ramp - Relocated to CT2	No		$1,959,985					
Portwide Security Fencing	Security Gates/ Fencing (6,188 LF)	No		$191,751					
Portwide Security Cameras	Cameras	No		$471,040					
Tower Crane Pier Pelican Island -	Tower Crane Pier	Leased	$678,791	$678,791	Concrete - Heavy Timber	1997	175		Yes

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
Galveston Channel									
Pier A Pelican Island - Galveston Channel	Pier A	Leased	$3,652,045	$3,652,045	Concrete piles, cap & deck, Bulkhead timber pile	1960	680		Yes
Pier B Pelican Island - Galveston Channel	Pier B - Concrete Deck & Piling	Leased	$2,986,814	$2,986,814	Concrete piles, cap & deck	1940	660		Yes
Pier C-E Pelican Island - Galveston Channel	Pier C-E - Concrete Deck & Piling	Leased	$4,185,438	$4,185,438	Concrete piles, cap & deck	1940	1,000		Yes
Pier D Pelican Island - Galveston Channel	Pier D - 90 Ton Gantry Crane	Leased		$891,542	N/A	2000			Yes
2920 Todd Road - Pelican Island Terminal (Shipyard)	Bulkhead	Leased	$2,220,714	$2,220,714	Sheet pile with concrete cap	1940	1,620		Yes

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
2920-1 Todd Road - Pelican Island	Office Building	Leased	$1,825,430	$1,825,430	Wood Frame	1940	37,740	No	Yes
2920-2 Todd Road - Pelican Island	Electric Shop	Leased	$315,426	$315,426	Wood Frame	1940	7,500	No	Yes
2920-3 Todd Road - Pelican Island	Production Building	Leased	$743,641	$743,641	Metal Frame	1940	7,728	No	Yes
2920-4 Todd Road - Pelican Island	Warehouse/Tool Room	Leased	$1,698,902	$1,698,902	Metal Frame / Non-Combustible	1940	22,600	No	Yes
2920-4a North Todd Road - Pelican Island	Sewage Treatment Plant	Leased	$193,103	$193,103	N/A	1998			Yes
2920-4b North Todd Road - Pelican Island	Machine Shop	Leased	$72,777	$72,777	Non-Combustible, Masonry Non-Combustible	1940	1,620	No	Yes
2929-4c North Todd Road - Pelican Island	Acetylene Shop	Leased	$49,057	$49,057	Joisted Masonry, Non-Combustible	1940	1,092	No	Yes

Address	Property Description	Building	Original Value	Original Value with 2024 Additions	Construction Type	Year Built	Square Feet	Sprinklers	Leased
2920-4d North Todd Road - Pelican Island	Paint Shed	Leased	$265,721	$265,721	Non-Combustible	1940	5,510	No	Yes
2920 -4e Todd Road - Pelican Island	Electrical Equipment and Substations	Leased	$1,226,794	$1,226,794	N/A	1940			Yes
2920-5 Todd Road - Pelican Island	Plate Shop	Leased	$2,074,036	$2,074,036	Metal Frame	1940	35,972	No	Yes
2920-7 Todd Road - Pelican Island	High Bay Building	Leased	$486,963	$486,963	Reinforced Concrete / Non-Combustible	1962	6,663	No	Yes
Pelican Island	Guard House	Leased	$60,459	$60,459					
Pelican Island	Lunch Room	Leased	$104,278	$104,278					

GALVESTON WHARVES
•123 Rosenberg Avenue 8th Floor, Galveston, Texas 77550
• Galveston (409) 765-9321 • Houston (281) 286-2484
• Fax (409) 766-6171• Website: http://www.portofgalveston.com

CERTIFIED STATEMENT

June 6, 2025

TO WHOM IT MAY CONCERN:

At the Regular Monthly Meeting of the Board of Trustees of the Galveston Wharves held May 27, 2025, Trustee/Mayor Brown moved for approval of the Port's FEMA approved Port of Galveston Hazard Mitigation Plan for the years 2025-2030. Vice Chairman Patterson seconded the motion. The motion unanimously carried.

I hereby certify that the above summary of facts is true and correct certification of the action taken by the Board of Trustees at the May 27, 2025, Regular Monthly Meeting of the Board of Trustees of the Galveston Wharves and reflected in the minutes of those meetings.

Angelina Ramirez, Secretary
Board of Trustees of the Galveston Wharves

U.S. Department of Homeland Security
FEMA Region 6
800 N. Loop 288
Denton, TX 76209

FEMA

June 9, 2025

Jennifer Charlton-Faia, Deputy State Hazard Mitigation Officer
Texas Division of Emergency Management
P.O. Box 285
Del Valle, TX 78617-9998

RE: Approval of the Port of Galveston, Texas Single Jurisdiction Hazard Mitigation Plan

Dear Ms. Charlton-Faia:

This office has concluded its review of the referenced plan, and we are pleased to provide our approval of this plan in meeting the criteria set forth by 44 CFR § 201.6. FEMA approval does not include the review or approval of content that exceeds the applicable FEMA mitigation planning requirements. By receiving this approval, eligibility for the Hazard Mitigation Assistance Grants will be ensured for five years from the date of this letter, expiring on June 8, 2030.

This approval does not demonstrate approval of projects contained in the plan. This office has provided the enclosed Local Hazard Mitigation Planning Tool with reviewer's comments, to further assist the community in refining the plan going forward. Please advise the referenced community of this approval.

If you have any questions, please contact David Freeborn, HM Community Planner, at (940) 268-7602.

Sincerely,

Ronald C. Wanhanen
Chief, Risk Analysis Branch

Enclosures: Approved Participants

cc: Anne Lehnick

Approved Participants

Attached is the list of approved participating governments included in the June 9, 2025 review of the referenced Hazard Mitigation plan.

	Community Name
1)	Port of Galveston

U.S. Department of Homeland Security
FEMA Region 6
800 N. Loop 288
Denton, TX 76209

FEMA

May 1, 2025

Jennifer Charlton-Faia, Deputy State Hazard Mitigation Officer
Texas Division of Emergency Management
P.O. Box 285
Del Valle, Texas 78617-9998

RE: Approvable Pending Adoption of the Port of Galveston, Texas Single Jurisdiction Hazard Mitigation Plan

Dear Ms. Charlton-Faia:

This office has concluded its review of the referenced plan, in conformance with the Final Rule on Mitigation Planning (44 CFR § 201.6). FEMA review does not include the review of content that exceeds the applicable FEMA mitigation planning requirements. Formal approval of this plan is contingent upon the adoption by the participants on Enclosure A, as well as the receipt of the final draft of the plan containing all plan components.

Adopting resolutions must be submitted to this agency for review and approval no later than one year from the date of this letter. Failure to submit these resolutions in a timely manner could lead to a required update of the plan prior to FEMA approval.

Once this final requirement has been met, a letter of official approval will be generated. The Local Hazard Mitigation Planning Tool, with the reviewer's comments, has been enclosed to further assist the jurisdictions in complying with planning requirements. If you have any questions, please contact David Freeborn, HM Community Planner, at (940) 268-7602.

Sincerely,

Ronald C. Wanhanen
Chief, Risk Analysis Branch

Enclosures: Participants

cc: Anne Lehnick

Participants

Attached is the list of participating local governments included in the May 1, 2025 review of the referenced Hazard Mitigation plan.

	Community Name
1)	Port of Galveston

Adoption Submittal (Final)

Following the issuance this of Approvable Pending Adoption letter, all participants are provided one year to adopt the plan and submit it through the State to FEMA. For multi-jurisdictional plans, multiple adoptions should be submitted as a complete package as outlined below.

The State must submit the plan files via:

Risk Management Directorate (RMD) SharePoint:

https://rmd.msc.fema.gov/Regions/VI/Mitigation%20Planning/Forms/AllItems.aspx

Note: You will be requested to register if you have not already done so. All plans containing Protected Critical Infrastructure Information (PCII) must be submitted as an encrypted document with the password being sent separately in an email to ensure secure file submissions.

---

1. Final draft of the plan in MS Word or pdf format containing:
   a. The final plan formatted as a single document.
   b. Documentation demonstrating adoption by the participating jurisdictions seeking approval. (i.e. copies of signed resolutions, official meeting minutes, etc.…) Note: Adoption resolutions can be separate files. Additional adoptions are not required to provide a copy of the plan.
   c. Remove strikethroughs, highlights and all Track Changes must be accepted in the final plan.

2. Send an email addressed to r6-mtd-planning@fema.dhs.gov as notification that the electronic file has been submitted. Please DO NOT send plans to the email inbox as it has very strict size limitations which will lock the inbox and not allow additional emails to be received. The email must include the following information:

   a. Include the follow when applicable: (Note: A submittal letter is no longer required.)
      i. Subject line [Approval Review for Name of Plan, State]
      ii. FEMA funding source, grant or disaster number, and project number (when applic
      iii. list of adopting jurisdictions
      iv. Plan File name (file name must include date submitted)

3. Submittals which do not conform to the above requirements will be returned to the State for resubmission