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COASTAL FLOOD RISK REDUCTION

Sea level rise and more frequent storms are the largest threat to long-term viability and protection of assets in both Cameron and Calcasieu parishes.

OVERVIEW

Project Description

Sea level rise, more frequent, higher-intensity tropical storms, and hurricanes are the largest threat to the long-term viability and protection of assets in Calcasieu and Cameron parishes. Coastal Flood Risk Reduction focuses on protecting the coast and marshes in Cameron, while also ensuring that investments in both parishes are shielded against future devastation. Risk reduction projects layer structural and non-structural interventions to reduce loss of life and property damages from surge events and lower flood insurance. These projects build on the Coastal Protection and Restoration Authority's (CPRA) work with additional layers of structural protection.

WHAT DOES THIS MEAN FOR CALCASIEU PARISH?

Even though most residents don't think of Calcasieu Parish as coastal, assets are increasingly more at risk, especially with sea level rise. As the region invests in jobs, infrastructure, and quality of life, coastal protections are needed in Calcasieu Parish as well to help protect those investments.

WHAT DOES THIS MEAN FOR CAMERON PARISH?

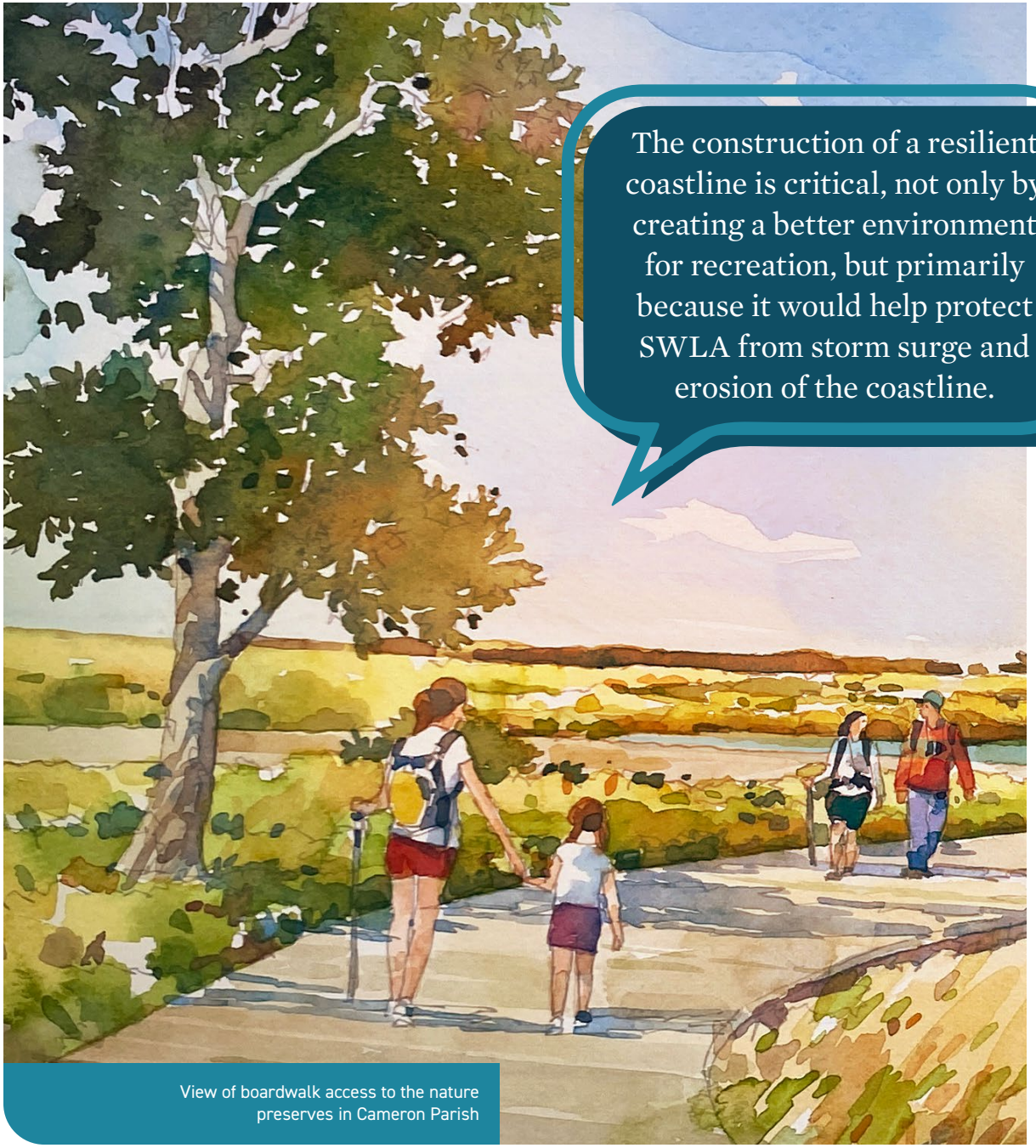
Coastal Flood Risk Reduction means long term viability, including a safe place to live and the protection of residents' lives and properties. With each storm, residents and their homes are more at risk. Protecting the coastline and ship channel by layering structural elements with non-structural strategies would help protect assets, foster economic investments, and enhance the natural environment. Investing in public beaches will support ecotourism and attract people to Cameron Parish.

WHY IS THIS IMPORTANT?

SWLA is facing an existential crisis related to land loss and climate change. The community's long-term survivability and economic viability depend on instilling confidence and providing a plan to protect life and property from devastating storms and coastal flooding that we have been experiencing more intensely and frequently in recent years. Expected sea level rise in the next 50 to 100 years will further expose both parishes. A 50- to 100-year coastal vision and plan allows the community to take steps to a resilient future. This plan lays out specific projects and concepts that have been proven in coastal Louisiana and Texas. These neighboring communities serve as the blueprint and an example of how to implement a similar Coastal Risk Reduction System, including examples of feasibility studies, types of projects, and securing funding.

Why is this important?

- Risk reduction projects would reduce loss of life and property damage due to surge events, lower flood insurance, and reduce fear of future sea level rise and hurricanes, resulting in increased investment and prosperity.
- Beach erosion threatens the shoreline and ecosystems today — proven strategies can improve beach amenities and access, while reducing protecting the environment.
- A layered approach would build on CPRA's ongoing work, adding structural protection projects that can be incorporated into future Coastal Master Plan updates.



View of boardwalk access to the nature preserves in Cameron Parish

PLAN TOPIC AREAS

Plan Topics

Coastal Flood Risk Reduction focuses on growth in Community Planning, Housing, Economic Development, Infrastructure, and Natural and Cultural Resources. A resilient Southwest Louisiana would help:

Community Planning

- **Increase bike and pedestrian connectivity around beaches in Cameron Parish through eco-revetment and raised pathways, making safe connections for residents and tourists along the entire coastline of Cameron Parish.**

Housing

- **Reduce property damage and loss of homes due to surge events while lowering flood insurance, making home ownership and housing more attainable.**
- **Increase developable areas not susceptible to flooding to encourage additional housing development.**

Economic Development

- **Minimize uncertainty and fear of flooding, improving the long-term viability of the economies of both parishes.** Increasing long-term confidence and economic activity in the area and availability of employment will make this area a more viable investment for industry and businesses. Encouraging workers to have safe, protected, and affordable housing will increase the available workforce and make this area attractive to businesses.

Infrastructure

- **Provide a layered approach with structural and non-structural interventions like erosion protection, drainage improvements, and the protection of marshes.**
- **Make communities more resilient by reducing the impact of surge events, sea level rise, and land loss.** With sea level rise, the land loss will accelerate if no action is taken, eliminating any buffer to hurricanes. These projects will protect all built infrastructure and assets in both parishes.
- **Utilize proven techniques and innovative solutions to promote an interconnected waterway system that reduces risk and provides long-term viability.**

Natural and Cultural Resources

- **Enhance and protect the environment as coastal Louisiana marshes are valuable assets constantly at risk or threatened. It's essential to protect this delicate resource.**
- **Promote improved access to beaches and waterways and become a destination for the public to enjoy which will encourage continued investments.**
- **Prevent the loss of marshes. They are not only vital for the ecosystem but are a part of providing resiliency.**

The following action steps are broken down by Calcasieu and Cameron parishes. It is critical for both parishes to work together in a coordinated manner on analysis, design, funding, construction, and maintenance of a coherent system.

CAMERON PARISH ACTION STEPS

Study

The first step in advancing these projects is to analyze and refine the proposed concepts. A feasibility study will provide the necessary assessment of the practicality of each conceptual design, along with analyzing the cost to achieve the proposed benefits.

1 Feasibility Study and Conceptual Design

A feasibility study, along with conceptual designs, will be invaluable information to progress the proposed projects. The study will provide the detailed assessment of many aspects of the projects such as location, size, materials, cost, and benefits. This information will be key when partnering and securing funding.

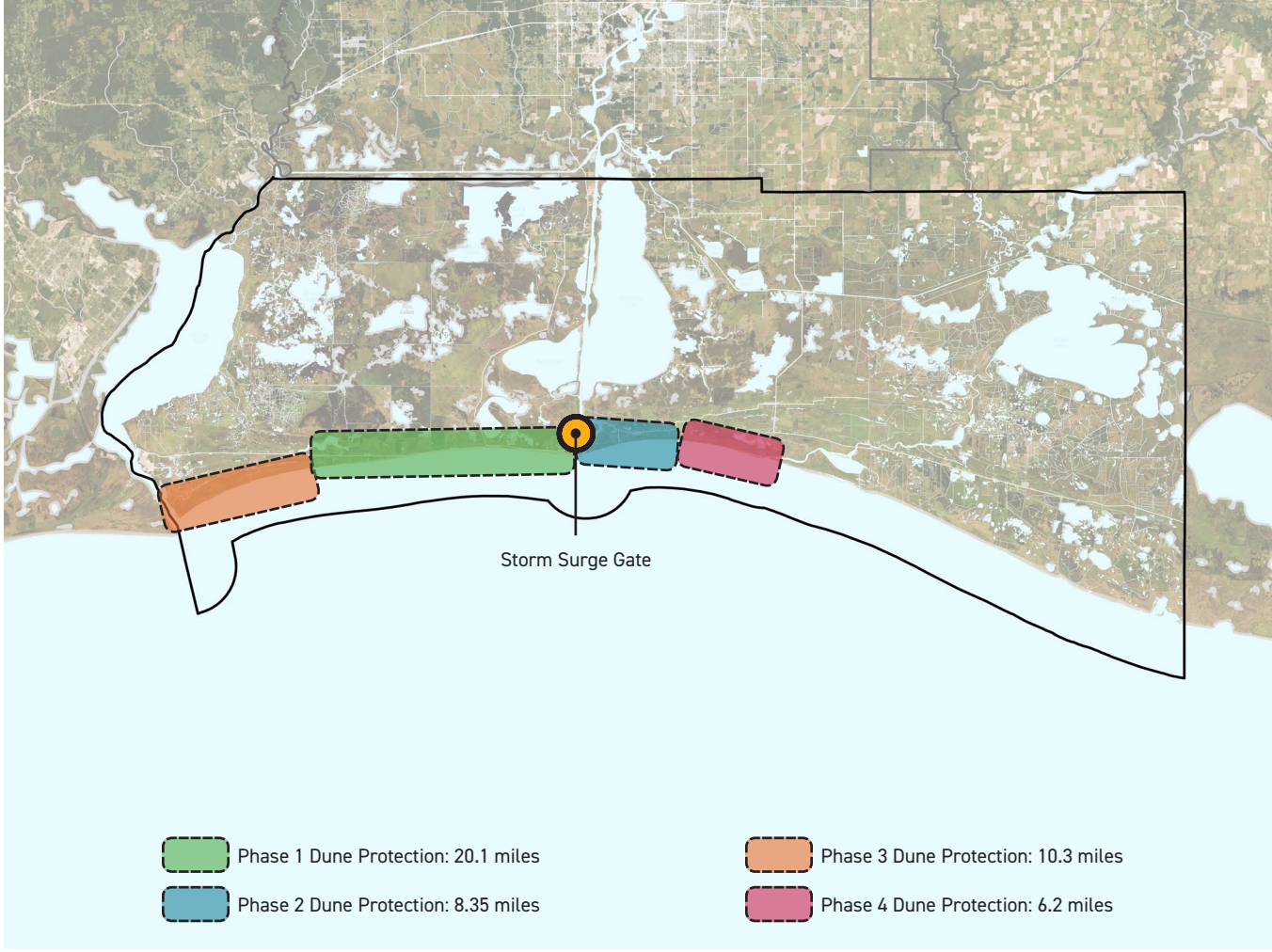
Cameron Parish Coastal Flood Risk Reduction	
Action Steps	
1	Feasibility study and conceptual design
2	Cost benefit analysis
3	Application for capital funding — includes partnering with USACE and CPRA to provide funds for design, construction, and long-term maintenance
4	Implement a layered approach (structural and non-structural) that builds on the work of CPRA
4a	Structural beach protection with living shoreline, vegetated dunes, earthen berms, and eco-revetment
4b	Living shoreline with rock revetment, backwater pump stations, and drainage
4c	Storm surge gate system
After completion...Operation and maintenance of the system.	

Potential Partners

- Cameron Parish
- Chenier Plain Coastal Restoration & Protection Authority
- Louisiana Coastal Protection and Restoration Authority (CPRA)
- US Army Corps of Engineers (USACE)
- Louisiana Wildlife and Fisheries
- Port of Lake Charles

Potential Funding Sources

- FEMA — BRIC PDM (Pre-Disaster Mitigation), HMGP
- US Army Corps of Engineers (federal)
- CPRA
- Louisiana Watershed Initiative
- HUD MIT
- Cameron Millage
- Non-Profit Foundations
- State Capital Outlay
- Federal Infrastructure Funding



2 Cost Benefit Analysis

With the project details such as cost and the benefits identified in the feasibility study, a cost benefit analysis will need to be performed. The importance of this analysis is to demonstrate that the proposed project benefits are greater than the project estimated cost and typically is a requirement of many funding sources.

Funding

There is an abundance of funding sources to progress these projects forward, such as local tax millage, state capital outlay, and federal grants. Successfully securing project funding of this magnitude will require partnerships with local, state, and federal agencies.

3 Application for Capital Funding for Design, Construction, and Long-Term Maintenance

These partnerships will be very important when applying for capital funding due to the typical competitive nature in distribution of available funds. A strategy will be developed to apply and use local and state funds for feasibility and early design that can better position these projects for the larger federal dollars required for construction.

A Good Example

LOUISIANA COASTAL PROTECTION

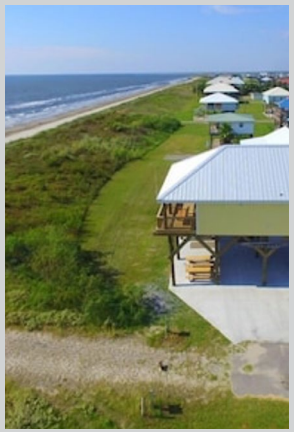
WHAT?

- Multi-layered structural and non-structural construction has been successful throughout Coastal Louisiana
- Proven solutions that help reduce land loss and protect communities against surge

WHERE?

- Grand Isle, Holly Beach, and Rockefeller Refuge

Grand Isle



Grand Isle

Tombos at Holly Beach

Implementation

Implementing these large scale projects will require strong partnerships with local, state, and federal agencies with focus and commitment. Although the final construction timelines may appear lengthy, benefits from these projects will be evident in early phases of implementation.

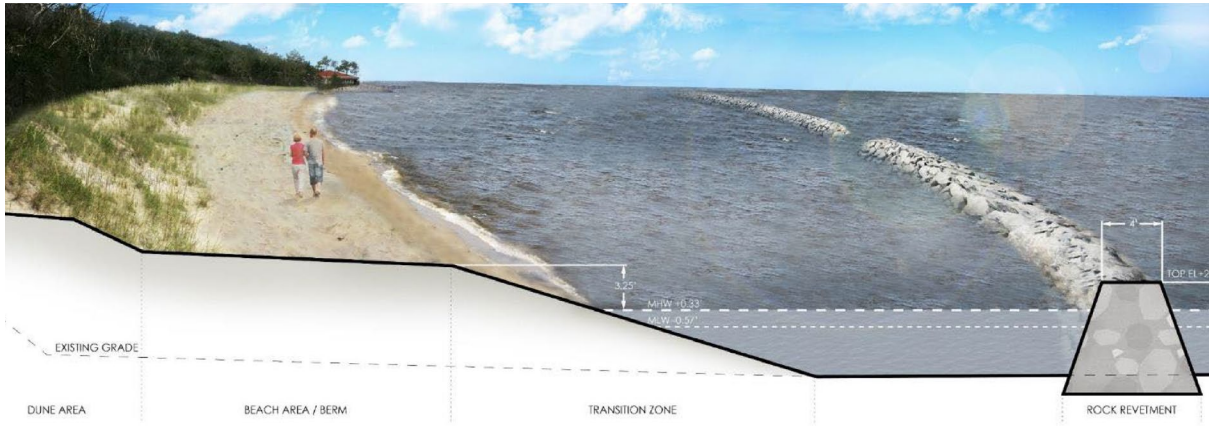
4 Implement a Structural and Non-Structural, Layered Approach

A layered approach that incorporates the existing plan, including Southwest Louisiana coastal non-structural funding and played solutions from CPRA and USACE, and layers additional structural coastal protection is the key to a resilient community that can adapt and respond to sea level rise and increased intensity of tropical and rain storms. The first layer must take place in Cameron Parish, which is SWLA's first line of defense. This acts as protection for Calcasieu Parish and Cameron Parish together, and is key to stopping the initial surge. Interventions, tailored to protecting the Cameron Parish coastline, are indicated to the right.

4a Structural Beach Protection with Living Shoreline, Vegetated Dunes, Earthen Berms, and Eco-Revetment

Dune creation and restoration, along with beach nourishment, provides a natural layer of risk reduction to inland infrastructure, in addition to ecological services and recreational opportunities. Dunes serve as a natural risk reduction feature that provides a sand buffer and protects the land from waves and flooding. Dune systems can be reinforced using a hybrid of rock revetments and dunes to strengthen them against erosion during storm events.

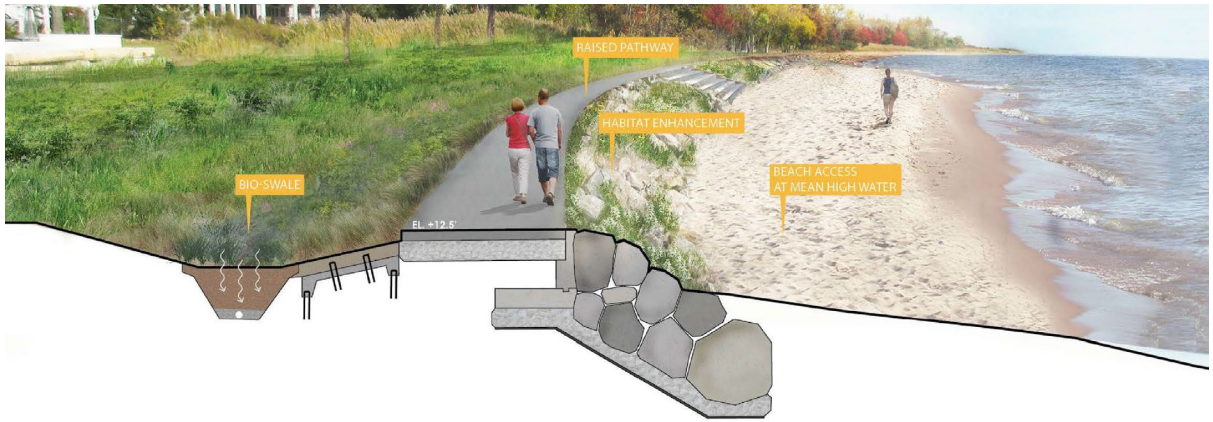
Additionally, plantings of native grasses help to stabilize dune soils, and these grasses capture wind-blown sediment, providing further protection against erosion. Beach nourishment involves depositing sand on the beach to increase durability of the protection system. Nourishment of the transition zone serves to reduce wave energy in addition to promoting accumulation of sand on the beach.

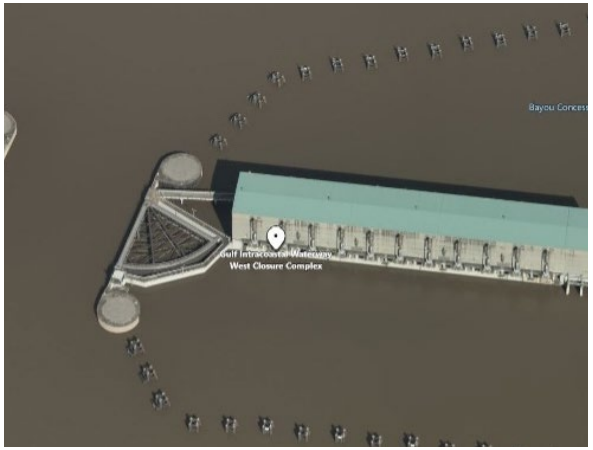


4b Living Shoreline with Rock Revetment, Backwater Pump Stations, and Drainage

Living shoreline systems can be used in conjunction with beach-dune restoration and creation or alone in front of existing beach-dune systems. Living shorelines take advantage of natural processes to make shorelines more resilient to erosion and storm events. Typically, rock revetments are placed offshore to serve as a breakwater, attenuating wave energy before the wave reaches the shore. Inlets within the breakwaters allow for some hydraulic connectivity to the shoreline and allow sediments carried by the wave activity to be deposited on the beach or in the transition zone.

Bioswales, used on the inland side of a man-made revetment or other elevated flood risk reduction feature, serve as a method to capture rainwater from storm events. These bioswales are vegetated with native plans that aid in the filtration of pollutants from the stormwater, in addition to allowing a larger percentage of the stormwater to infiltrate into the soil rather than becoming runoff. These systems, used in conjunction with traditional, mechanical pumps, provide resilience to rainwater flooding, in addition to tropical events.





4c Storm Surge Gate

The impacts of storm surge can cause significant damage to coastal habitats, infrastructure, land loss, etc. This exposure can kill or hinder the growth of economics, industry, residential, and commercial development. The location of the gate system would stop the surge, providing the level of protection needed. The storm surge gate system will only be closed during periods of high-risk tropical storm events, while allowing navigation at all other times. The size of the gate opening will be determined by navigation needs, authorized channel width along with future needs, and environmental requirements.

CALCASIEU PARISH ACTION STEPS

Study

The first step in advancing these projects is to analyze and refine the proposed concepts. A feasibility study will provide the necessary assessment of the practicality of each conceptual design, along with analyzing the cost to achieve the proposed benefits.

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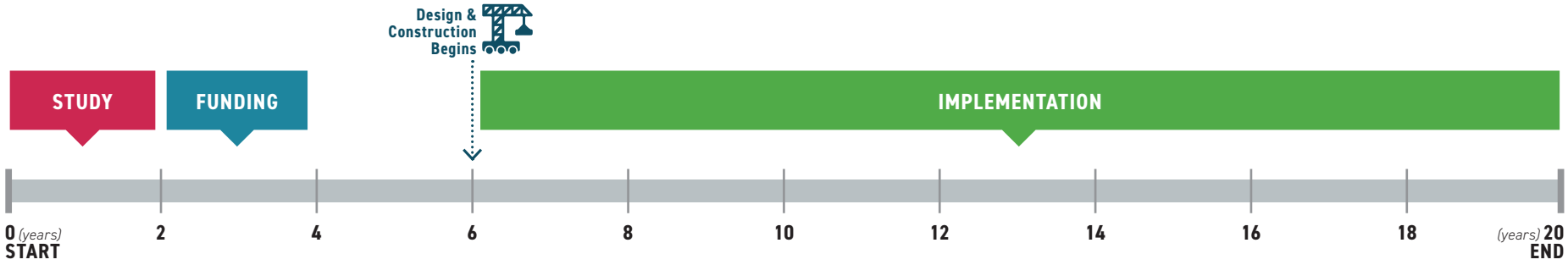
Calcasieu Parish Coastal Flood Risk Reduction	
Action Steps	
1	Feasibility study and conceptual design
2	Cost benefit analysis
3	Application for capital funding — includes partnering with USACE and CPRA to provide funds for design, construction, and long-term maintenance
4	Implement a layered approach (structural and non-structural) that builds on the work of CPRA
4a	Levees along southern developed area; flood walls where there is no sufficient space; drainage pump stations at bayous
4b	Sector gate at the Calcasieu River for surge protection during tropical events
4c	Barge gates and pump Station to provide surge protection and drainage when the system is closed
After completion...Operation and maintenance of the system.	

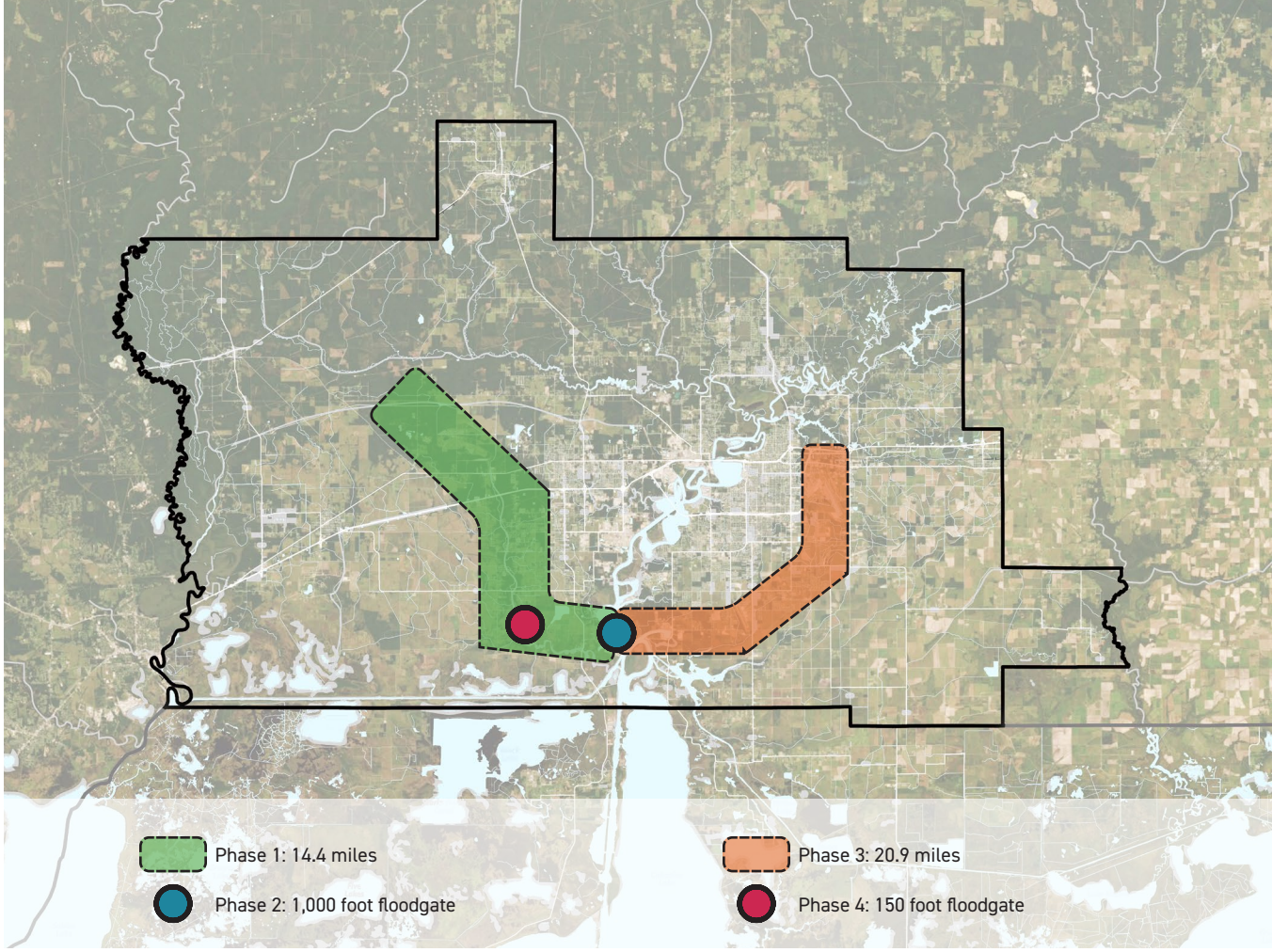


Potential Partners

- Chenier Plain Coastal Restoration & Protection Authority
- Louisiana Coastal Protection and Restoration Authority (CPRA)
- US Army Corps of Engineers (USACE)
- Calcasieu Parish
- City of Lake Charles
- Louisiana Wildlife and Fisheries
- Port of Lake Charles

Potential Funding Sources

- FEMA BRIC (Building Resilient Infrastructure and Communities)
- FEMA PDM (Pre-Disaster Mitigation)
- FEMA HMGP (Hazard Mitigation Grant Program)
- FEMA STORM Act (Safeguarding Tomorrow Revolving Loan Program)
- US Army Corps of Engineers (federal)
- CPRA
- Louisiana Watershed Initiative
- HUD CDBG-MIT (Community Development Block Grant — Mitigation)
- HUD CDBG-DR (Community Development Block Grant — Disaster Recovery)
- Cameron Millage
- Non-Profit Foundations
- State Capital Outlay
- LA DOTD (Engineering Division) appropriations, including the State Flood Control Program
- Federal Infrastructure Funding



Funding

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A Good Example

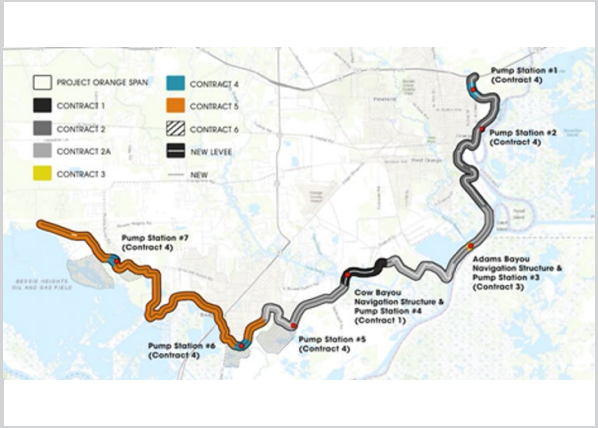
STRUCTURED PROTECTION IN ORANGE COUNTY

WHAT?

- $1.2 billion Coast Storm Risk Management System
- Provides protection for 100-year storm event, including projected 2070 sea level rise

HOW?

- Federally funded with local cost share
- Includes floodwalls, levees, sector gates, pump stations, drainage structures, and flood gates



Coast Storm Risk Management System

Implementation

Implementing these large scale projects will require strong partnerships with local, state, and federal agencies with focus and commitment. Although the final construction timelines may appear lengthy, benefits from these projects will be evident in early phases of implementation.

4 Implement a Structural and Non-Structural, Layered Approach

With sea level rise and future higher intensity tropical storms being the largest threat to long-term viability and protection of assets in Calcasieu Parish, structural flood risk reduction projects would provide the most benefit to reducing loss of life and property, lowering flood insurance, and reducing the fear of future sea level rise and hurricanes.

4a Levees, Flood Walls, and Drainage Pump Stations

Earthen levees are proposed along the southern developed areas and would tie into higher elevations as they proceed northward. Concrete floodwalls would be placed where the width of the levee is too large for the space available. The overall alignment placement would be an iterative process when developed to account for maximum benefit relative to feasibility. Based on previous studies, the approximate height expected in the southern portions of the levee will be 22 ft NAVD.

Google Earth

4b Sector Gate at the Calcasieu River

Where the earthen levees approach the Calcasieu River, a large steel sector gate will be constructed in the river, providing continuous alignment of surge protection during tropical events, while allowing navigation at all other times. The size of the gate opening will be determined by navigation needs, authorized channel width along with future needs, and environmental requirements.

4c Barge Gates and Pump Station

Barge gates and pump stations provide surge protection and drainage when the system is closed. barge gates will be proposed on smaller channels, as they usually require less project area than a sector gate. Also, pump stations will be required to manage the interior water levels during a rainstorm, while the system is closed. Previous studies have estimated approximately 6000 cfs pumping needs for the protection area.

Protecting SWLA and being proactive instead of waiting for disaster to strike

A Good Example

STRUCTURED PROTECTION IN NEW ORLEANS

WHAT?

- Structural Coastal Protection System constructed and strengthened after Hurricane Katrina has helped New Orleans during recent hurricanes, like Hurricane Ida

HOW?

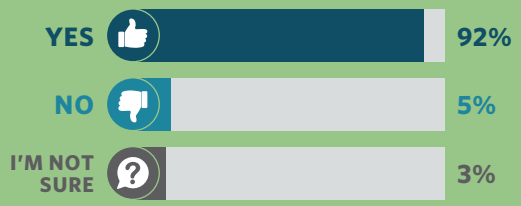
- Prove hurricane surge and sea level rise protection projects include sector gates, pump stations, barge gates, sluice gates, floodwalls, levees, and tidal lock structures

Bayou Segnette Barge Gates and Pump Stations

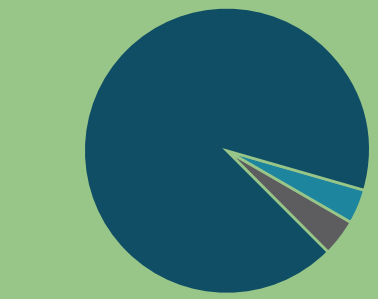
HSDRRS West Closure Complex

HIGHLIGHTING COMMUNITY SUPPORT

I would visit a protected beach with amenities like parking, public restrooms, and accessible walking trails.



I think this project will benefit SWLA.



92% of respondents said **YES**

4% of respondents said **NO**

4% of respondents said **I'M NOT SURE**

IMPLEMENTATION

Economic Impact and Return on Investment

The road to get to a resilient future for coastal Louisiana will not be easy. We are on the front lines of a global sea level crisis, which requires that we must have vision and use proven techniques and innovative solutions to deal with this issue. It is important to our families, our community, our economic viability, and our future in Southwest Louisiana.

When considering the impact of Coastal Flood Risk Reduction, among the most important benefits is the protection of assets in both Calcasieu and Cameron parishes. As opportunities for economic investment and development are sought out, it is critical to focus not only on the construction of those opportunities, but on their longevity and long-term viability in the region.

From Plan to Action

To align with Federal and State funding programs, the community and its leaders must agree on the threat, the vision, and possibilities to position the community and take the necessary programming steps. Identification of a steward and maintenance entity and establishing a funding stream for this organization is one of the key steps of the process.

IMPLEMENTATION

	HOW? (ACTION STEPS)	COST	TIME FRAME	POTENTIAL FUNDING SOURCES	LEAD ENTITY	SUPPORTING PARTNERS/ENTITIES
Cameron Parish	Implement a layered approach with a combination of structural and non-structural elements: • Cameron 1A — Structural beach protection with living shoreline, vegetated dunes, earthen berms, and eco-revetment • Cameron 1B — living shoreline with rock revetment, backwater pump stations, and drainage • Cameron 1C — Storm surge gate system	1A — $$$ 1B — $$$$ 1C — $$$$	5 to 20 years	• CPRA • Parish Millages • USACE (US Army Corps of Engineers • State Capital Outlay (for construction)	TBD	Chenier Plain CRPA CPRA NFS Local Funding Agency
	Feasibility study and conceptual design with benefit cost analysis	$$	3 to 5 years	• Non-profit foundations	Cameron Parish or Chenier Plain CRPA	
	Application for capital funding (includes partnership with USACE and CPRA to provide funds for design, construction, and long-term maintenance funding)	$	1 to 3 years	• Local funding	Cameron Parish or Chenier Plain CRPA	
Calcasieu Parish	Implement a layered approach with a combination of structural and non-structural elements: • Calcasieu 1A – Levees along southern developed area; flood walls where there is not sufficient space • Calcasieu 1B – Sector gate at the Calcasieu River, providing surge protection during tropical events while allowing navigation at all other times • Calcasieu 1C – Barge gates and pump station to provide surge protection and drainage when system is closed	1A — $$$$ 1B — $$$$ 1C — $$$$	20 to 50 years	• CPRA • Parish Millages • USACE (US Army Corps of Engineers • State Capital Outlay (for construction)	TBD	Chenier Plain CRPA CPRA NFS Local Funding Agency
	Feasibility study and conceptual design with benefit cost analysis	$$	3 to 5 years	• Non-profit foundations	Calcasieu Parish or Chenier Plain CRPA	Visit Lake Charles
	Application for capital funding (includes partnership with USACE and CPRA to provide funds for design, construction, and long-term maintenance funding)	$	1 to 3 years	• Local funding	Calcasieu Parish or Chenier Plain CRPA	