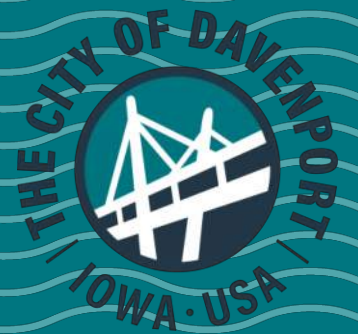


MISSISSIPPI RIVER FLOOD RESILIENCY PLAN

NOVEMBER 2021



PROJECT GOALS

- Develop and recommend non-structural and structural flood mitigation systems that support the City's Flood Plan objectives, increase operational efficiency, and enhance transportation routes during times of Mississippi River flooding.
- Develop an implementation plan and funding strategy for the recommended programs and projects to increase flood resiliency.
- Engage with the public and stakeholder groups.



ENGAGEMENT OVERVIEW

VISIONING

Fall 2020

Key Questions

- How do you experience flooding today?
- How do you use the riverfront today?
- What do you want to do on the riverfront that they can't do today?

Stakeholder Meetings

- Village of East Davenport
- Downtown
- West Davenport Businesses
- West Davenport Residents
- Riverfront/Parks Focus Group
- City Operations Group
- Riverfront Improvement Commission
- QC Chamber

Survey: Visioning and Interactive Mapping

- 346 responses

ALTERNATIVES

Spring 2021

Key Questions

- What are your top priority goals for flood strategies?
- What options for solutions do you support? Why?

Stakeholder Meetings

- Village of East Davenport
- Downtown
- West Davenport Business & Black Hawk/Walnut Representatives
- QC Chamber

Open House

- Diversity, Equity and Inclusion organizations
- Community utility and response partners
- Neighborhood leaders
- Media
- High school student newspapers

Media

- Presentation airings on all local media
- interviews

Survey: Alternatives

- 507 responses

CONFIRMATION

Summer 2021

Key Questions

- Do the recommendations reflect your priorities and feedback?
- What are your concerns/priorities around phasing and implementation?

Stakeholder Meetings

- Village of East Davenport
- Downtown
- West Davenport Business & Black Hawk/Walnut Representatives
- Riverfront Improvement Commission
- QC Chamber

Open House

- Diversity, Equity and Inclusion organizations
- Neighborhoods and Friends groups

Booth Outreach

- Farmers Market
- QC Empowerment Open Air Market

Media

- Presentation airings on all local media interviews

Survey: Recommendations

- 165 responses

GUIDING PRINCIPLES

What are the overarching values and goals that apply to all flood resilience concepts for Davenport?

RESILIENCE

Reduce the impact of flooding on day-to-day lives and economies, including the ability to recover more quickly from a flood event.

OPERATIONS

Reduce the operational drain of flood fighting on the City's resources.

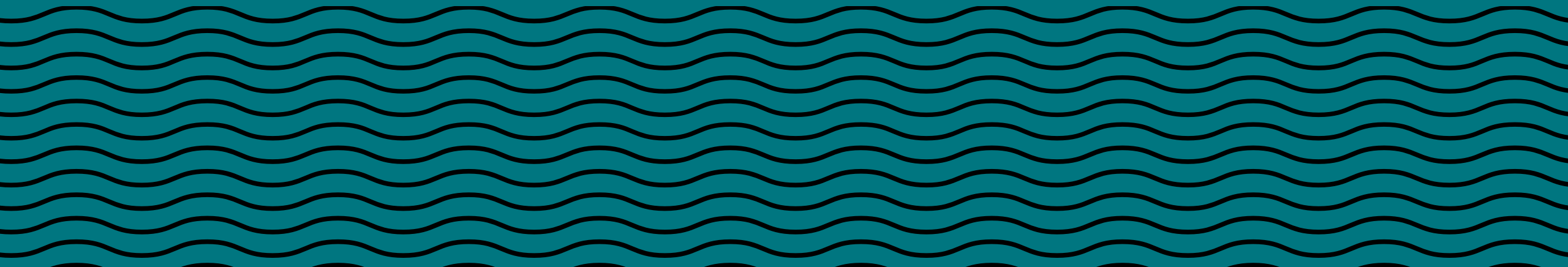
EQUITY

Provide balanced investment in flood mitigation infrastructure and level of flood fighting effort along the full riverfront.

PUBLIC ACCESS

Prioritize the riverfront as a public amenity for the community and deepen Davenport's relationship to the Mississippi.

MITIGATION RECOMMENDATIONS



INTRODUCTION

- To meet the **multiple objectives** and incorporate **diversity of perspectives**, the Flood Resiliency Plan offers **both incremental and transformational recommendations** that balance respect for and retreat from the river.
- The recommendations fit within the context of the City's stated goals, the City's unique relationship with the Mississippi River, and master plan documents and prior studies.
- A flexible approach to programmatic and infrastructure changes can be scaled or revised to accommodate future needs, constraints and/or funding opportunities.
- **An approach that balances structural and non-structural goals is challenging; that tension is a feature of the Flood Resiliency Plan, not a flaw.**

Specific outcomes of this balance are:

- emphasis on non-structural policy and programmatic recommendations for individual property owners based on the Silver Jackets study
- targeted design level and alignment for the structural mitigation recommendations
- shared understanding of the re-investments required to improve and maximize the benefits of the existing flood mitigation infrastructure throughout the City

NON-STRUCTURAL RECOMMENDATIONS

PROPERTY ACQUISITION PROGRAM

Target properties

- Located in the floodway
- Repetitive losses
- Identified by the building risk and mitigation assessment
- Access challenges

Benefits

- Remove on-going flood risks for owners
- Reduce City effort to furnish services in flood-prone areas



INDIVIDUAL BUILDING MITIGATION

Public-Private Partnership

- Addresses residual risk
- Cost-share
- Utilize building risk and mitigation assessment
- Encourage private responsibility for risk
- Balance public and private investment

Riverfront public facilities

- Reduce flood-fighting effort
- Protect public investment



UPDATE STORMWATER MASTER PLAN

Interior drainage

Reduce pumping requirements

Co-benefits for greenspace and water quality



OTHER PROGRAMMATIC APPROACHES

Improve CRS Rating

Building codes

Ordinance updates

Land Use & Zoning

Require flood mitigation to utilize public funding programs

Stream & Watershed studies



STRUCTURAL RECOMMENDATIONS - BASIS

City of Davenport's Historical Precedent and Relationship with the Mississippi River

- City has balanced access and visual connectivity with a combination of retreat, mitigation, and flood fighting to respond to periodic Mississippi River flood events - as opposed to building a structural flood mitigation system - with flood fighting on a limited basis to maintain the transportation network for access and commerce.

Results from the Public Engagement Process

- Diversity of opinions regarding structural flood risk reduction infrastructure
- Guiding principles of **Resilience, Operations, Equity, Public Access**

Stage-Frequency History on Mississippi River

Since 1878, the Mississippi River has

- exceeded stage 18 for 273 days, with 142 of those days occurring since 2000
- exceeded stage 22 for 18 days, with 7 of those days occurring since 2000
- never reached stage 24

STRUCTURAL RECOMMENDATIONS - BASIS

Costs and Benefits

- Detailed cost-benefit ratio study by alternative was outside the scope of this study
- Simplified review of project costs and impacted transportation routes and properties

Existing Seawall Elevation

- Based on the best available information provided by the City, the lowest elevation of the seawall upstream of the dam is between stage 22-23
- Increasing the height of the wall several feet would be very difficult, and expensive, given the age of the wall and length (~2 miles)

Structural mitigation to stage 22 offers the City of Davenport a balanced, equitable, and cost-effective solution that's rooted in the City's rich history of co-existing with the river and lives out public awareness that the mighty Mississippi can always produce a larger or longer flood beyond what anyone can expect or affordably mitigate.

AREA 1: EAST VILLAGE TO ARSENAL BRIDGE

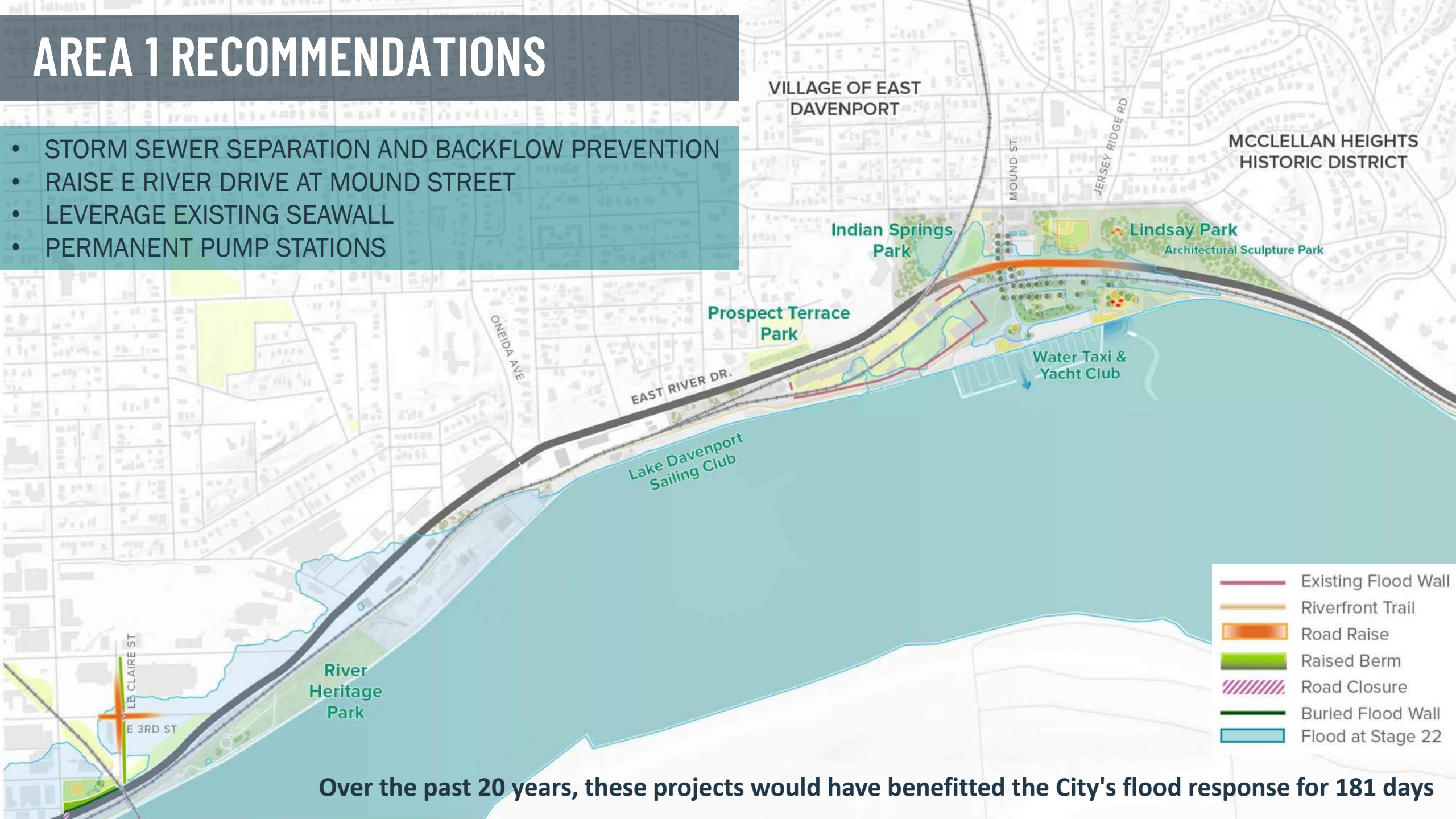
Key Takeaways

- Storm sewer systems are the first source of flooding
- Closing E River Drive hinders transportation access on the east side of Davenport
- Lack of east/west connectivity is detrimental to East Village businesses
- Portions of E River Drive, from approximately Federal Street to the Arsenal Bridge, lie within the regulatory floodway



AREA 1 RECOMMENDATIONS

- STORM SEWER SEPARATION AND BACKFLOW PREVENTION
- RAISE E RIVER DRIVE AT MOUND STREET
- LEVERAGE EXISTING SEAWALL
- PERMANENT PUMP STATIONS



Over the past 20 years, these projects would have benefitted the City's flood response for 181 days

AREA 1 BENEFITS



-  Flood Wall
-  Riverfront Trail
-  Road Raise
-  Pedestrian Connection
-  Bike Connections

AREA 2: ARSENAL BRIDGE TO CENTENNIAL BRIDGE

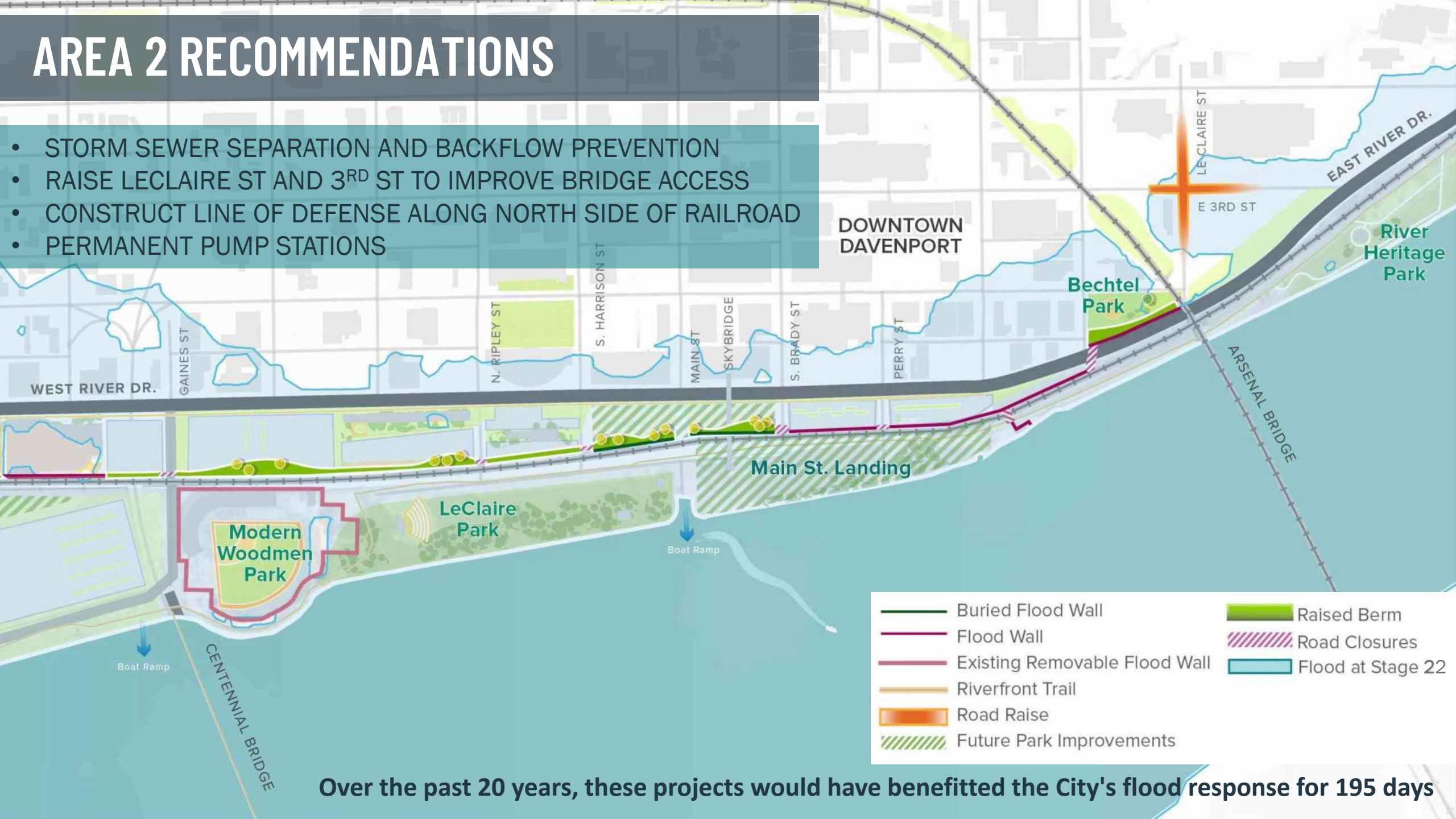
Key Takeaways

- City expends significant effort flood fighting in Area 2
- Flooding over portions of River Drive by stage 18
- Riverfront park amenities either flooded or difficult to access during major flood events
- Flood fighting done by Canadian Pacific has benefits for the City
- Canadian Pacific track raise created an additional visual barrier to the river



AREA 2 RECOMMENDATIONS

- STORM SEWER SEPARATION AND BACKFLOW PREVENTION
- RAISE LECLAIRE ST AND 3RD ST TO IMPROVE BRIDGE ACCESS
- CONSTRUCT LINE OF DEFENSE ALONG NORTH SIDE OF RAILROAD
- PERMANENT PUMP STATIONS

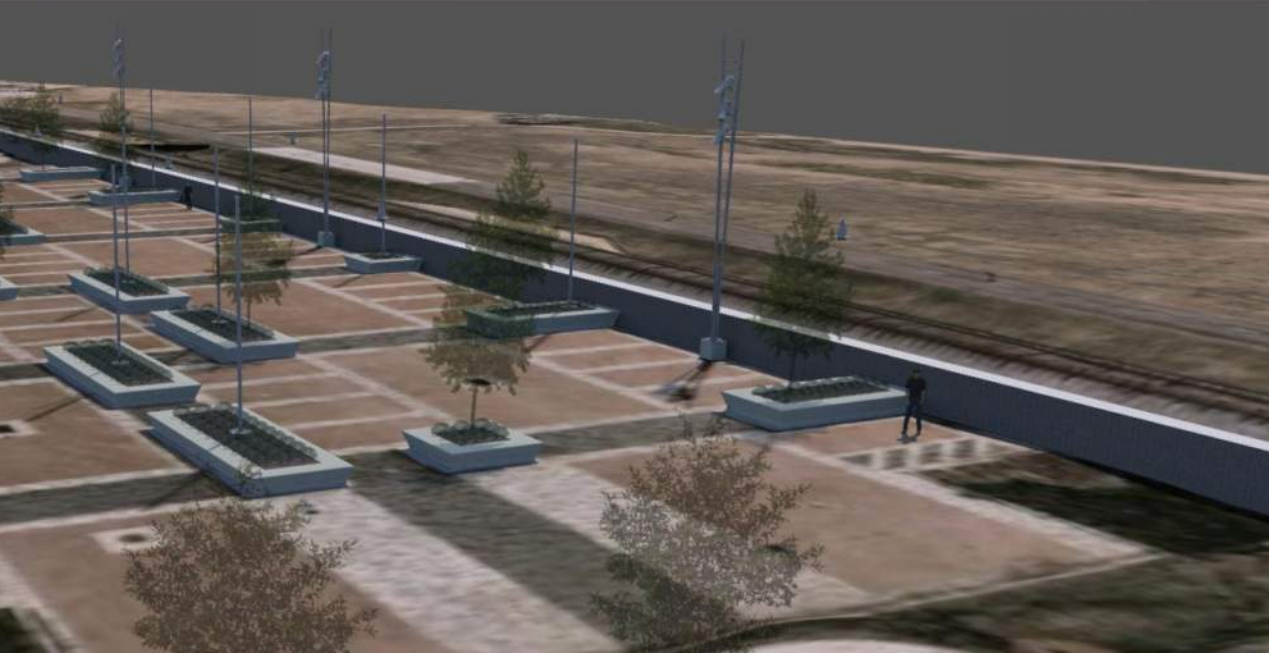
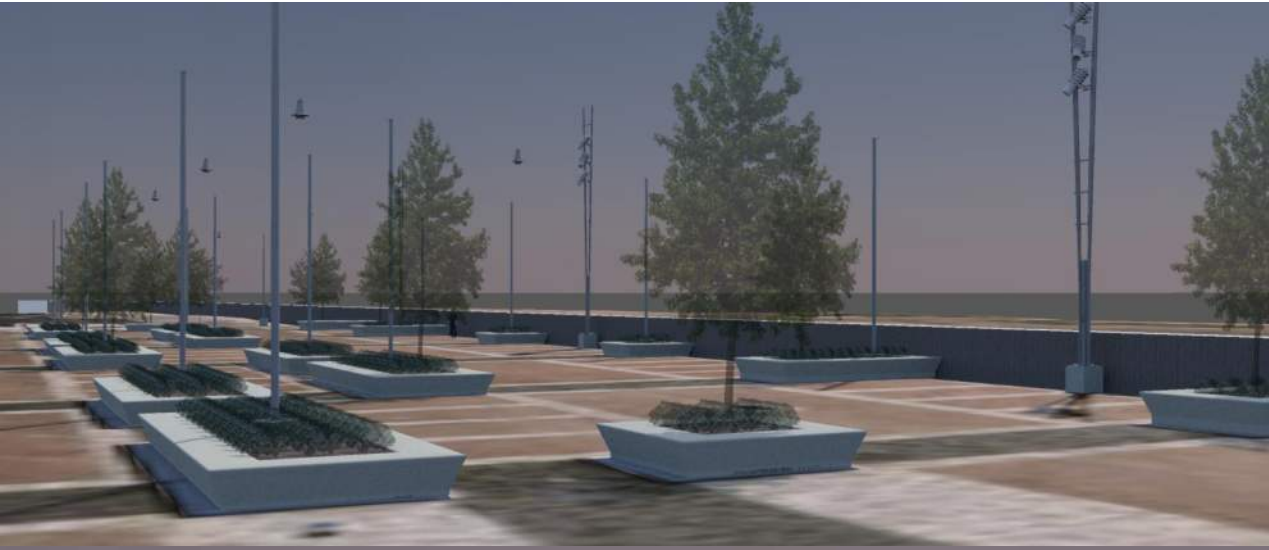


Over the past 20 years, these projects would have benefitted the City's flood response for 195 days

AREA 2 BENEFITS



AREA 2 RENDERINGS



AREA 3: CENTENNIAL BRIDGE TO W RIVER DRIVE

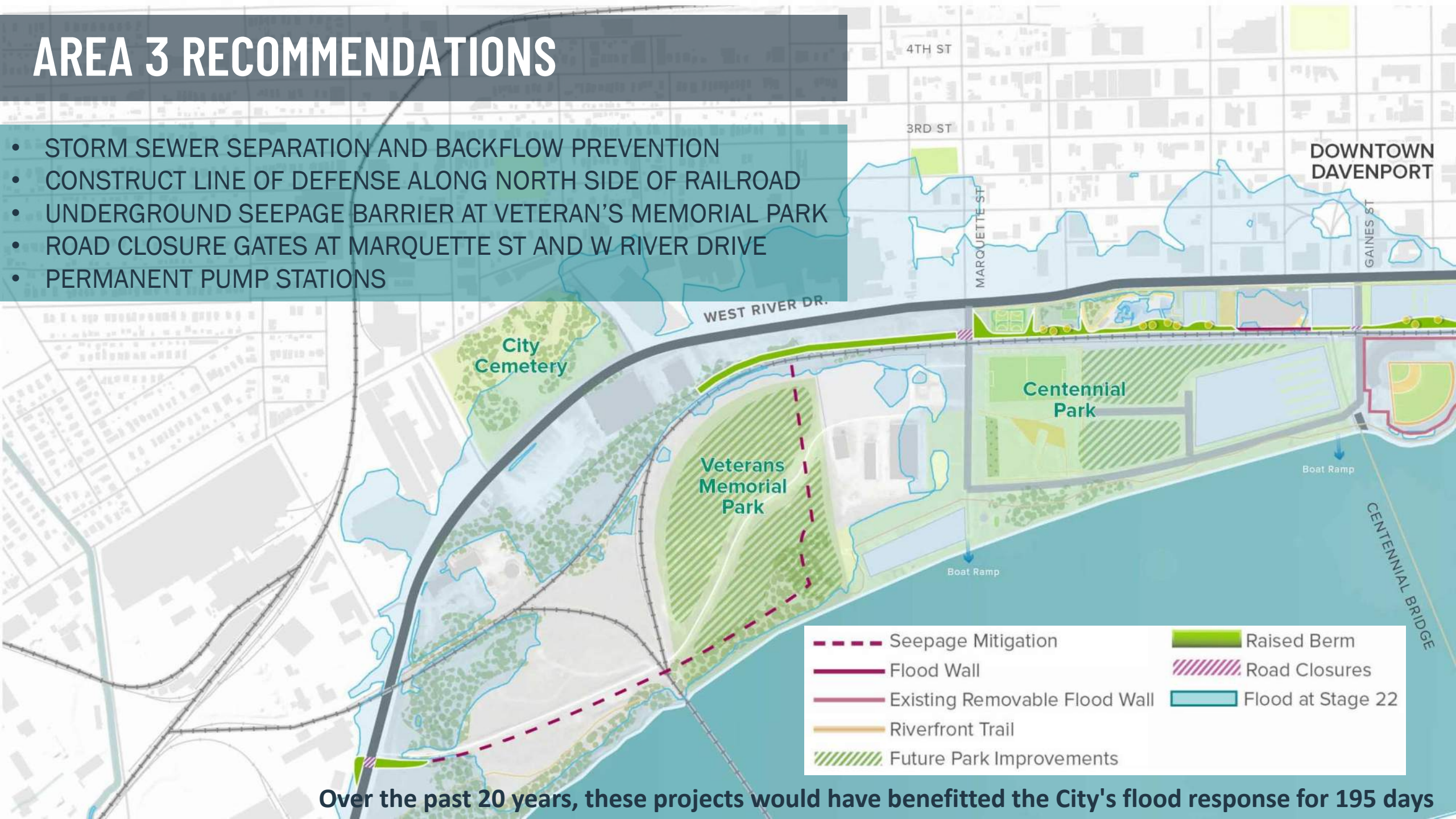
Key Takeaways

- City and private property owners expend significant effort flood fighting in Area 3
- Flooding over portions of River Drive by stage 18
- Flooding impacts riverfront parks and access to River's Edge
- Access to Marquette Public Works Facility is vulnerable
- Significant visual barriers to the river already exist between W River Drive and the railroad



AREA 3 RECOMMENDATIONS

- STORM SEWER SEPARATION AND BACKFLOW PREVENTION
- CONSTRUCT LINE OF DEFENSE ALONG NORTH SIDE OF RAILROAD
- UNDERGROUND SEEPAGE BARRIER AT VETERAN'S MEMORIAL PARK
- ROAD CLOSURE GATES AT MARQUETTE ST AND W RIVER DRIVE
- PERMANENT PUMP STATIONS



Over the past 20 years, these projects would have benefitted the City's flood response for 195 days

AREA 3 BENEFITS



- Seepage Mitigation
- Flood Wall
- Riverfront Trail
- Future Park Improvements
- Pedestrian Connection
- ← Bike Connections
- Raised Berm
- /// Road Closures

AREA 4: WEST END AND CREDIT ISLAND

Key Takeaways

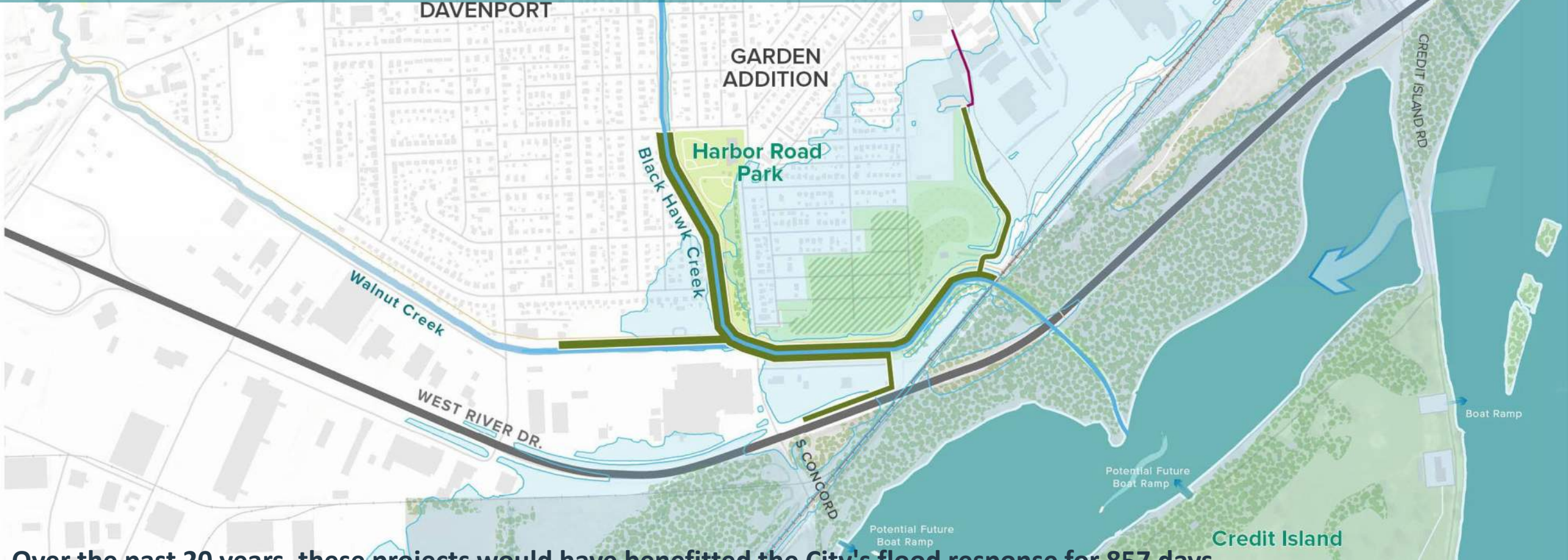
- Lack of regular flood infrastructure maintenance and inspection has been a concern
- City expends significant effort flood fighting in the Garden Addition
- Garden Addition is vulnerable to flooding from the river, creeks, and interior drainage
- Lack of trails - W River Drive and the railroad present barriers to riverfront access
- Commercial properties flood fight with some City assistance



AREA 4 RECOMMENDATIONS

- Flood Wall
- Reinforced Berm (existing)
- Riverfront Trail
- Future Park Improvements
- Flood at Stage 22

- REDUCE STORM SEWER OUTFALLS AND STANDARDIZE BACKFLOW PREVENTION
- RECONSTRUCT EXISTING BERMS AND ADD EASTERN TIE-OFF
- ADDRESS INTERIOR DRAINAGE - STORM SEWER AND DETENTION BASINS
- REPLACE CAUSEWAY WITH A BRIDGE
- PERMANENT PUMP STATIONS



Over the past 30 years, these projects would have benefitted the City's flood response for 857 days

AREA 4 BENEFITS



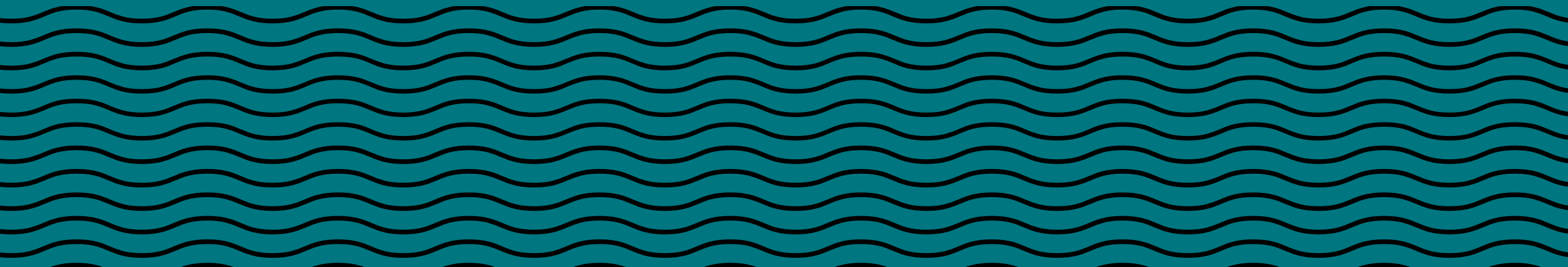
-  Flood Wall
-  Riverfront Trail
-  Future Park Improvements
-  Pedestrian Connection
-  Bike Connections
-  Reinforced Berm (existing)

STRUCTURAL MITIGATION PROJECT SUMMARY

Area	Total Project Cost Estimate
1 – East End to Arsenal Bridge	\$ 24.8MM
2 – Arsenal Bridge to Centennial Bridge	\$ 52.2MM
3 – Centennial Bridge to West End	\$ 49.6MM
4 – West End and Credit Island	\$ 36.3MM

Note: One project, estimated at \$2.5MM, has been excluded from the Area-based Total Project Cost Estimates because the costs span all project areas.

OPERATIONAL FLOOD PLAN RECOMMENDATIONS



OPERATIONAL FLOOD PLAN RECOMMENDATIONS

Update the Flood-Fighting Plan

- Allocate staff time and budget annually to update the Flood Plan
- Update operations and maintenance plan and renew agreements with private entities annually
- Revise based on recent construction projects (sewer interceptor project and others)

Standardize equipment, centralize controls

- Existing valves are all unique (i.e., turn counterclockwise, 76 times), and many leak
- Standardize gate valves, add automated closures, and connect to central SCADA system
- Gate valves can be monitored, exercised, opened/closed remotely
- Reduce training requirements, simplify operation, reduce labor effort

Retreat or flood proof impacted public facilities

- Public facilities at risk that require individual actions to prepare for flooding
- Remove, elevate, or flood proof electrical, plumbing, and other utilities
- Plan and budget to relocate susceptible city facilities at the end of useful life (i.e., Marquette Facility)

OPERATIONAL FLOOD PLAN RECOMMENDATIONS

Integrate Operational Flood Plan actions into current workflow software

- Complexity and scale of Flood Plan necessitate transition into work order management software and geo-spatial representation of flood tasks
- Work order management simplifies execution and tracking
- Geo-spatial elements enable visual tracking, map development, and mobile applications
- Reduce dependence on institutional knowledge to execute tasks

Develop agreements with partners that implement the Flood Plan

- Coordination with several entities is required. Formalize the expectations, actions, and communication channels.
- Reduce dependence on institutional knowledge and long-term relationships to execute tasks.

ADDRESSING FLOOD CRESTS ABOVE LIMITS OF MITIGATION

There's always a bigger flood

- All cost-effective flood mitigation measures may eventually succumb to next record flood
- Approach of retreat, flood proof, and realistic public investment in line of defense and pumps
- Private property owners must take personal responsibility, with support from Public-Private partnership

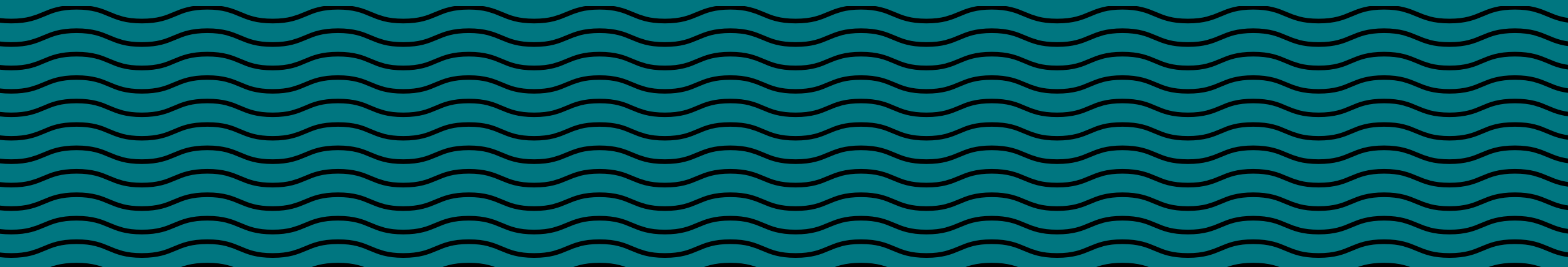
Prepare for crests above mitigation limits

- Outline actions in the Flood Plan above line of defense
- Define the stage when mitigation actions cease, transition to public safety

Identify additional temporary flood fighting measures prior to constructing mitigation

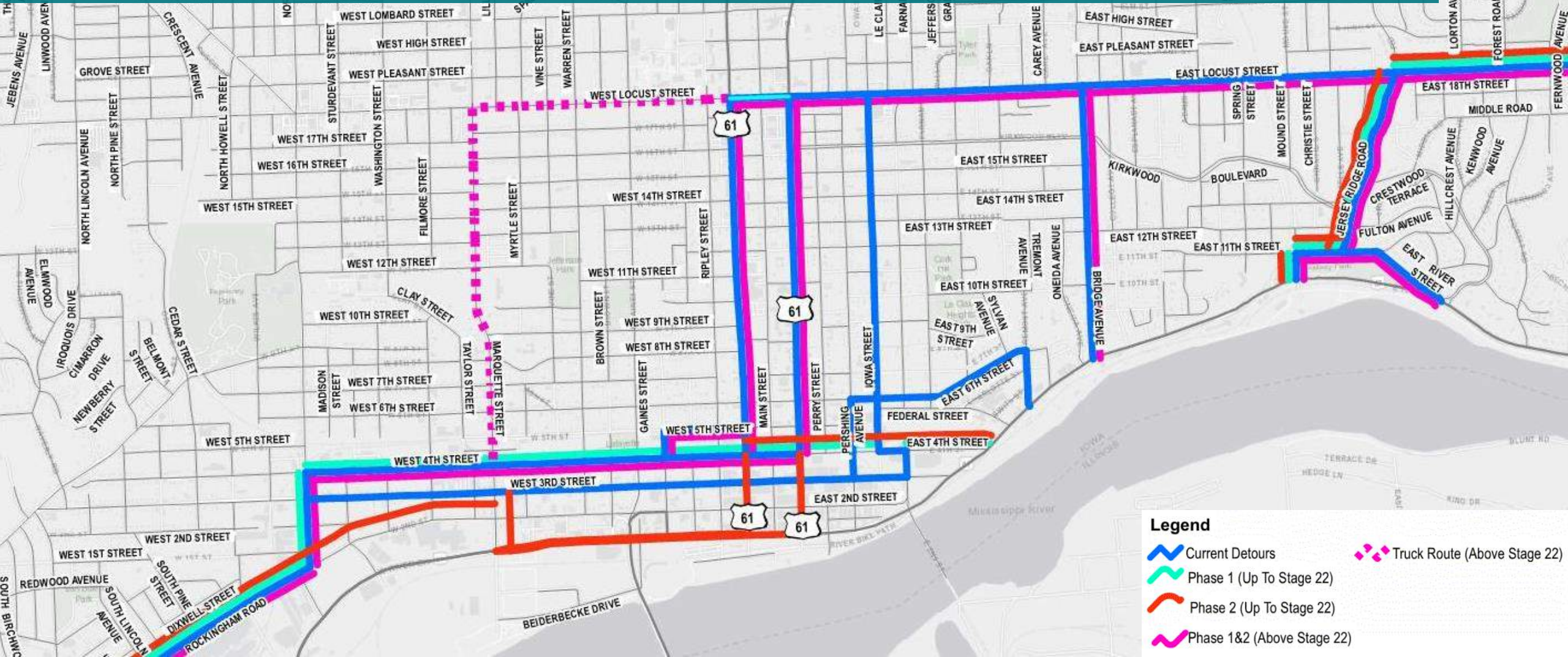
- Set design criteria for levees, floodwalls, pump stations and storm sewer separations

TRANSPORTATION RECOMMENDATIONS



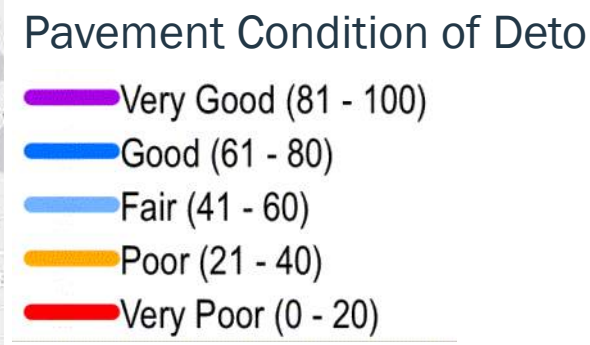
ESTABLISH A STANDARD FLOOD DETOUR ROUTE

- INCREMENTAL NATURE OF CURRENT FLOOD RESPONSE YIELDS INCREMENTAL CHANGES TO DETOUR ROUTES
- CHANGES TO DETOUR ROUTES CONFUSE MOTORISTS AND EXPEND CITY COMMUNICATION & LABOR EFFORT
- PHASE 1 PROJECTS WILL KEEP RIVER DRIVE OPEN MORE OFTEN

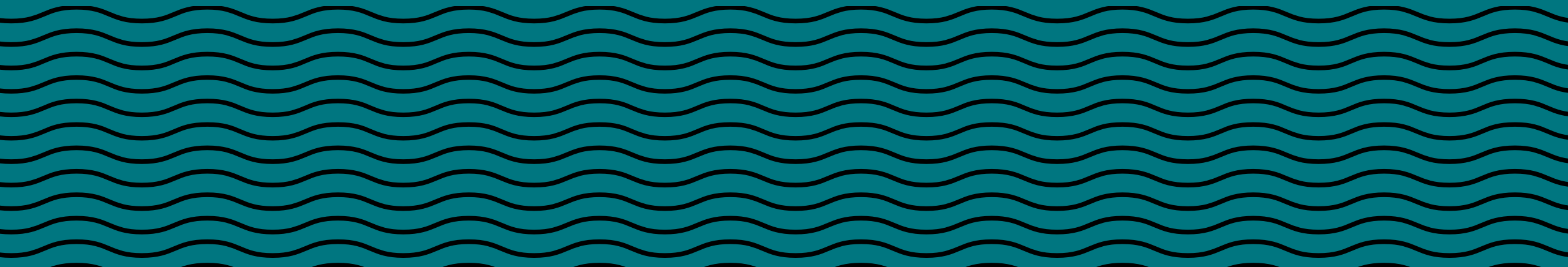


MAKE NECESSARY IMPROVEMENTS TO DETOUR ROUTES

- PRIORITIZE REPAIRS TO CITY STREETS USED FOR FLOOD DETOURS
- ACCOUNT FOR ESTIMATED TRAFFIC LOADS FROM RIVER DRIVE ON FLOOD DETOUR STREETS



IMPLEMENTATION PLAN



THE IMPLEMENTATION PLAN IS...

- 1. A framework that prioritizes structural and non-structural flood mitigation projects as objectively as possible.**
- 2. A tangible and comprehensive list of projects that have been sub-divided from the overall master plan into manageable, logical, and fundable projects that can be designed and built to form the overall master plan.**
- 3. A timeline to implement projects to avoid unnecessary costs of meshing sub-divided projects together.**

IMPLEMENTATION PLAN

Phase 1 projects are incremental solutions that maximize the flood mitigation benefit of existing infrastructure and programmatic investments.

Phase 2 projects are transformational, full system buildout projects.

Phase 3 projects increase resiliency and simplify operations of the fully built system by providing permanent pump station capacity at 14 storm sewer outfall locations.

STRUCTURAL IMPLEMENTATION – FIRST STEPS

These recommendations are based on planning-level data provided by the City, such as Flood Plan actions and notes, 1-foot contours, GIS utility data, and flood inundation maps. The recommendations should be refined prior to design and implementation with more precise data, including field survey, geotechnical and hydraulic analyses, and inspection of existing infrastructure.

Critical tasks to be completed as part of future work include:

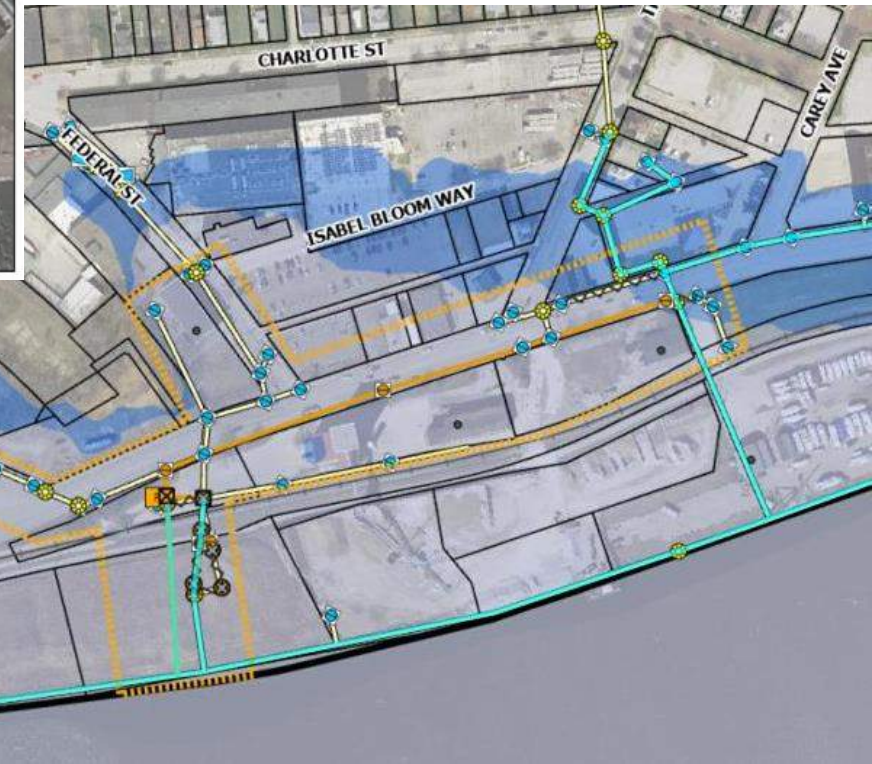
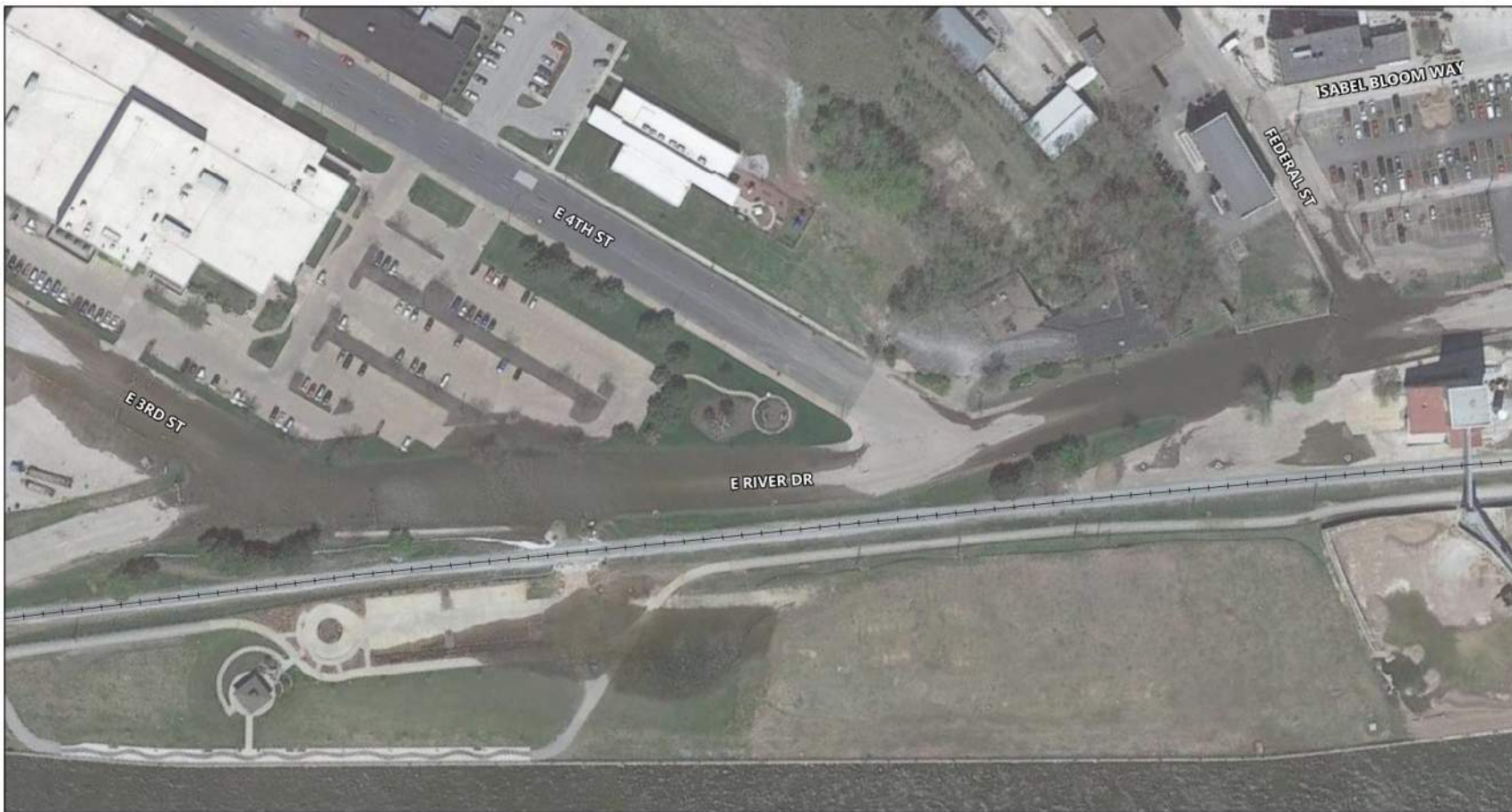
- **survey** of all key infrastructure, including roadways, storm sewer systems, topography and utilities along proposed alignments, and the top of the seawall upstream of the Arsenal Bridge
- **river modeling study**
 - to identify any impacts of the structural recommendations on Mississippi River water surface profiles (i.e., upstream/downstream property owner impacts)
 - to set the design level of defense/separation in elevation units (such as NAVD88) along the entire riverfront between the East Village and the Garden Addition
- **hydraulic modeling study** of the relationship between flow in the Government box, upstream/downstream pool elevations, and connected storm sewer systems. Some storm sewer modeling can be completed as part of the individual project design process.

IMPLEMENTATION – PHASE 1

- Projects across the riverfront that offer immediate return on investment in the form of **increased resiliency during low-moderate flood stages**
- Implement **non-structural mitigation programs** and plans
 - Property Acquisition Program
 - Public-private partnership floodproofing program
 - Citywide Stormwater Master Plan update
 - Operational Flood Plan revisions and improvements
 - Municipal building codes
 - Land use / zoning policies
 - Increase Community Rating System score
- Several projects identified in previous studies - including **rehabilitation of existing stormwater pump stations** and **rehabilitation of the Garden Addition flood berms**
- Projects to **raise E River Drive** in the East Village and install **backflow prevention** in several locations along River Drive are included.

EXAMPLE PHASE 1 PROJECT

Backflow Prevention
along East River Drive
between 3rd Street and
Tremont Avenue

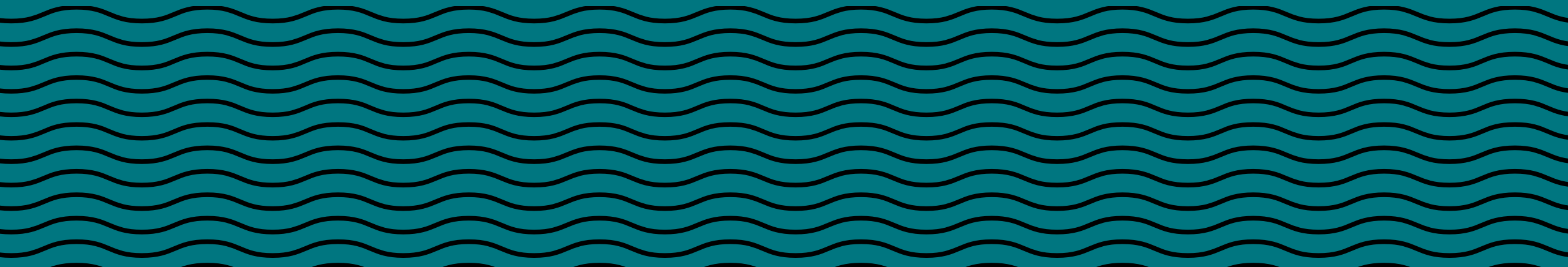


IMPLEMENTATION: PHASES 2 & 3

- Projects across the riverfront that form a continuous line of defense for **increased resiliency during moderate to major flood stages**
- Continues non-structural mitigation programs and plans begun in Phase 1
- Starts at the Arsenal Bridge and progresses downstream, constructing **above- and below-ground structural flood mitigation infrastructure** including storm sewer separation and backflow prevention, seepage mitigation, flood walls, levees, road raises, and temporary closures
- **Permanent pump stations**



FUNDING STRATEGIES

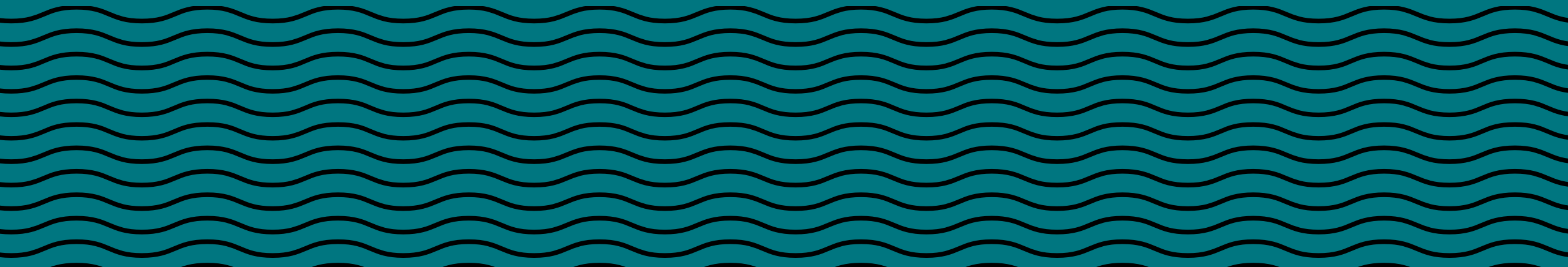


FUNDING STRATEGIES

- Identified Federal / State / Local funding opportunities
- Made suggestions matching individual projects to best-fit opportunities
- Dedicated City funding streams are required for both programs and Operations & Maintenance



SUMMARY



The Mississippi River Flood Resiliency Plan

- Meets community and City goals
- Supports the existing riverfront, park and land use plans
- Maintains the City's unique relationship with the Mississippi River
- Can be scaled to accommodate future needs, constraints, and funding opportunities
- Offers incremental and transformational recommendations that balance respect for and retreat from the river
- Phased approach that can leverage multiple funding strategies to incrementally mitigate flood risk
- Balances public investment and individual responsibility to increase flood resiliency

Reducing flood risk is a journey. This Plan serves as a road map to cost-effectively mitigate flood risk within the City of Davenport and lives out the community's continued commitment to living and working with the Mississippi River.