City of Alton, Illinois

Flood Risk Reduction Study

Flood Plain Management Services

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Presented to: The City of Alton, Illinois

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1.0 Study Purpose and Scope

This report examines opportunities to reduce the flood inundation risk to structures located along the Mississippi River near the downtown area of the City of Alton, IL in light of increasing recurrence and duration of high-water events. The purpose of this report is to provide the City of Alton officials sufficient information to make informed decisions regarding future flood risk management activities.

The scope of this report is to provide the City of Alton with an analysis of structural and non-structural proposed measures, including a structure inventory, to assist the City with reducing long-term flood risk. The structure inventory can be found in Appendix B. The evaluations in this report take into consideration local hydraulics, site conditions, structure attributes, and other benefits. The analysis will primarily be comprised of existing data. Sources referenced throughout the main report include data from the City of Alton, Madison County, Federal Emergency Management Agency (FEMA), U.S. Army Corps of Engineers (USACE), U.S. Geological Survey (USGS), and National Oceanic and Atmospheric Administration (NOAA).

Throughout this report, flood events and their resultant inundation will be referred to by Annual Exceedance Probability (AEP), which is the probability that this level of flooding may be realized or exceeded in any given year. For example, a flood event with a 1% AEP would have a 1% probability of occurring every year. This is a change in terminology from the recent commonly used term "annual chance of exceedance" (ACE). Additionally, in the past, flood events have often been described by their "return period" – or the estimated average length of time between flood events of a similar magnitude. A 1% AEP event would have been referred to as having a 100-year return period or being a 100-year event. This terminology is no longer used because it falsely conveys a sense of time and lowers public risk perceptions. Table 1 provides a list of common AEP flooding events for reference, with their equivalent "return period." It is important to note that all AEP references in this report are for expected water levels inside and outside the system, not the AEP of meteorological events (i.e., a 1% flood event is not the same as, nor does it necessarily occur as a result of, a 1% storm event).

Table 1. Comparison of AEP, ACE, and Return Period Terminology

AEP/ACE	Return Period*
20%	5-year
10%	10-year
4%	25-year
2%	50-year
1%	100-year
0.5%	200-year
0.2%	500-year
0.1%	1000-year
*Note: Return Period is a term that can be misleading, is often misunderstood, and is no longer used by USACE (see ER 1110-2-1450).	

2.0 Study Background

2.1 Study Authority

This study is a special study under the Flood Plain Management Services (FPMS) program and is authorized by Section 206 of the Flood Control Act of 1960 (P.L. 86-645), as amended. The FPMS program allows USACE to conduct small, conceptual studies for local communities. This program is for planning only, and it is possible that additional analyses beyond this report would be needed in order to further design or construct the various flood risk reduction measures in the report.

"That, in recognition of the increasing use and development of the floodplains of the rivers of the United States and of the need for information on flood hazards to serve as a guide to such development, and as a basis for avoiding future flood hazards by regulation of use by States and municipalities, the Secretary of the Army, through the Chief of Engineers, Department of the Army, is hereby authorized to compile and disseminate information on floods and flood damages, including identification of areas subject to inundation by floods of various magnitudes and frequencies, and general criteria for guidance in the use of flood plain areas; and to provide engineering advice to local interests for their use in planning to ameliorate the flood hazard: Provided, that the necessary surveys and studies will be made and such information and advice will be provided for specific localities only upon the request of a State or responsible local governmental agency and upon approval by the Chief of Engineers."

2.2 Study Location

The City of Alton, Illinois is located on the east bank of the Mississippi River at approximately River Mile 203, in Madison County, Illinois. Alton is located approximately 22 miles north of St. Louis, Missouri. The study area has been defined in coordination with the City to focus on structures that receive flooding in the downtown region, encompassing approximately 33 acres (Figure 1).

The City experiences consistent flooding from the Mississippi River due to its proximity to the river. The current FEMA flood profile for the Mississippi River shows flooding from a 1% AEP event reaching a water surface elevation of approximately 437.7 ft NAVD88. Google street view and the National Structure Inventory (NSI) 2.0 were used to collect data for structures in the 0.2% AEP (500 Yr.) floodplain. Current conditions show that the 1% AEP event on the Mississippi River would inundate an approximately 7-acre area north of W. Broadway in Downtown Alton, as shown in Figure 1.

It should be noted that current FEMA profiles were last updated in 1984. This study utilizes Flood Insurance Rate Map (FIRM) 2016, which is the most current information. FEMA is currently in the process of releasing updated FIRMs, however, for the study area the updated maps are not yet effective.

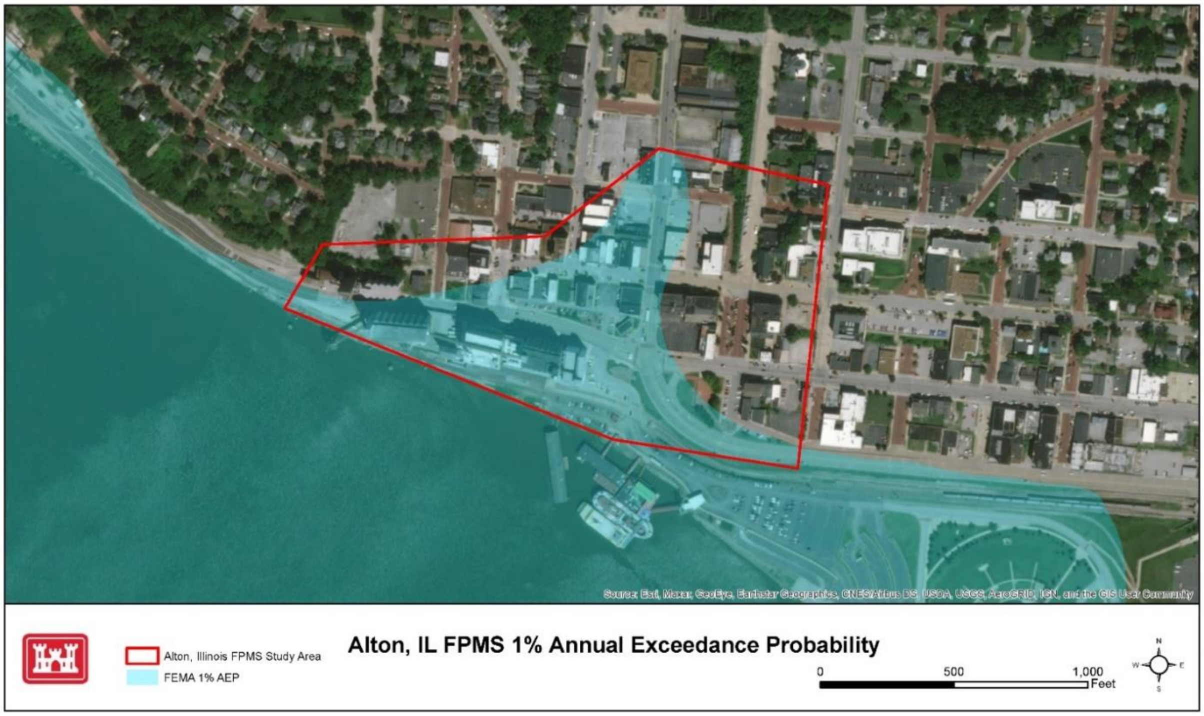


Figure 1: Alton, IL FPMS Study Area & Preliminary Flood Insurance Rate Map

2.3 Alton Flooding History

The City of Alton's experience with flood fighting efforts in the downtown area is well known from the high-water crests in the 1970's and 1980's, the record flood in 1993, and the consistent flooding from 2016 to present. The 2019 flood was the 2nd highest flood on record after 1993. Four of Alton's top ten record flood events have occurred since 2013.

In recent flooding events, the streets near the intersection of Route 67 (Piasa Street) and Route 100 (W. Broadway), are impassable to pedestrian and vehicular traffic, preventing personnel and customer movement. The flooding in the study area has impacted the ability for local businesses to conduct normal operations. In 2019, the estimated flood mitigation and recovery costs exceeded $700,000 and over $4M in property damages incurred for the entire City of Alton. Although it is a disruption, the flooding of the roadways does not impede emergency response for the general area. There are nearby alternate routes that are accessible during these flood events. While flooding can pose a risk to the life safety of Alton's citizens, there have been no reported deaths due to flooding within the last 25 years. Therefore, no additional life safety analysis was performed as part of this effort.

During flood events, Alton has built and maintained a temporary flood wall to protect the businesses and residents of the downtown area. The temporary flood wall has provided sufficient protection from flooding; however, overtopping has occurred, resulting in structural and economic loss. When constructed, the temporary flood wall is approximately 1,250 feet in length and averages five (5) feet in height. This large footprint requires significant manpower efforts in order to place the large tonnage of barrier blocks and gravel. Since the 1970's, Alton has constructed the temporary flood wall approximately seven (7) times as part of their floodlighting efforts in the downtown area. Figure 2 shows the current placement of the temporary floodwall placement when constructed.

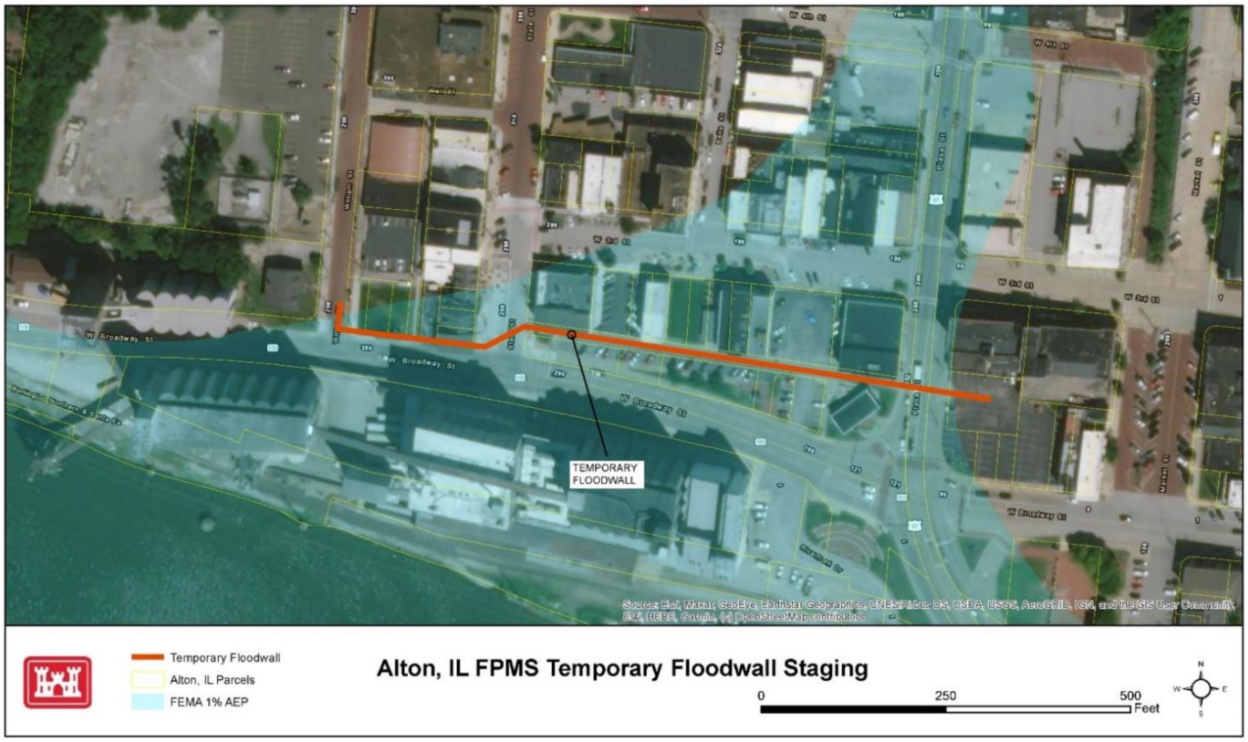


Figure 2. Alton, IL Temporary Flood Wall Location

3.0 Existing Conditions

3.1 Hydraulics and Hydrology

The City of Alton is bounded by the Mississippi River to the south. USACE Melvin Price Lock and Dam is located approximately 4 miles downstream. The Mississippi River is the primary source of flooding within the study area. The Upper Wood River Levee System provides flood risk reduction for a portion of the City of Alton and ties into high ground just before the Alton Amphitheater. At this tie-in, Alton is situated on high ground, but at the study area located in downtown Alton, the developed area is situated at an elevation at risk to flood water elevations.

The flood of record at Alton occurred during The Great Flood of 1993 where floodwaters reached a gage height of 42.7 feet measured at Mel Price Lock and Dam. This converts to an elevation of 437.8 feet NAVD88. Flooding in 1993 occurred in the summer as a result of heavy rains occurring simultaneously in the Upper Mississippi River and Missouri River basins. Seasonal flooding in the Upper Mississippi River Basin often occurs in late spring or summer due to snowmelt and heavy precipitations, but record floods can also occur in fall or winter. The Flood of 2016 reached a record elevation of 430.8 feet NAVD88, is the 5th highest recorded flood for the Alton gage.

The current effective FEMA Flood Hazard boundary for a 1% AEP (100 Yr.) event in the City of Alton is at elevation of approximately 436.9 feet NAVD88, last updated in 1984. Table 2 below gives the flood profiles from the USACE 2004 Flow Frequency Study of the Upper Mississippi River. This 2004 study contains the official effective water surface profiles for the Mississippi River and is the most recent to utilize to compare flood records, i.e., 1993, 2016, etc. See Appendix A: Hydraulics and Hydrologic Analysis for more detail.

Table 2: Alton, IL Flood Elevations, Mississippi River, approximately Mile 203

Statistical Return Period	Annual Exceedance Probability (AEP)	Elevation* (ft, NAVD 88)
2-year	0.5	421.2
5-year	0.2	425.6
10-year	0.1	428.4
25-year	0.04	431.9
50-year	0.02	434.7
100-year	0.01	436.9
200-year	0.005	439.1
500-year	0.002	440.5
*Denotes interpolated data		

The Hydrologic Engineering Center's River Analysis System (HEC-RAS) model for existing conditions and future with and without project conditions generated water surface profiles for eight AEP events including the 50%, 20%, 10%, 4%, 2%, 1%, 0.5%, and 0.2%. For this study, a 1-D HEC-RAS hydraulic model of the Mississippi River Floodway was modified to produce flood inundation results in the study area. Flow corresponding to the frequency profile elevations from the 2004 USACE Flow Frequency Study were used as the model inflows. The results of the modeling were combined with LiDAR terrain of the study area to produce depth grids for economic and cultural analysis.

Current flood frequency analyses and hydraulic modeling indicate flooding of the downtown Alton area will continue to be at risk for hydraulic events less frequent than a 4% AEP event. In current and future conditions, the City would have to continue flood fighting efforts to reduce flood damages to downtown area.

In addition to the Mississippi River water overtopping its banks and rising against the temporary floodwall, the City has identified other sources of flooding, including under seepage (I.e., water coming from underneath the wall and through the soil beneath the wall), drainage water from nearby bluffs, and stormwater runoff and backup. This study only identified flood risk reduction measures to address the out-of-bank flooding by the Mississippi River. Additional analyses would be needed to address the other sources of flooding, such as an interior drainage analysis, prior to any additional design and potential construction of flood risk reduction features.

The future condition of the study area is anticipated to remain the same as the existing condition. Without additional flood risk reductions measures, it is assumed that the City will continue to expend resources to continue flood fighting efforts. Despite being at risk of flooding, the business owners remain resilient and the market values for the commercial properties remain steady. Of the 35 structures impacted by the 1% and 0.2 % AEP flood events, nearly all remain occupied at this time. The average flood prone home was built in 1939 in Alton, and pre-dates the National Flood Insurance Program (NFIP) and delineation onto the Flood Insurance Rate Map (FIRM). The homes that pre-date the NFIP were grandfathered into the program and have lower flood insurance rates and less restrictive regulatory requirements. Lower rates and lesser regulatory requirements persist until a change in ownership or substantial improvement occurs.

3.2 Economics

A windshield survey of the study area was performed using Google Street View. A windshield survey is when structures are assessed to determine structure characteristics, such as foundation type, foundation height, and first floor elevation. In the Alton study area, there are 12 multi-use structures that are commercial units on the first floor and residential units on the upper floors. The windshield survey is conducted for completing preliminary recommendations, but in order to ensure accuracy, individual structure assessments would be required prior to implementing specific nonstructural mitigations. The recommendations in this report would mitigate flood damages up to the 1% AEP flood event and do not address potential damages from greater (less frequent) flood events.

If no flood risk reduction measures were implemented in the City of Alton, the current economic conditions are likely to remain the same. Structures will continue to be inundated regularly and residential and business owners can expect continued economic losses due to flood damages. Due to the age of structures in the City, most are built in low-lying areas and experience repetitive flooding. Alton has limited funds that are exhausted when implementing temporary flood risk reduction measures such as a floodwall to prevent damages to businesses and infrastructure. Businesses struggle due to reduced tourism caused by access restrictions during flooding, particularly during most of the 2019 tourist season. In the absence of Federal and State assistance, the City will continue to suffer significant expenses and economic losses from the recurring impact of floods.

3.3 Recreation and Environmental Resources

The Great River Road, which is over 2,000 miles long, runs along the Mississippi River past 10 states and hundreds of historic, river towns. Certain portions of the Great River Road have been designated as a national scenic byway, including the 33-mile stretch from Hartford to Grafton, Illinois which is known as the Meeting of the Great Rivers National Scenic Byway. The byway traverses the study area.

The Downtown Alton area is a popular tourist attraction that contains many of the area's main attractions, shops, and restaurants. It is known for lodging and residential areas with river views and a walkable lifestyle. Many of the City's tourist attractions are in this vicinity, including the Alton Visitor's Center, as well as several significant historical attractions, including two Historic Districts, Civil War Confederate Prison, and Lincoln-Douglas Square. See Section 3.5 for *Cultural Resources and Historic Structures*.

The Riverfront Park is in walking distance to downtown Alton. The park has walking / biking trails, docking location for riverboat cruises, Argosy Casino Alton, and Alton Marina. The trails through Riverfront Park connect two Madison County Transit trails including one that traverses the Great River Road and others that connect to neighboring communities and the old Chain of Rocks Bridge, connecting to Missouri. The Liberty Bank Amphitheater is located within Riverfront Park and hosts a multitude of special events each year.

The study area mainly consists of developed areas. Based on data from the National Wetlands Inventory (NWI), created by the U.S. Fish & Wildlife Service, there are no wetlands in the study footprint. This wetlands assessment has not been field verified. Should construction proceed, a wetlands survey should be conducted to verify that no wetlands would be affected by the project.

3.4 Hazardous, Toxic, and Radioactive Waste (HTRW) Concerns

A preliminary HTRW assessment was conducted with information from Environmental Protection Agency's (EPA) EnviroFacts website, Illinois Hazmat cleanup records, and past Phase 1 and 2 Assessments conducted near the study area. See Appendix C: Hazardous, Toxic, and Radioactive Waste (HTRW).

3.5 Cultural Resources and Historic Structures

There are two (2) National Register of Historic Places (NRHP) listed Historic Districts within the study area (Figure 3): the Middletown NRHP District and the Christian Hill NRHP District. These two districts converge along State Street. The Middletown NRHP District includes the downtown Alton business district to the east of State Street and extends east and north. The original nomination was accepted and placed on the NRHP on 17 September 1977, incorporating the original town of Alton, Hunter's development, and a section of the historic downtown business district. The boundaries of this original submission are roughly Broadway, Market, Alton, Franklin, Common, Liberty, Humboldt, and Plum Streets. A boundary modification to include the entire historic business district was listed on the NRHP on 4 January 2022 (Boundary Increase 2). This extended the southern section of the Middletown District to the west to State Street, where it meets the Christian Hill NRHP. This boundary increase is within the current study area, and many of the buildings contribute to the historic district (approximately 20). The buildings and structures of the boundary increase represent the commercial growth of Alton between

1849 and 1962. There are no individually NRHP-listed buildings from the Middletown NRHP District within the study area.

The Christian Hill NRHP District includes the buildings along the west side of State Street and continues up the bluff (west and north). It was placed on the NRHP on 17 September 1977 and is roughly bounded by Broadway, Belle, 7th, Cliff, Bluff, and State Streets. It includes residential and commercial structures representing the growth of Alton from ca. 1830 to 1910. Most of the commercial structures are along State Street. There are approximately 9 buildings that contribute to the historic district within the study area. There are no individually NRHP-listed buildings from the Christian Hill NRHP District within the study area.

The archaeological site of the Alton Military Prison is within the study area. It is within the Christian Hill NRHP District and is an individually listed archaeological site on the NRHP (on 31 December 1974). It is bounded by Route 100, William, 4th, and Mill Streets. Started as Illinois' first state penitentiary, it was reutilized during the Civil War as a prison for confederate soldiers. Currently it is a paved parking lot, but according to the 1974 survey report (Perino and Struever 1974) there may be more foundations and original cell block flooring under the parking lot.

The only cultural resource surveys conducted within the study area are those for the historic architecture, which were the basis of the historic district nominations, and the archaeological investigation at the Alton Military Prison. A map also provided Appendix D: Map of Alton, IL National Register Historic Districts and Historic Structures

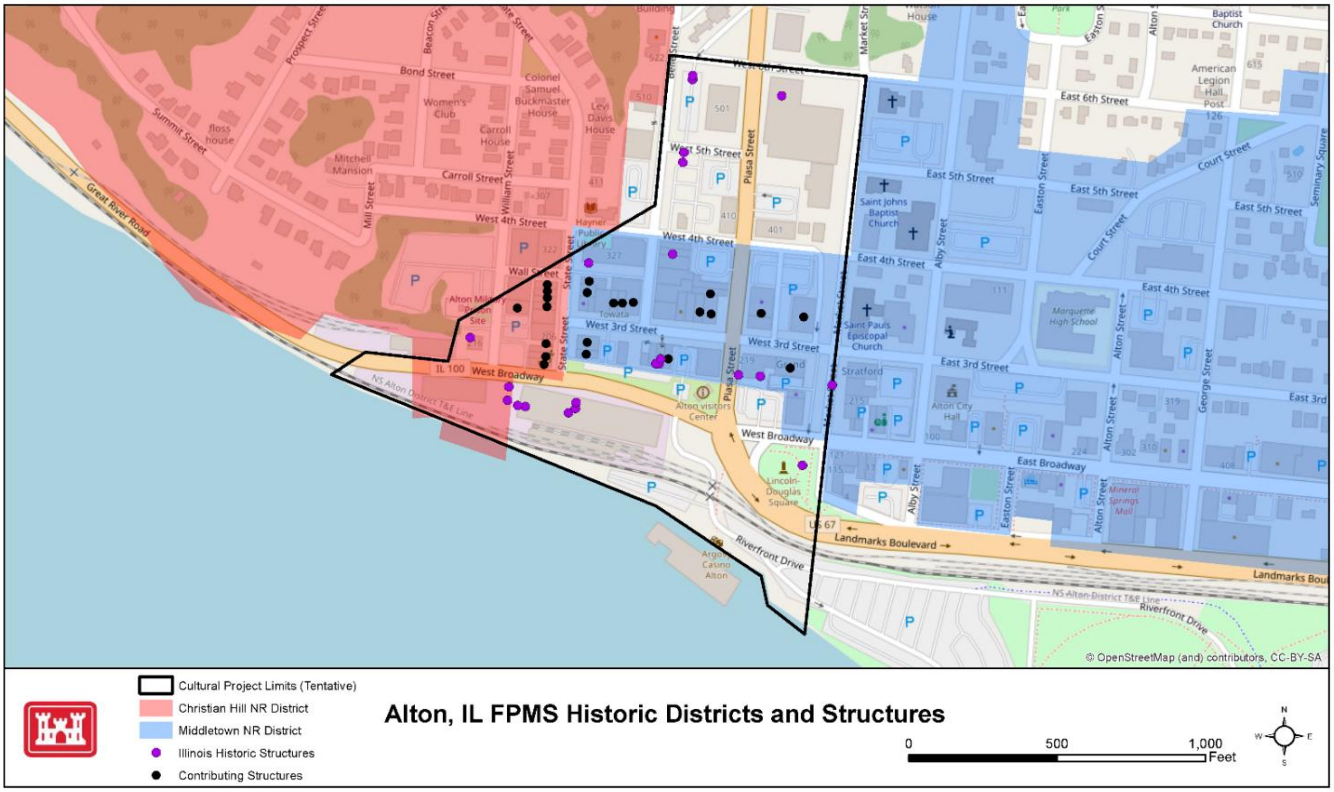


Figure 3: Alton, IL National Register Historic Districts and Historic Structures

It is assumed that the existing historic structures would remain in the study area. However, without a flood risk reduction project these structures would be protected through stopgap measures. If the temporary measures were to fail, the structures would have the potential to be damaged to a point where they would qualify for buy-out under a FEMA program to reduce flood damage. As a result, structures would be removed, and the historic and/or historic architectural value would be lost. The loss of non-historic structures could also affect the historic setting of the remaining historic resources, thus also resulting in a negative impact.

3.5.1 Cultural Impacts of Proposed Solutions

Any permanent option for this project would most likely have an adverse effect on the Christian Hill and Middletown NRHP Historic Districts. A levee/floodwall would affect visual impact of both districts. The impact for the Christian Hill District is less because the view of the Mississippi River is already impacted by the grain silo structures and the buildings of the Middletown District. The Middletown District would be impacted by the potential alteration of its setting and the restricted view of the Mississippi River. Depending on the final plan, construction may or may not have a direct effect on any individual buildings. Temporary flood wall structures adversely affect the historic districts when deployed but do not pose permanent cultural impacts to the historic districts. There is no currently known adverse effect to the Alton Military Prison site.

Any of these actions would require the implementation of the federal regulation 36CFR Part 800 – Protection of Historic Properties as mandated by the National Historic Preservation Act of 1966 as amended through 1992. This implementation would elicit required consultation with the State Historic Preservation Office, the Advisory Council on Historic Preservation, local government, county and local historical organizations (such as the Alton Area Landmarks Association), and other organizations with a demonstrated interest in the undertaking (such as Alton Main Street, AltonWorks, etc.). The project would most likely require the drafting of a programmatic agreement which would detail plans to mitigate the potential adverse effects to the Christian Hill and Middletown NRHP Historic Districts.

4.0 General Flood Mitigation Options

As it pertains to flood risk management, mitigation refers to the idea of performing an action in order to reduce risk of flooding causing damage to structure or acting as a risk to the health/safety of people. In this report, mitigation approaches are broken down into structural measures (levees, floodwalls, etc.) and nonstructural measures (floodproofing, elevations, and acquisition of structures).

4.1 Nonstructural Mitigation Measures

Nonstructural measures reduce flood damages without significantly altering the nature or extent of flooding. Damage reduction from nonstructural measures is accomplished by changing the use of the floodplains, or by accommodating existing uses to the flood hazard. They can be considered independently or in combination with structural measures. Non-structural flood proofing is an umbrella term that incorporates flood mitigation techniques that do not involve structural methods, such as berms, levees, floodwalls, flood gates, etc. Instead, non-structural flood-proofing methods are categorized as follows:

1. Dry or Wet Flood Proofing
2. Elevation
3. Structure Acquisition or Relocation

4.1.1 Dry Flood Proofing

Dry flood proofing attempts to keep water away from the structure by creating a watertight seal with exterior barriers such as impervious sheeting, waterproof walls, watertight shields for doors and windows, and drainage collection systems such as a sump pump. Dry flood proofing is best for slab foundation structures and flood depths three feet or less, which limits hydrostatic forces pushing on subfloor areas. This measure achieves flood risk management benefits but is not recognized by the NFIP for any flood insurance premium rate reduction if applied to residential structures. Figure 4 shows a diagram that summarizes the features of dry flood proofing. Dry flood proofing is the recommended mitigation approach for historic structures.

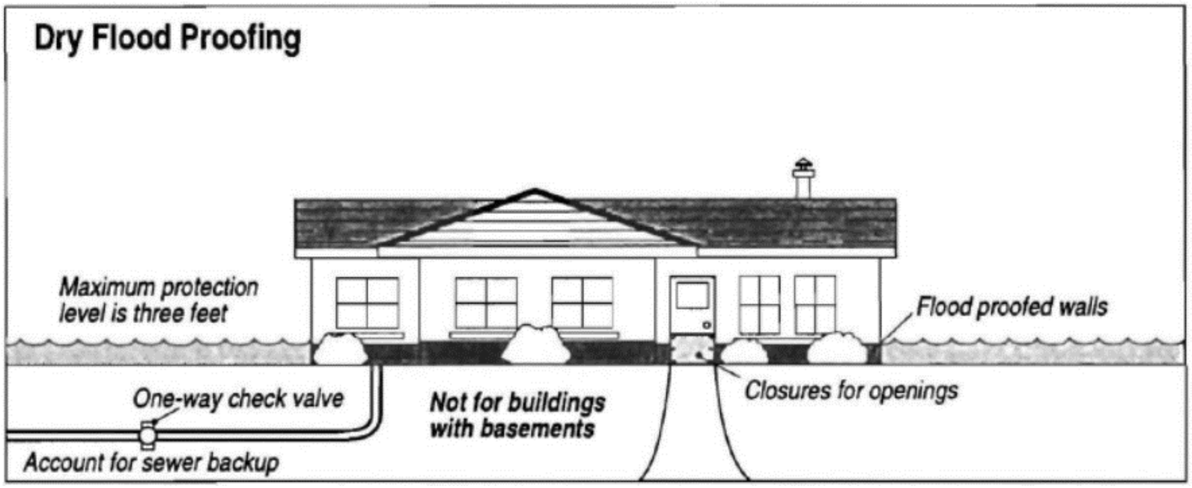


Figure 4. Nonstructural Dry Floodproofing Diagram

4.1.2 Wet Flood Proofing

Wet flood proofing allows water to enter the structure as it naturally would, but this type of inundation would not cause damages because the utilities, appliances, or other high value items would have proactively been relocated to a higher elevation within (or on top of) the structure. The benefit of allowing water into a structure is to equalize or lessen the load on floors and walls from the effects of hydrostatic forces. While not typically recommended, a residential structure can be wet floodproofed by being constructed and finished with water resistant materials as shown in Figure 5. Wet flood proofing is best suited for warehouse structures given the open floorplans that can be retrofitted to elevate high value machinery and inventory. If the structure does have a subfloor area such as a basement, it is commonly recommended to fill the basement with sand or other material and relocate the lost square footage into a new addition above the base flood elevation.

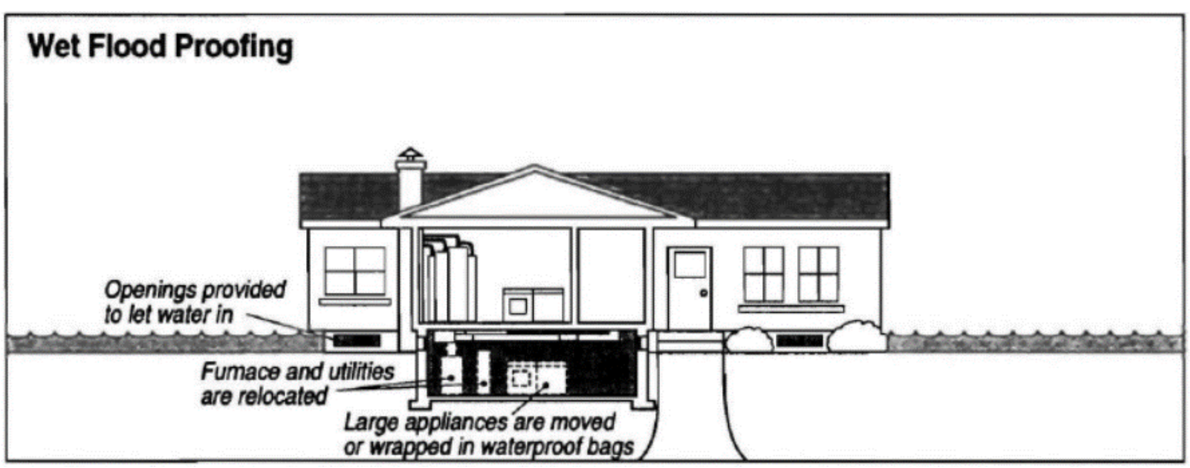


Figure 5. Wet Flood Proofing Diagram

4.1.3 Elevation

Elevation is the lifting (or raising) of an existing structure to an elevation which reduces flood damages to a desired level (typically equal to or greater than the 1% annual exceedance probability flood elevation). The elevation of a structure is generally more expensive than flood proofing, but it also provides more benefits. For this strategy, the structure is elevated from its existing foundation material onto a new foundation. Each foundation type has its own challenge to elevate with crawlspace foundations being easiest and slab foundations being the most challenging. Similar to other flood proofing alternatives, any utility from a basement would be lost as the only subfloor area allowed under NFIP regulations would be an enclosure with the appropriate number of vents to allow for hydrostatic pressure equalization. The analysis for this report assumes that any buildings with subfloor areas such as basements would not be converted to enclosures and would therefore be enclosed with fill. Figure 6 shows a diagram that summarizes the features of elevation. The elevation mitigation approach assumes that each structure is elevated high enough to be greater than the base flood elevation.

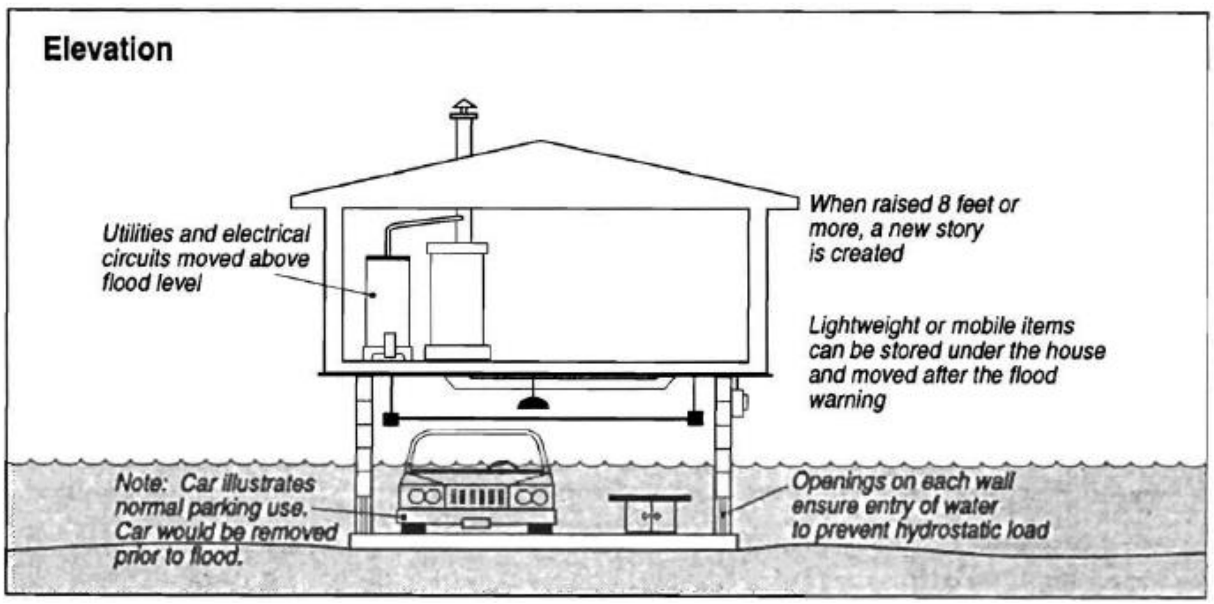


Figure 6. Nonstructural Elevation Diagram

4.1.4 Acquisition and Relocation

Structure acquisition (buyout) and relocations are mitigation strategies that remove the hazard from the floodplain, which is the only nonstructural alternative that permanently reduces flood risk. Relocations involve uplifting a structure onto a transport vehicle and relocating it to an area outside of the floodplain. Acquisitions involve purchasing and demolishing the home or building, and acquisitions generally place a deed restriction on the property to prevent future development in perpetuity. Acquisition is generally the most expensive mitigation approach as it requires compensating the homeowner the full market value of the structure.

4.2 Structural Mitigation Measures

Structural flood risk management measures are physical modifications to the floodplain or floodway designed to reduce the frequency of damaging levels of flood inundation. Structural measures can be designed to act as a physical barrier between floodwaters and structures at risk of being damaged by those floodwaters or as a means of storing floodwaters upstream. Examples of structural measures include dams with reservoirs, dry dams, channelization measures, levees, walls, diversion channels, pumps, and bridge modifications.

For the purposes of this study, the construction of a levee was evaluated as a potential mitigation measure. In general, levees are earthen structures, typically 10-12-foot top width (crown), and typically 1 on 3 slopes. Levee height determines the levee's base width; for a 10-foot-high levee with a 12-foot crown, the base of the levee would be approximately 102 feet wide, not taking into consideration the 15-foot vegetation buffer on each side. Levees also require regular inspections and have annual operation/maintenance costs. Due to several concerns, including the lack of space, expense of real estate, concerns with historic districts, and impacts to aesthetic resources, it has been determined at this time that a levee is not feasible as part of this study.

While the construction of a levee was not considered, another similar structural measure was considered: the construction of a floodwall. Floodwalls typically require less real estate in order to construct, however the materials and the design are considered more expensive per linear foot than a levee. As part of the scope of this study, various floodwall alignments were considered (see Section 6.0).

4.3 Study Constraints and Considerations

Constraints are restrictions that limit the planning process. Some constraints are general and common to all studies (such as resource constraints and legal and policy constraints). Resource constraints are those associated with limits on knowledge, expertise, experience, ability, data, information, money, and time. Legal and policy constraints are those defined by law, Corps policy and guidance. Other constraints are specific and unique to each study. Study considerations include information that may influence the study process or conclusions. A clear understanding of constraints and considerations is essential to the success of the planning and evaluation process.

The following specific constraint was identified for this study:

- The study is limited to the scope and funding identified in the Flood Plain Management Services (FPMS) program. This program is for planning only, and it is possible that additional analyses beyond this report would be needed in order to further design or construct the various flood risk reduction measures in the report.

The following are considerations for the study:

- A potential project may need outside entity and/or government buy-in to aid in project implementation and potential funding.
- Ensuring no negative impacts on other areas with proposed modifications.
- Avoid or minimize impacts to Cultural and Historic Structures. See Section 9.2 for details.
- Dense urbanization limits areas of available space to implement flood risk management measures.
- There is limited space within the study area for the installation of structural alternatives such as levee and floodwalls.
- Maximize cost efficiency of flood management measures.
- Uncertainty in cooperation of property owners to administer and maintain mitigation measures.

5.0 Alton Floodplain Analysis

5.1 Ground Surface Elevation Analysis

Light Detection and Ranging (LiDAR) data displays the ground surface elevation across a spatial map. Figure 7 shows 1-meter resolution LiDAR data for Alton demonstrating how flooding affects the downtown area. The lowest ground surface elevation in the study area is located near Piasa Street and Belle Street and is evident in Figure 7. Flood waters will travel to the lowest ground surface areas and retain water which increases the depth and duration of the flooding. In Figure 7, while the areas shown in green indicate the lowest ground surface elevation, these areas are higher than the 0.5 AEP (2 Yr.) flood water surface elevation (421 NAVD88). This indicates that the most flood prone areas within the study area are concentrated within the first few blocks near the river.

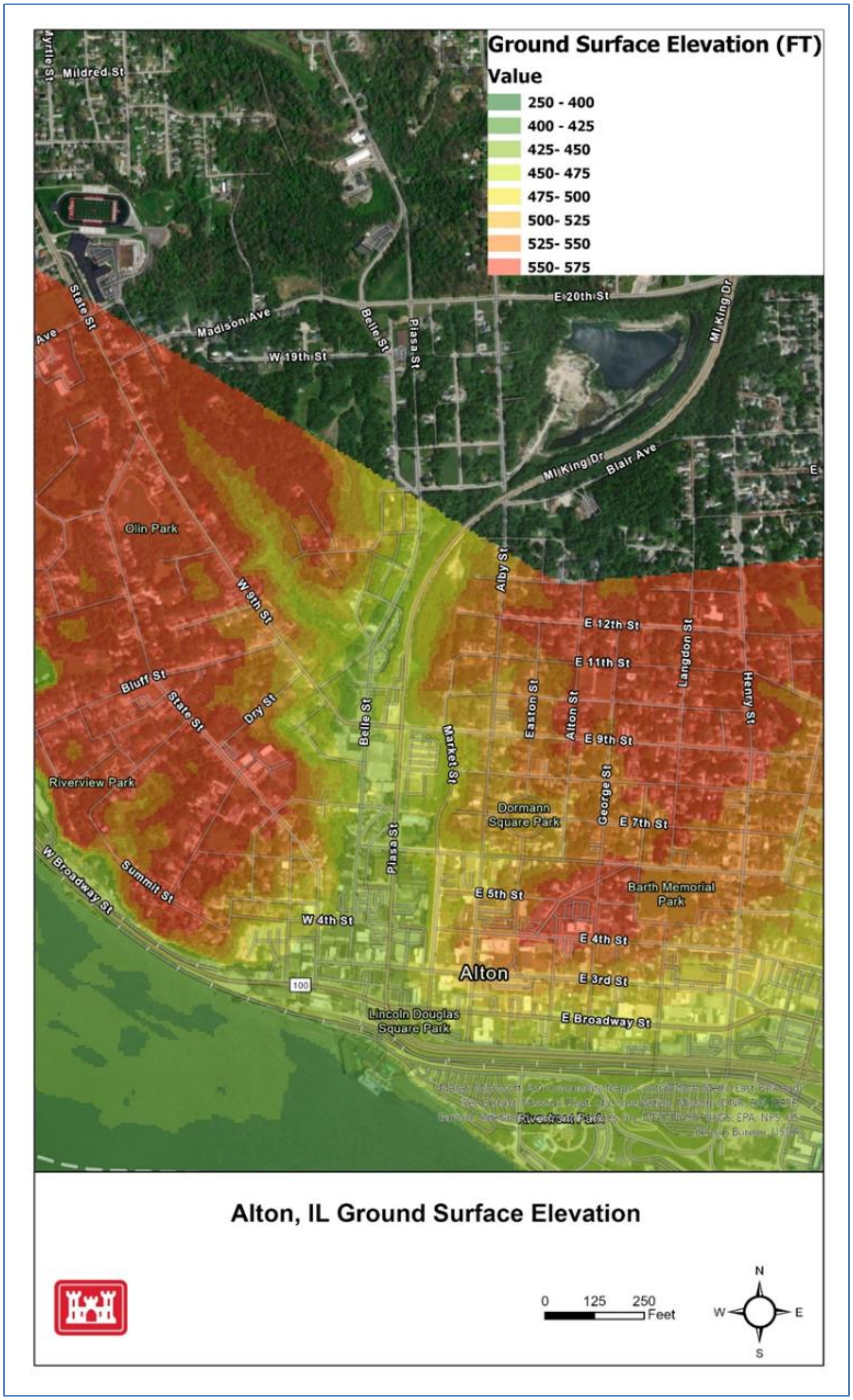


Figure 7. Downtown Alton and Vicinity Ground Surface Elevation

5.2 Flood Susceptibility

There are three primary ways to measure flood susceptibility in structures:

1) First-Floor Elevation
2) Beginning Damage Elevation
3) Depth of Flooding Relative to First Floor

5.2.1 First-Floor Elevation

First-floor elevation is defined as the ground surface elevation plus the foundation height, which was measured during the Google Street View windshield survey for each structure. First-floor elevation can be used to quickly identify structures that are more likely to be flood prone, relative to neighboring structures. Additionally, the first-floor elevation signifies where the majority of damages to contents and the building envelope begin. While a first-floor elevation measurement provides an assessment of the elevation significant at which damages begin, it does not properly illustrate where water enters the building, or the depths of flooding given at a particular flood event.

5.2.2 Beginning Damage Elevation

Beginning damage elevation is defined as the lowest point at which water begins to enter the building and is dependent on the building's foundation type. Beginning damage elevation is measured as ground surface elevation plus any distance up to a basement window, crawl-space vent, or a door or window leading into the structure. The beginning damage elevation statistic is a more accurate data point than first-floor elevation because it accounts for the different types of building foundations.

5.2.3 Depth of Flooding

The depth of flooding relative to the first floor elevation of a structure is the most precise indicator of flood susceptibility and goes beyond the normal measure of first floor elevation by indicating how high flood depths are expected to rise to give the 1% AEP or 0.2% AEP flood events. A depth of flooding measurement of two feet would indicate that a 1% AEP flood event would expect to flood the structure two feet above the first floor. A depth of flooding measurement of negative two feet would indicate that flooding may not reach the first floor but instead could cause damage in a subfloor space such as the basement or crawlspace. Since the ground surface elevation changes spatially, the depth of flooding statistic provides the best overall characterization of flood susceptibility by being able to compare flood prone structures across a floodplain or even separate studies.

5.3 Summary of Flood Susceptibility

The majority of the structures located in the study area contain a slab foundation, which means that damages for these structures begin at the first-floor elevation. There are also structures that contain a subfloor, such as a basement or a crawlspace with vents. Some of the structures have placed covers over these vents while other structures maintain active vents to allow airflow into crawlspaces. It is assumed that floodwaters will enter the subfloor through the vents at the ground surface elevation rather than first floor elevation. Table 3 shows that there are six (6) structures that may begin to see damages at the 4% AEP flood event, 24 structures that may begin to experience damages at the 2% AEP flood event, and an additional 39 structures that may not experience damages until the 1% AEP flood event. For the structural inventory within the study area, 29% of the structures do not begin to experience damages until the 0.2% AEP flood event. A detailed individual structure elevation list can be found in Appendix B. (Appendix B: Inventory of Flood prone Structures)

Table 3. Alton, IL Elevation Statistics (feet, NAVD)

Frequency Of Flooding	4% AEP(25Yr)	2% AEP(50Yr)	1% AEP(100Yr)	0.2% AEP(500Yr)
Structure Count	6	24	39	73
Average Ground Surface Elevation	429.1	432.3	434.0	435.8
Average Foundation Height	0.5	0.5	0.5	0.5
Average First Floor Elevation	429.6	432.8	434.5	436.3
Average Beginning Damage Elevation	429.6	432.8	434.5	436.3

5.4 Flood Depths & Velocities

Flood depths were generated through hydraulic modeling methodology previously described in Section 3.1. It should be noted that potential flooding caused by precipitation events alone were excluded from this report. There are no structures in the study area that experience flood velocities greater than three (3) feet per second. Flood velocities less than three (3) feet per second are considered “slow rise” by the USACE National Nonstructural Floodproofing Committee and should only be mitigated if flood depths are the primary driver of damages. Because the nature of flooding is considered “slow rise”, the structural integrity due to velocity is not currently an issue in the study area. Table 4 shows the average depths (relative to ground surface elevation) and velocities for each flood frequency in Alton.

Table 4. Alton, IL Flood Depths & Velocities

Frequency Of Flooding	4% AEP(25Yr)	2% AEP(50Yr)	1% AEP(100Yr)	0.2% AEP(500Yr)
Structure Count	6	24	39	73
Average Depth of Flooding (ft)	2.03	1.94	2.94	5.1
Average Velocity of Flooding (ft/sec)	<1	<1	<1	<1

Figures 8-11 show the distribution of the number of structures at each flood depth increment (4%, 2% 1% & 0.2% AEP). For example, at the 4% AEP (25 Yr.) event, there are three (3) structures that experience flooding of less than one (1) feet; one (1) structure that has flood depths of 2-4 feet and one (1) structure that has flood depths greater than five (5) feet.

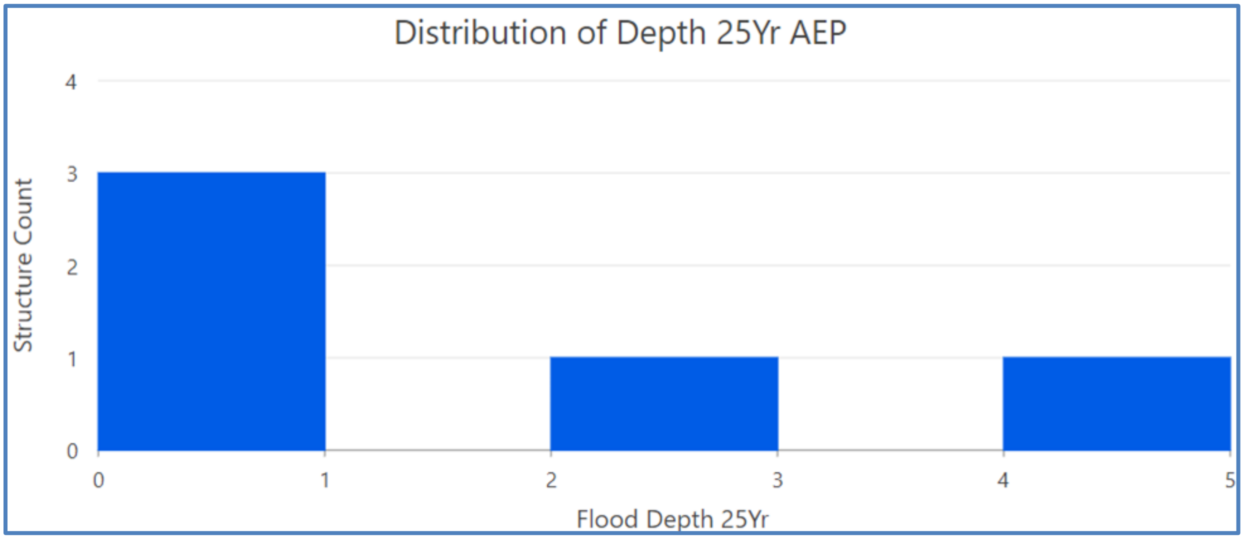


Figure 8. 4% AEP (25 Yr.) Depth Frequency

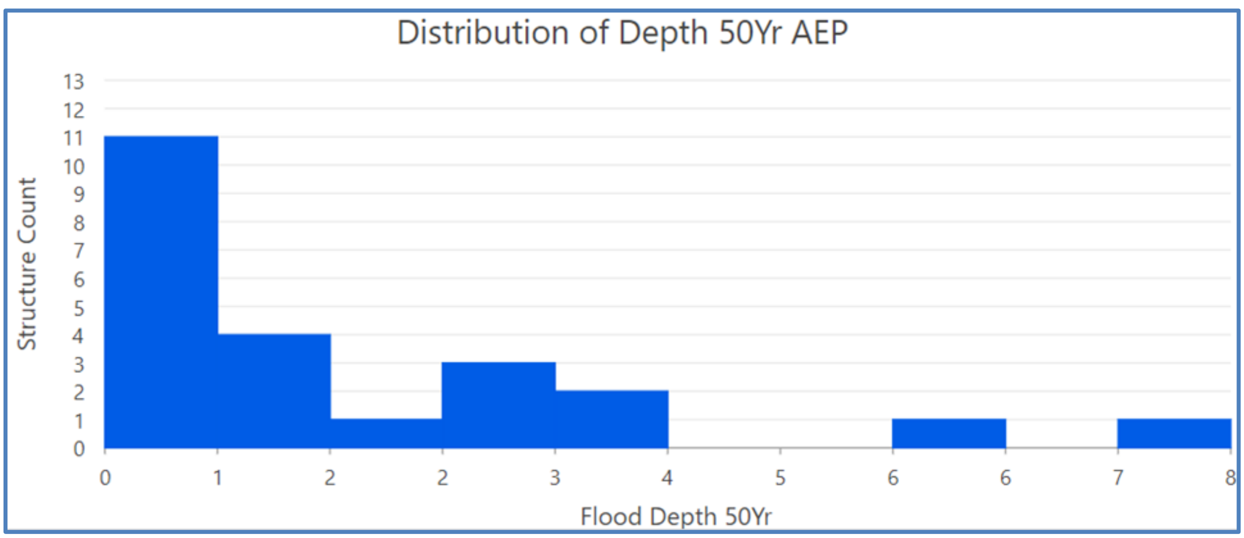


Figure 9. 2% AEP (50 Yr.) Depth Frequency

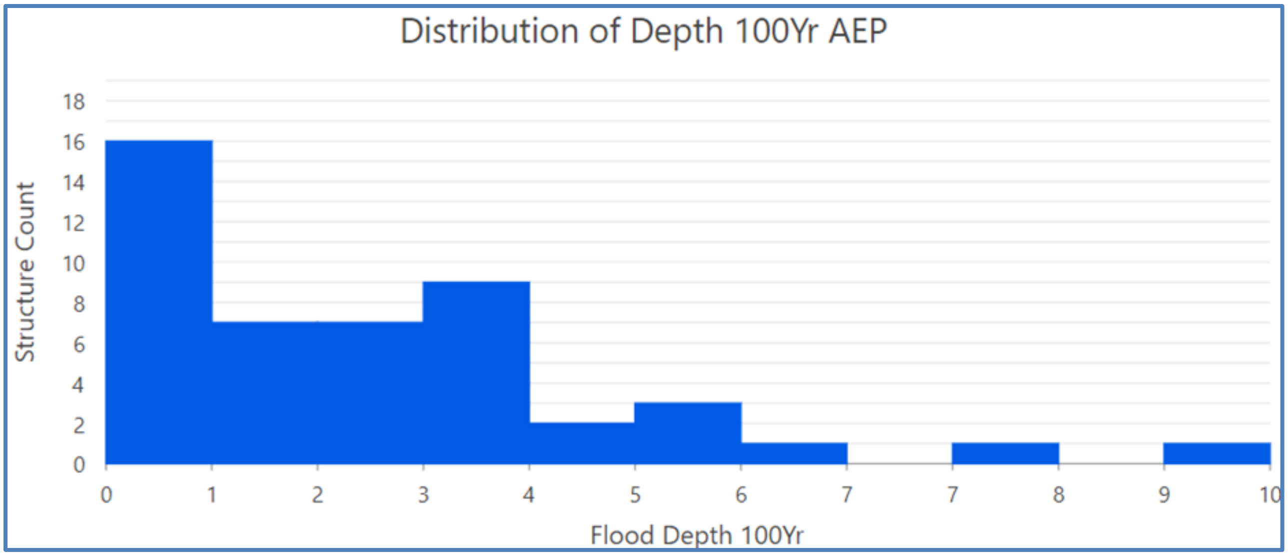


Figure 10. 1% AEP (100 Yr.) Depth Frequency

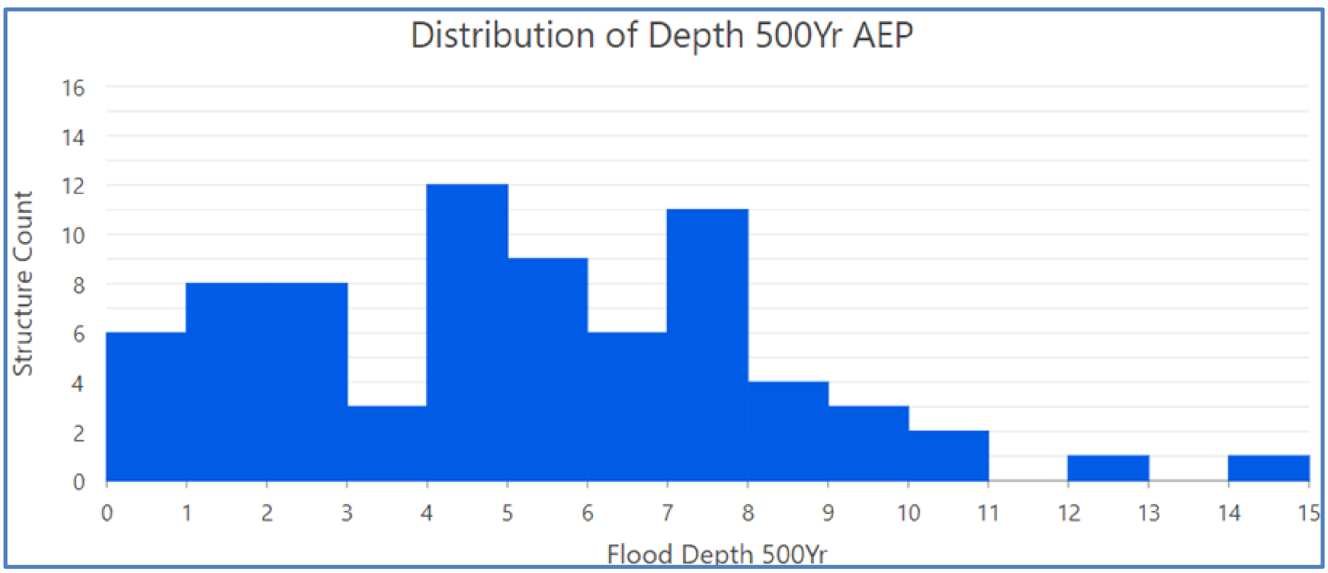


Figure 11. 0.2% AEP (500 Yr.) Depth Frequency

Figure 12 below shows inundation depths relative to the ground surface elevation of structures in the study area. The flood water flows toward Piasa Street as it follows the existing ground elevations. At the 1% AEP event, the flood depths along W. Broadway are the highest with an average depth of 5.5 feet and shallower along Piasa St., with an average flood depth of 2.6 feet. The floodwaters begin to diminish to the north of the study area towards West 4th Street.

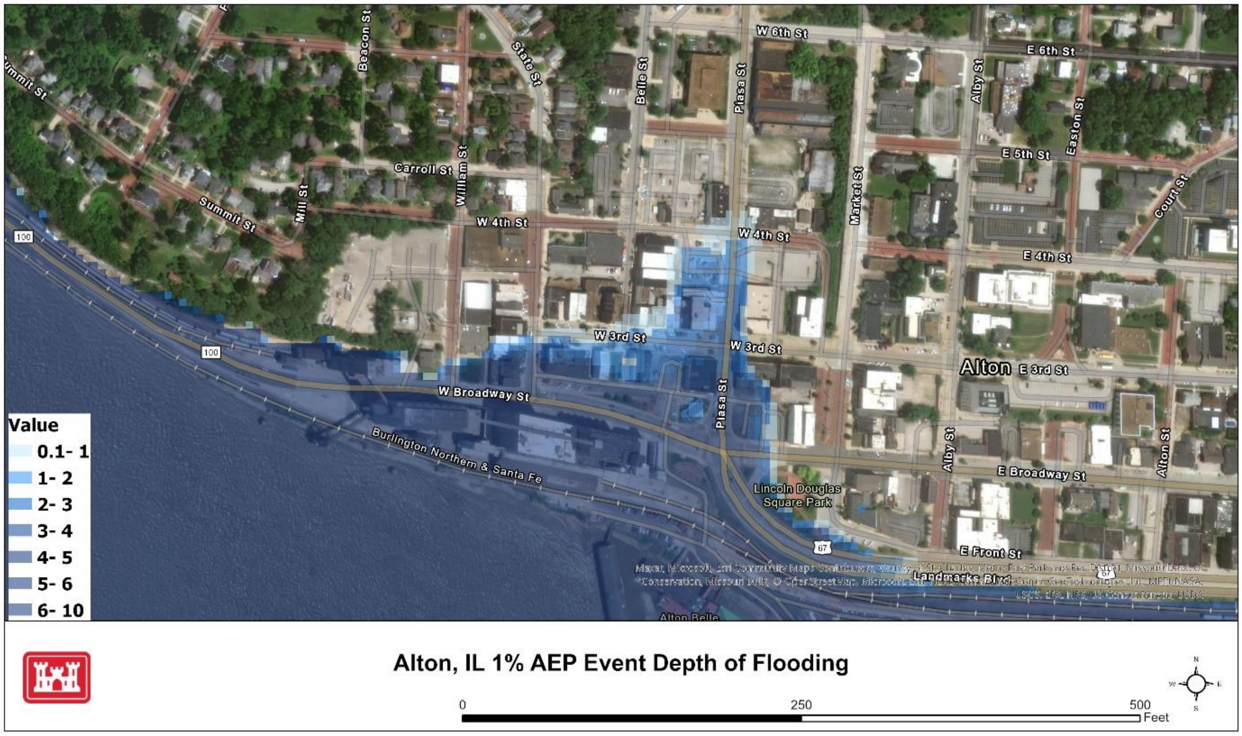


Figure 12. Alton, IL 1% AEP Event Depth of Flooding

Table 5 shows the depth of flooding relative to the first-floor elevations for each structure in the floodplain. During the 1% AEP (100 Yr.) flood event, 11 structures have flood depths above three feet, 28 structures have flood depths between zero and three feet. For this study, the recommended flood mitigation approaches are based on the statistics in Table 5. Table 5 summarizes the expected depth of flooding relative to the first-floor elevation and helps show that dry floodproofing can be an effective method of mitigation for the 1% AEP for the Alton study area. Table 5 does not indicate the distribution of flooding that structures experience.

Table 5. Alton First Floor Flood Depth Statistics

	4% AEP(25Yr)	2% AEP(50Yr)	1% AEP(100Yr)	0.2% AEP(500Yr)
Flood Depths above 3 feet	2	5	11	48
Flood depths between 0 and 3 ft	5	19	28	25
Flood depths below 0 ft	0	0	0	0
Unaffected	66	49	34	0

Figure 13 shows the 1% AEP (100 Yr.) depth of flooding in Alton by structure. Since the majority of the structures are in the yellow range (1-3 ft of flood depths), dry floodproofing would reduce risk to these structures from damages that may be caused by flooding.

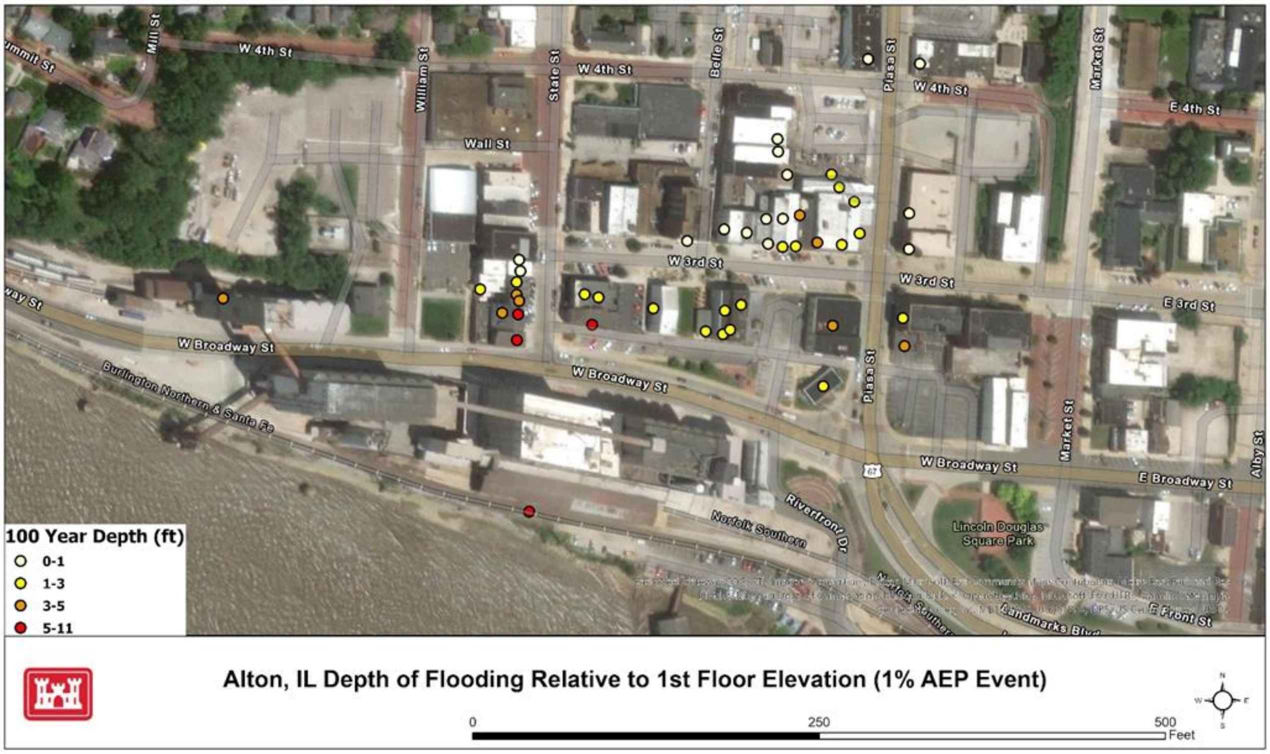


Figure 13. Alton, IL Depth of Flooding Relative to 1st Floor Elevation (1% AEP event)

5.5 Structure Valuation

The study area encompasses 75 structures over 33 acres. Google Street View was utilized to view all structures in the study area, which consists primarily of slab structures, however, some structures have subfloors, such as crawlspaces or basements. Foundation types and foundation height measurements were noted. Structure square footage and the year the structure was built was gathered using 2017 Parcel data provided by the Madison County, IL. The Madison County Assessor's structure valuations (excluding land values) were multiplied by three (per county assessor policy) to determine the appraised (market) value. These values were then indexed to the year 2022 using RS means. RS means is a tool used to develop a ratio that captures the value change of a structure over the years. The structure types are generally all brick, mostly historic structures, that range up to 3-4 stories in height. Some of the structures are multipurpose, meaning there are residential units on the upper levels of commercial businesses. The majority of the structures are commercial with some residential and industrial structures.

The structure inventory can further be sorted by structure type to generalize structural attributes such as square footage, year built, and structure value, as shown in Table 6. The maximum flood depth at the

1% AEP (100 Yr.) is approximately 7-8 feet, which means that the flood waters would most likely not enter the 2-3 floors of the structures where the residential units are located. Therefore, residential units were intentionally given foundation heights above the flooding elevations to avoid duplicative errors when accounting for structural damages.

Table 6. Alton Structural Attributes by Structure Type

Structure by Type	Average Foundation Height(ft)	Average Square Footage	Average Year Built	Average appraised Value
Commercial	0.5	8,463	1939	$ 219,164
Residential	8	1,419	1939	$ 255,452
Industrial	0.5	48,657	1939	$ 2,112,054

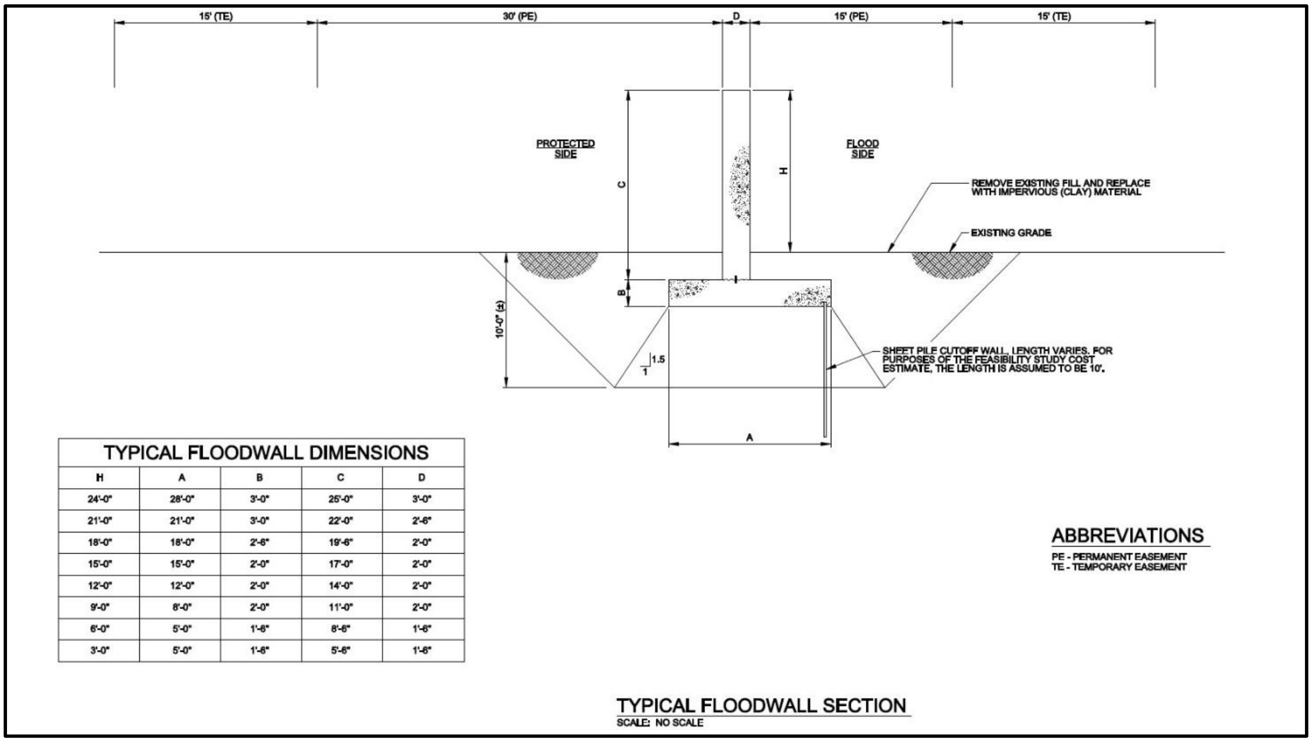
5.6 Flood Prone Structures

Appendix B includes a table that lists flood prone structures within the study area, sorted by depth of flooding relative to the first-floor elevation. (Appendix B: Inventory of Flood prone Structures) First floor elevation is defined as the ground surface elevation plus the elevation of the foundation height. A positive value of "5" can be interpreted as flood waters inundating the structure with 5 feet of water above the first floor, typically relative to where the front door of the structure is. An Esri ArcGIS shapefile will be provided to the City of Alton to better sort and interpret the data presented in Appendix B.

6.0 Evaluation of Structural Flood Mitigation Recommendations

For the purposes of this study, the structural evaluation focused on potential floodwall alignments as potential flood mitigation measures. Floodwalls are structural flood risk management measures designed to reduce flood risk by acting as physical barriers between water sources and structures. They function in the same way as a levee embankment and can be considered a type of levee. Floodwalls take up a smaller footprint than levees and as such are more appropriate for densely developed areas with space limitations. Floodwalls are typically built of concrete, and the visible portion is typically the same width from top to bottom. Depending on the height of the floodwall, the width can be 12 inches to 36 inches. Figure 14 shows a typical floodwall alignment. Floodwalls require footings and toe drain systems, both of which require regular inspections and have annual operation/maintenance costs. As the City of Alton already employs a temporary floodwall system, no other alternatives involving a temporary system, to include a permanent foundation system with temporary or collapsible surface floodwalls, were considered.

Five (5) potential floodwall alignments were developed for the purposes of this study, including four options developed by USACE (Options 1 - 4) and one option provided by the City of Alton (Option 5). Cost Estimates for each option are included in Appendix E. (Appendix E: Cost Estimates). Costs include estimates for construction, engineering and design, and construction management along with a contingency based off specific historical data and any risk or uncertainty with this type of work. Engineering / design and construction management use standard cost estimating percentage-based amounts based off the subtotal and associated contingency. The cost estimates do not include potential expenses, such as future operations & maintenance (O&M), real estate, and cultural mitigation, if required. Additionally, there are real estate requirements and costs, including but not limited to, the acquisition of temporary construction easements and permanent easements for future maintenance purposes.



TYPICAL FLOODWALL DIMENSIONS

H	A	B	C	D
24'-0"	28'-0"	3'-0"	25'-0"	3'-0"
21'-0"	21'-0"	3'-0"	22'-0"	2'-6"
18'-0"	18'-0"	2'-6"	19'-6"	2'-0"
15'-0"	15'-0"	2'-0"	17'-0"	2'-0"
12'-0"	12'-0"	2'-0"	14'-0"	2'-0"
9'-0"	8'-0"	2'-0"	11'-0"	2'-0"
6'-0"	5'-0"	1'-6"	8'-6"	1'-6"
3'-0"	5'-0"	1'-6"	5'-6"	1'-6"

Figure 14. Typical Floodwall Section

6.1 Option 1: Concrete Floodwall - Along Mississippi River to railyard and Wood River Levee System

6.1.1 Proposed Floodwall Alignment

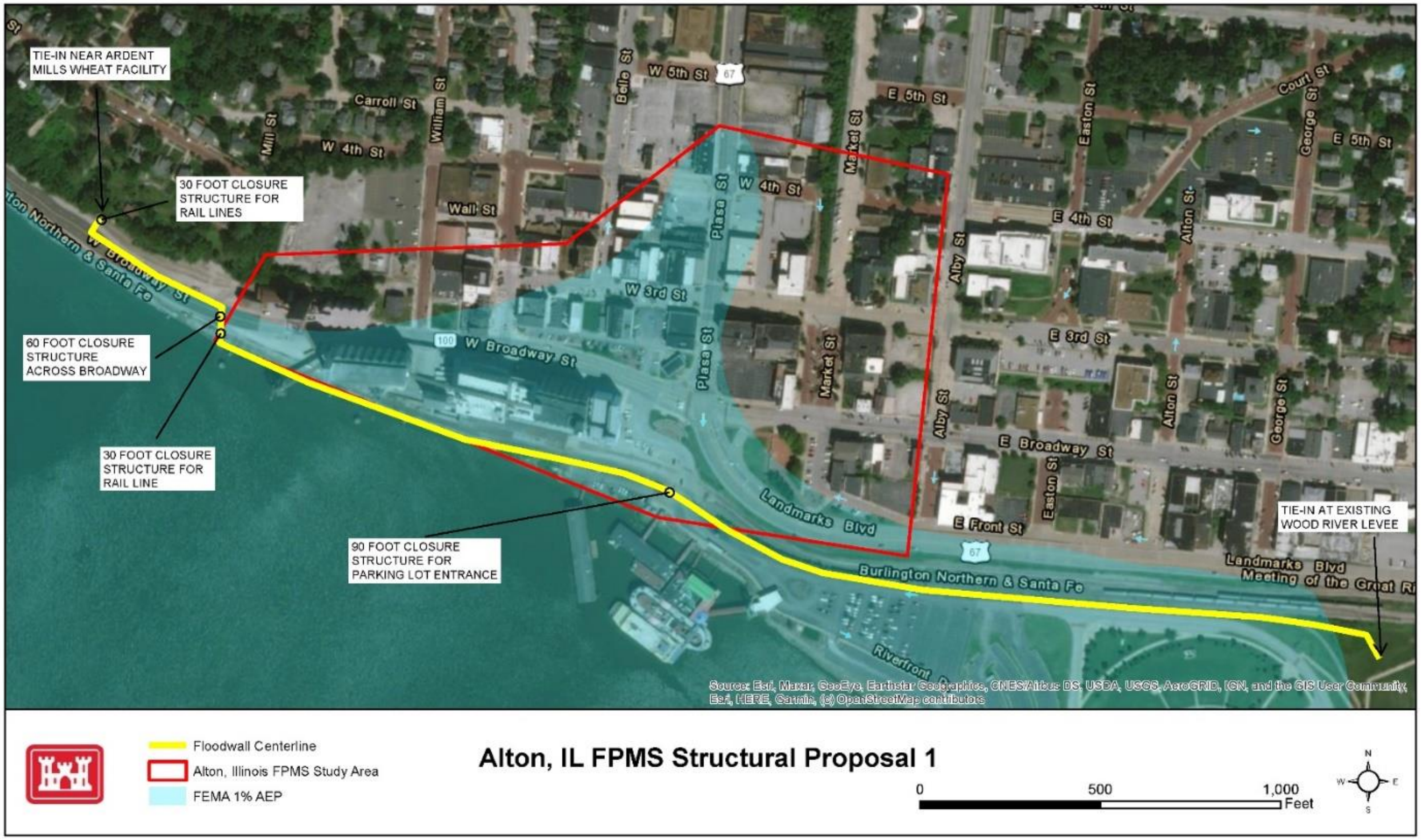


Figure 15. Structural Option 1: Concrete Floodwall along Mississippi River to Wood River Levee System

6.1.2 Plan Description and Considerations

This option involves a concrete floodwall spanning from the North side of the Ardent Mills Wheat facility down along the riverfront of the Mississippi River and connecting to the existing Wood River Levee System. Figure 15 shows this proposed alignment. Four closure structures, averaging 60 feet in length, would be required for this alignment. The closure structures would be placed across roadways, entrances, and rail lines. A pump station would also be required for this alignment to manage the interior drainage.
The average height of this floodwall is approximately 11 feet above the existing elevation, which would significantly diminish the aesthetic view of the Mississippi River from the City of Alton. This alignment would cause a disconnection between the Alton Riverfront and the City and would likely cause major impacts to public access by tourists, residents, and recreation along the Great River Road.

6.1.3 Cost Estimate

An approximate total cost for Option 1, including a permanent floodwall, closure structure, pump station, along with mobilization / demobilization and contingencies is approximately $91,410,000 (FY23). The cost estimate for this measure is based off historical construction data and alignments. For additional cost breakdown of this Option, see Appendix E.

6.2 Option 2: Concrete Floodwall - Along McAdams Parkway / Broadway to Wood River Levee System

6.2.1 Proposed Floodwall Alignment

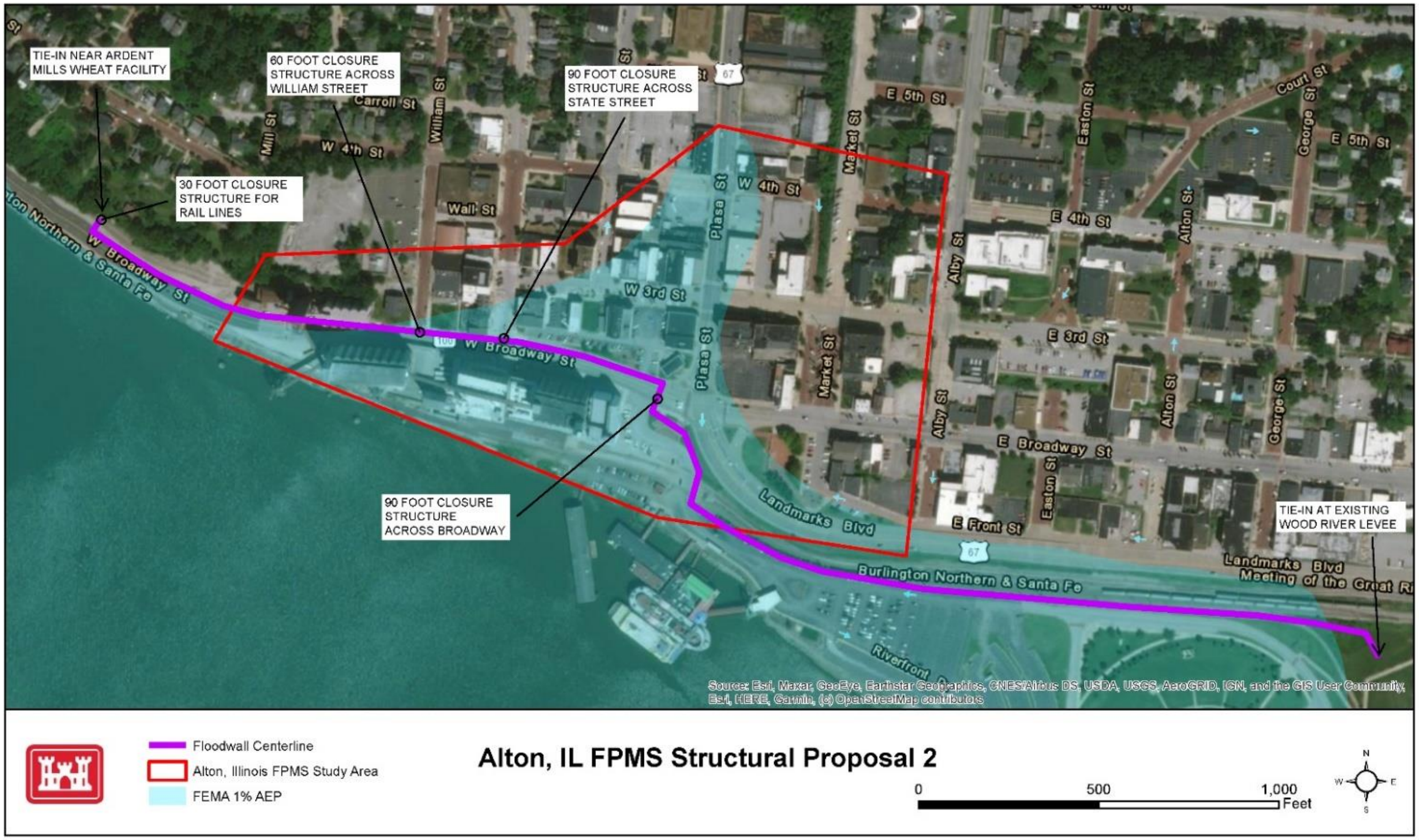


Figure 16. Structural Option 2: Concrete floodwall along McAdams Pkwy / Broadway connecting to Wood River Levee System

6.2.2 Plan Description and Considerations

This option involves a concrete floodwall that extends along the North side of W Broadway from the Ardent Mills Wheat facility to the existing Wood River Levee System. Figure 16 shows this proposed alignment. Four closure structures, averaging 70 feet in length, would be required to connect the railroad at the Ardent Mills facility and the following intersections: William Street at Broadway, State Street at Broadway, and Broadway at Piasa Street. In addition to these closure structures, a pump station would be required to manage the interior drainage.

This proposed alignment would require a major modification to Broadway/Highway 100, causing a decrease in traffic lanes. The average height of this floodwall would stand around 9 feet above the existing elevation, which would likely significantly diminish the aesthetic views of the Mississippi River from the City of Alton. This alignment would cause a disconnection between the Alton Riverfront and the City and potentially causing impacts to public access by tourists, residents, and recreation along the Great River Road.

6.2.3 Cost Estimate

An approximate total cost for Option 2, including a permanent floodwall, closure structure, pump station, along with mobilization / demobilization and other contingencies is approximately $94,020,000 (FY23). The cost estimate for this measure is based off historical construction data and alignments. For additional cost breakdown of this Option, see Appendix E.

6.3 Option 3: Concrete Floodwall - Along Broadway to Railyard to Market Street

6.3.1 Proposed Floodwall Alignment

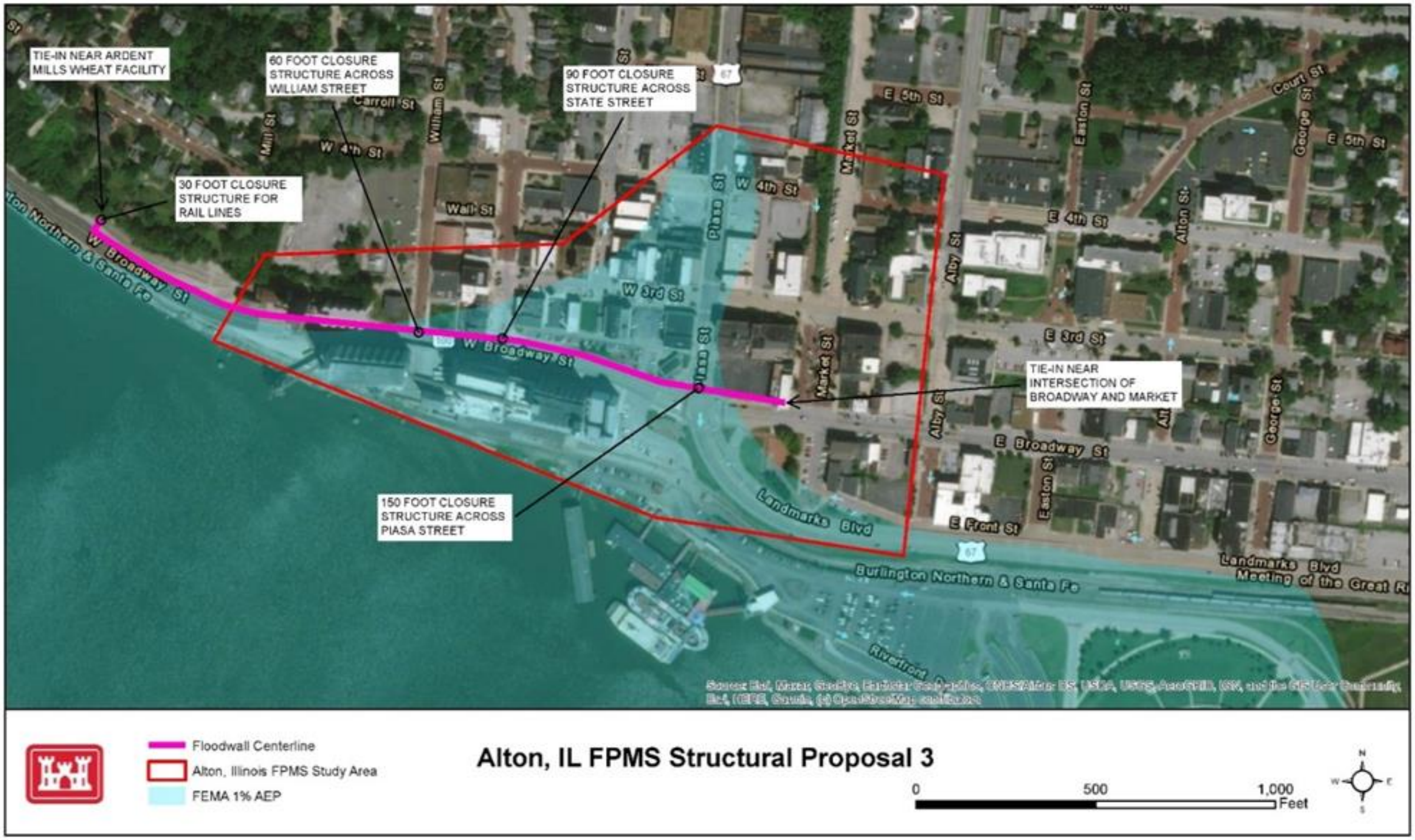


Figure 17. Structural Option 3: Concrete Floodwall along W Broadway to intersection of W Broadway and Market St.

6.3.2 Plan Description and Considerations

This measure involves a concrete floodwall spanning the North side of W Broadway from the Ardent Mills Wheat facility to the intersection of Broadway and Market Street. Figure 17 shows this proposed alignment. Four closure structures, averaging 85 feet in length, would be required to connect the railroad line at the Ardent Mills facility and the following intersections: William Street at Broadway, State Street at Broadway, and Piasa Street at Broadway. A pump station would be required to manage the interior drainage.

This proposed alignment would necessitate a major modification to Broadway/Highway 100, causing a permanent decrease in traffic lanes. The average height of the floodwall is approximately 9 feet above the existing ground elevation, which would likely significantly diminish the aesthetics of the Mississippi River from the City of Alton. This alignment could potentially disconnect public access within the study area causing impacts to recreation along the Great River Road.

6.3.3 Cost Estimate

An approximate total cost for Option 3, including a permanent floodwall, closure structure, pump station, along with mobilization / demobilization and other contingencies is approximately $62,250,000 (FY23). The cost estimate for this measure is based off historical construction data and alignments. For additional cost breakdown of this Option, see Appendix E.

6.4 Option 4: Concrete Floodwall - Along Broadway to William Street to Market Street

6.4.1 Proposed Floodwall Alignment

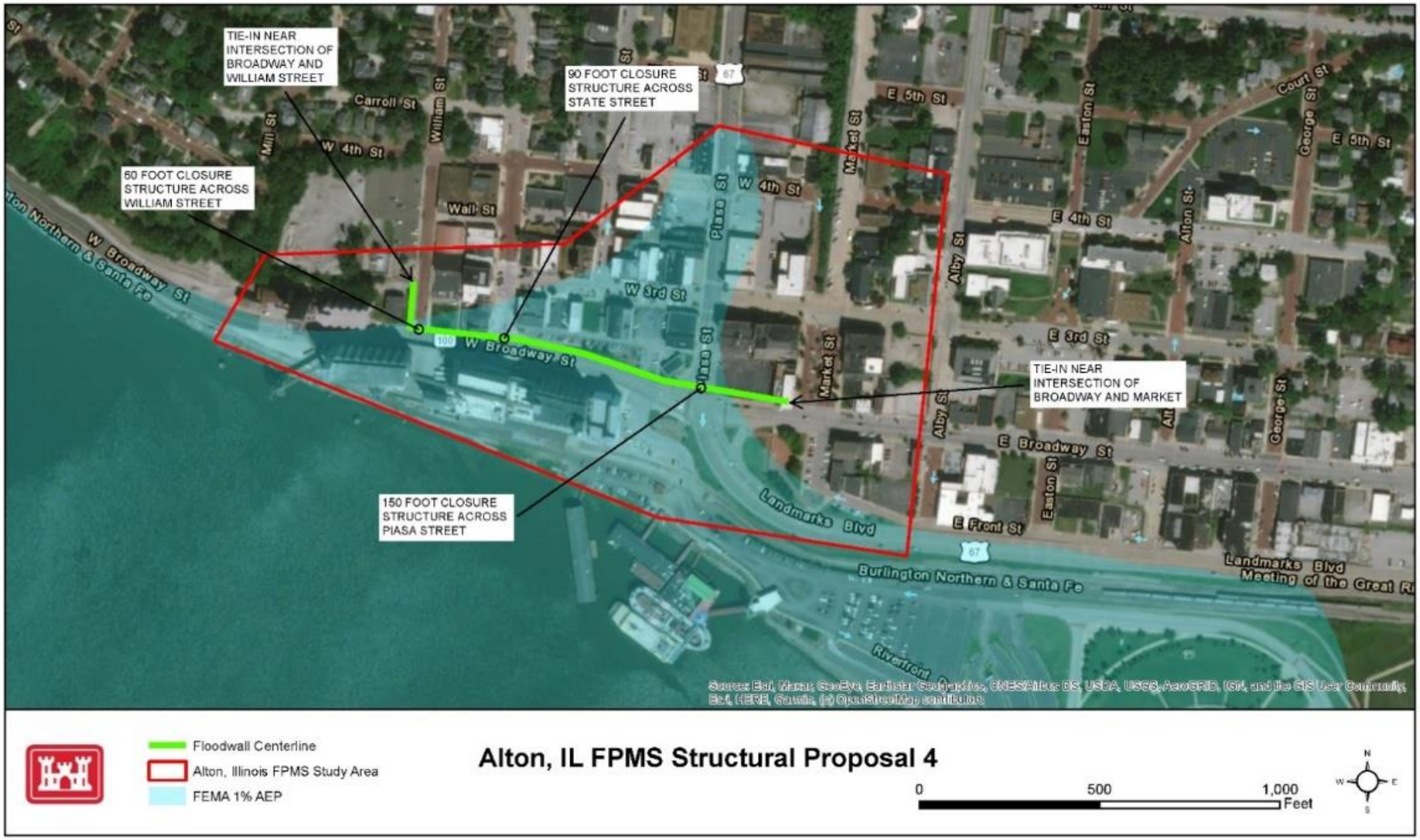


Figure 18. Structural Option 4: Concrete Floodwall along W Broadway to the intersection of William Rd & Market Street

6.4.2 Plan Description and Considerations

This measure involves a concrete floodwall that extends from the North side of W Broadway from the intersection of William Road and Broadway to the intersection of Broadway and Market Street. Figure 18 shows this proposed alignment. Three closure structures, averaging 90 feet in length, would be required at the following intersections: William Street at Broadway, State Street at Broadway, and Piasa Street at Broadway. In addition to these closure structures, a pump station would be required to manage interior drainage at the structure.

This proposed alignment would require a major modification to Broadway/Highway 100, causing a decrease in traffic lanes. The average height of the floodwall is approximately 9 feet above the existing ground elevation, which would likely significantly diminish the aesthetics of the Mississippi River from the surrounding area.

6.4.3 Cost Estimate

An approximate total cost for Option 4, including a permanent floodwall, closure structures, pump station, along with mobilization / demobilization and contingencies is approximately $45,630,000 (FY23). The cost estimate for this measure is based off historical construction data and alignments. For additional cost breakdown of this Option, see Appendix E.

6.5 Option 5: City of Alton Preferred

6.5.1 Proposed Floodwall Alignment

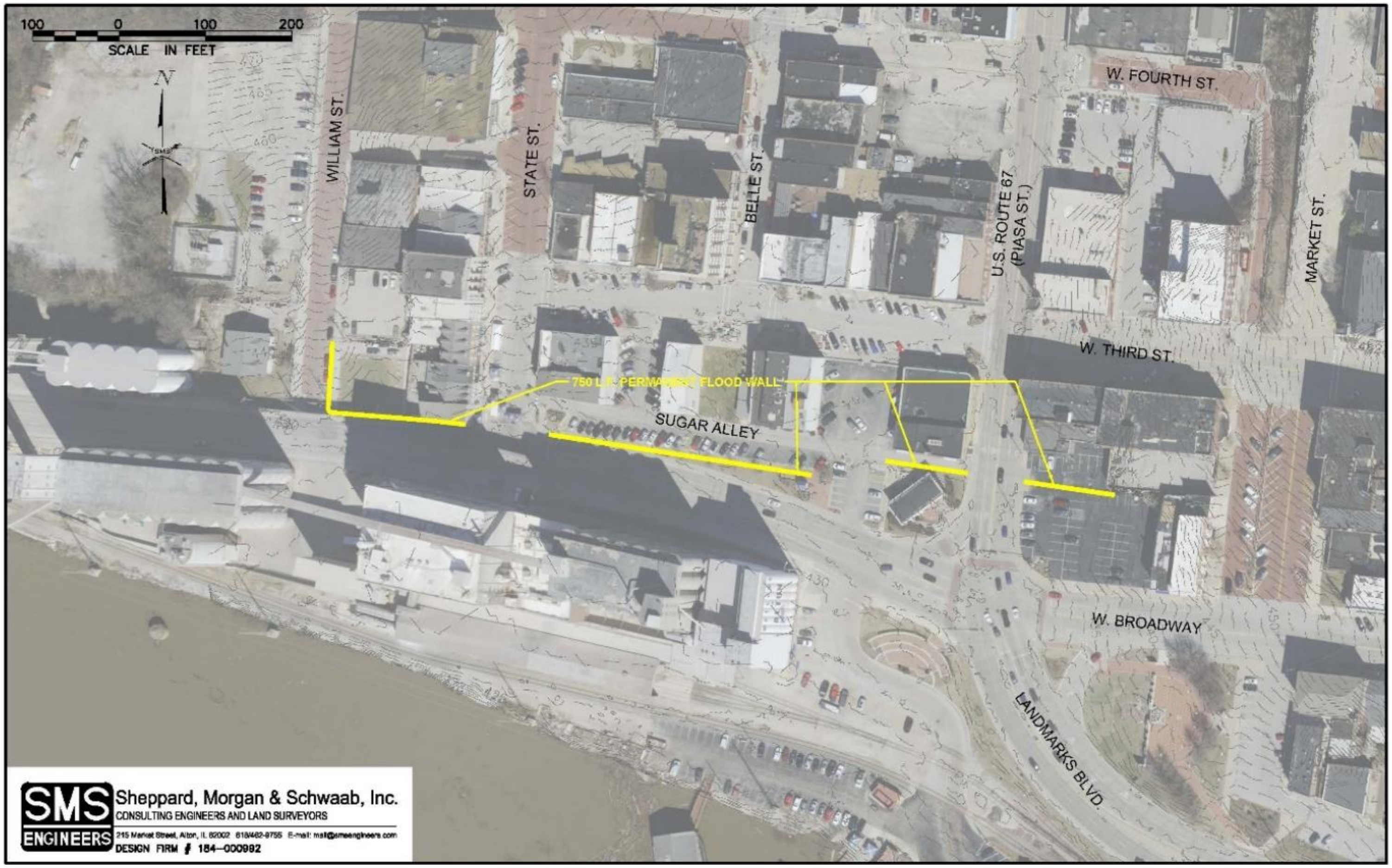


Figure 19. Structural Option 5: Alton. IL Proposed Floodwall Alignment

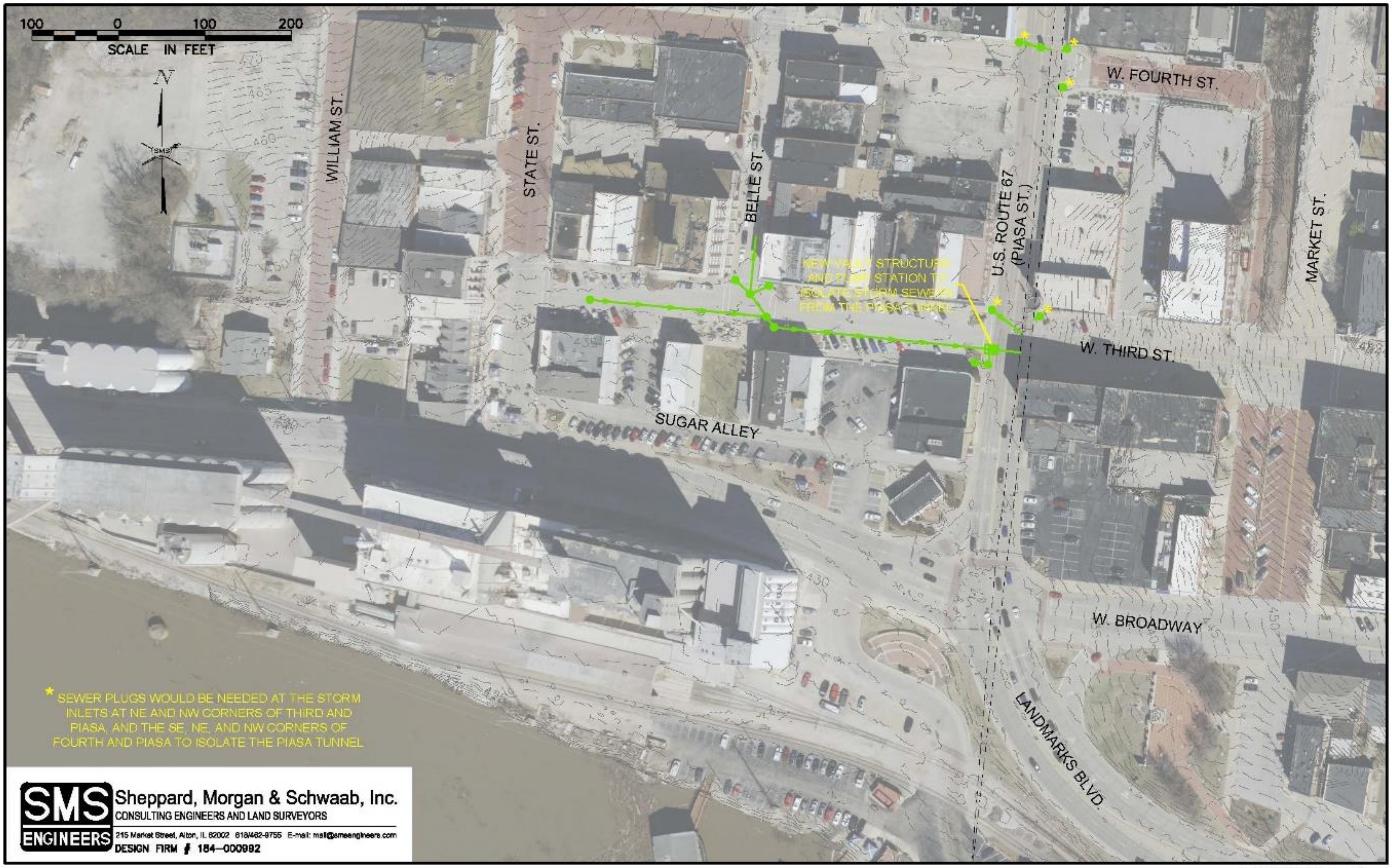


Figure 20. Structural Option 5: Alton, IL Proposed Sewer Improvements

Figure 21. Structural Option 5: Alton, IL Inundation

6.5.2 Plan Description and Considerations

While this report was being drafted, the City of Alton requested that Option 5 be included in this study and provided a proposed floodwall alignment and documentation developed by Sheppard, Morgan & Schwaab, Inc. The proposed floodwall alignment includes four (4) sections of permanent floodwalls as shown in Figure 19. Initially, the City indicated that closure structures were being considered across State Street and U.S. Route 67 (Piasa Street) with a section of Muscle Wall connecting the two inner walls near Sugar Alley. However, during partner review of this report, it became clear that the City modified its design to eliminate closure structures and instead use Muscle Wall to connect all the permanent alignments.

It should be noted that USACE did not perform an analysis on the effectiveness of this plan nor did USACE perform a risk analysis to determine if there exists an increase in risk with the deployment of Muscle Walls in between each permanent alignment. While the City is experienced in Muscle Wall deployment during flood fighting, deploying Muscle Walls and connecting them to permanent floodwalls could pose a challenge to City resources including manpower. The plan also includes sewer (Figure 20) improvements. The approximate required height of each proposed feature was determined using the 1% AEP elevation established from the hydraulic modeling.

The 1% AEP water surface elevation along this proposed floodwall alignment is approximately 436.7' NAVD88. This elevation corresponds to a water depth of 9' at the proposed State Street gate, 5.5' at the Piasa Street gate, and 5' at the alleyway between W. Broadway and Sugar Alley. These depths correspond to the required height of the walls to provide flood risk reduction up to a 1% AEP and do not include any freeboard. The inundation at these roadways reach depths greater than 1 foot rendering them impassable between a 10% and a 4% AEP. This results in a need to close flood gates (or have temporary measures in place) before water reaches elevations above 428.5 feet at State Street and 431.2 feet at Piasa St.

6.5.3 Cost Estimate

An approximate total cost for the proposed City of Alton floodwall with 2-foot muscle wall extensions, along with mobilization / demobilization and other contingencies is approximately $12,228,000 (FY23). The cost estimate for this measure is based off historical construction data and alignments. This estimated total does not include the costs associated for the City's proposed pump station for sewer improvements. For additional cost breakdown of this Option, see Appendix E.

It is recommended that both an under-seepage analysis (to address water coming underneath the wall and/or up through the ground) as well as an interior drainage analysis (to address the water coming down the hill as well as potential storm water drainage issues) be conducted.

7.0 Evaluation of Non-Structural Flood Mitigation Recommendations

7.1 Flood Mitigation Methodology

The nonstructural floodproofing recommendations are based on the structure foundation type, occupancy type, and local flooding characteristics. Each flood prone structure in the study area has been evaluated for its structural attributes, hydraulic conditions, and estimated cost of nonstructural flood mitigation. All options in this report are preliminary and are subject to a detailed field survey and site-specific cost estimate.

7.2 Summary of Viable Floodproofing Measures

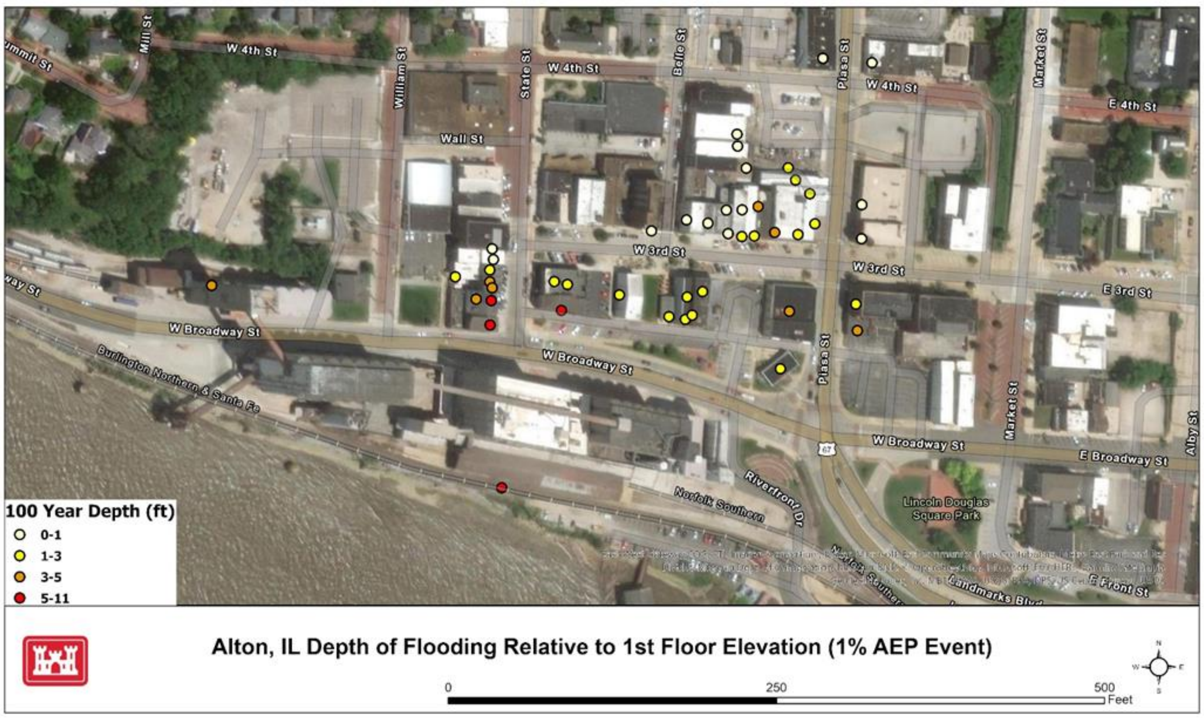


Figure 22. Alton, IL Depth of Flooding Relative to 1st Floor Elevation (1% AEP event)

Figure 22 shows the 1% AEP (100 Yr.) depth of flooding in Alton by structure. During a 1% AEP event, 84% of the structures within the study area experience flood depths less than three (3) feet above the first-floor elevation. Therefore, dry floodproofing is considered to be a viable mitigation approach for majority of the structures in the study area. The risk reduction measures evaluated for this report require the ability of the property owner to anticipate and install these measures in advance of the flood event which is typically possible given the "slow rise" flooding nature of the Mississippi River.

For structures with flooding that exceed three (3) feet in depth, viable mitigation measures include elevation, relocation, or acquisition, however, these methods are not expected to be viable options due to the historic nature of the structures.

For historic structures, the mitigation approaches with the least impact to exterior façades are either floodwalls (structural) or floodproofing (nonstructural). For the historic structures that receive flood depths greater than three (3) feet flood above the first-floor elevation, the construction of a temporary floodwall could also be considered as an option for mitigation. When mitigating historic structures, floodproofing systems should be selected so that the historic nature can be preserved and protect aesthetics of the structure. It is expected that there would be a greater expense associated with floodproofing historic buildings in order to preserve the historic nature of those flood prone structures.

7.3 1% AEP Flood Event Mitigation Options

Table 7 below provides a structural inventory of the study area and the corresponding mitigation measures for each structure at a 1% AEP (100 Yr.) flood event. The 1% AEP (100 Yr.) value represents the depth of flooding (feet) relative to the first-floor elevation. The “NA” indicates no flooding occurs at the 1% AEP event. Structures that receive flood inundation in the 0.2% AEP (500 Yr.) event but are not inundated in the 1% AEP (100 Yr.) event do not include flood mitigation recommendation, i.e., “No Recommendation”. The “Flood proof Cost” includes cost estimates associated with the construction for dry floodproofing (residential and non-residential structures) as well as a contingency percentage based off on certain risks of the project, engineering and design, and supervision and administration costs. The estimate does not include real estate, survey, or O&M costs.

In the study area, there are four (4) historic structures that receive flood depths that exceed the threshold for dry floodproofing to be a considered a viable option. Generally, for structures that cannot be mitigated by dry floodproofing, other options such as elevation, buyouts/acquisition, and wet floodproofing can be considered. However, these options are not recommended for historic structures due to potential for impacts. A potential viable mitigation option for these structures could be the construction of a temporary floodwall.

Table 7. Alton FPMS 1% AEP Nonstructural Mitigation Recommendation

Parcel Id	Number	Street	Appraised Value	1% AEP (100Yr)	Ground Surface	Floodproof Cost	Historic Structure	Recommendation
1220576897	206	W 3RD	$ 134,630	NA	439.0	$ -	Yes	No recommendation
1220576903	208	W 3RD	$ 276,094	NA	439.0	$ -	Yes	No recommendation
1220576837	214	W 3RD	$ 104,842	NA	439.3	$ -	No	No recommendation
1220577991	118	4TH	$ 117,665	NA	439.3	$ -	No	No recommendation
1220576926	300	BELLE	$ 199,633	Na	436.9	$ -	No	No recommendation
1220577213	329	BELLE	$ 184,277	NA	437.3	$ -	No	No recommendation
1220572488	331	BELLE	$ 201,281	NA	438.1	$ -	No	No recommendation
1220576991	315	BELLE	$ 218,286	NA	438.2	$ -	No	No recommendation
1220576124	8	W BROADWAY	$ 109,786	NA	442.3	$ -	No	No recommendation
1220575353	111	MARKET	$ 100,500	NA	439.1	$ -	No	No recommendation
1220575353	115	MARKET	$ 184,277	NA	437.1	$ -	No	No recommendation
1220576773	216	STATE	$ 296,676	NA	436.2	$ -	Yes	No recommendation
1220576911	302	STATE	$ 290,887	NA	440.7	$ -	Yes	No recommendation
1220576811	217	WILLIAM	$ 137,725	NA	440.9	$ -	Yes	No recommendation
1220576803	100	W 3RD	$ 157,504	3.0	433.7	$ 22,025	Yes	Dry Floodproofing
1220576955	104	W 3RD	$ 700,405	2.6	434.0	$ 14,994	Yes	Dry Floodproofing
1220576853	108	W 3RD	$ 315,369	2.8	433.8	$ 19,617	Yes	Dry Floodproofing
1220576845	110	W 3RD	$ 276,094	0.7	435.9	$ 11,281	No	Dry Floodproofing
1220576850	112	W 3RD	$ 156,740	0.8	431.2	$ 8,603	No	Dry Floodproofing
1220576856	114	W 3RD	$ 197,824	0.4	436.3	$ 23,454	No	Dry Floodproofing
1220576955	114 B	W 3RD	$ 159,353	0.7	435.9	$ 4,813	No	Dry Floodproofing
1220576486	117	W 3RD	$ 141,986	2.0	434.6	$ 14,375	Yes	Dry Floodproofing
1220576486	117 B	W 3RD	$ 356,855	1.8	434.8	$ 10,348	Yes	Dry Floodproofing
1220576489	119	W 3RD	$ 159,353	2.6	434.0	$ 22,115	Yes	Dry Floodproofing
1220576495	123	W 3RD	$ 103,595	1.7	434.9	$ 7,625	Yes	Dry Floodproofing
1220577104	200 A	W 3RD	$ 209,067	0.4	436.2	$ 46,133	Yes	Dry Floodproofing
1220576515	203	W 3RD	$ 100,500	1.9	434.7	$ 23,425	No	Dry Floodproofing
1220576546	215 B	W 3RD	$ 276,094	3.0	433.7	$ 13,925	Yes	Dry Floodproofing
1220576991	315	BELLE	$ 199,633	0.4	436.2	$ 18,405	No	Dry Floodproofing
1220576955	319	BELLE	$ 315,369	0.3	436.3	$ 41,840	No	Dry Floodproofing
1220576478	206	STATE	$ 289,279	3.1	433.5	$ 37,235	Yes	Dry Floodproofing
1220576618	208	STATE	$ 104,842	0.5	436.2	$ 6,641	Yes	Dry Floodproofing
1220576618	206	STATE	$ 289,279	2.6	434.0	$ 20,563	Yes	Dry Floodproofing
1220576752	210	WILLIAM	$ 296,234	1.6	437.0	$ 19,419	No	Dry Floodproofing
1220577781	101	W 3RD	$ 141,986	3.8	432.8	$ 75,075	No	**
1220576546	215	W 3RD	$ 137,725	5.7	431.0	$ 11,281	Yes	*
1220576232	145	W BROADWAY	$ 5,667,155	10.2	425.0	$ 169,061	Yes	***
1220576484	306	W BROADWAY	$ 63,436	4.7	432.0	$ 6,219	Yes	*
1220576618	204	STATE	$ 197,824	5.0	431.6	$ 4,201	Yes	*

Notes:

"No Recommendation" includes the structures with inundation in a 500-year event, but no inundation in a 100 year event.

*Historic Structure and cannot be mitigated by dry floodproofing. Alternative options such as temporary floodwalls could be considered.

** New Frontiers Home & Garden Furnishings: Structure (not Historic) and cannot be mitigated by dry floodproofing.

***Ardent Mills Property: Historic structure that cannot be mitigated by floodproofing or temporary floodwall given the proximity to the river and corresponding water depths.

7.4 Cost Comparison

The cost estimates in Table 7 were developed based on the square footage and layout of each structure within the study area. The nonstructural cost estimates include installation of door / garage barriers and three (3) foot flood proofing membranes. For residential structures, the costs include aforementioned methods as well as structural reinforcement, such as demolition, reinforcing concrete install, replacing exterior sheeting, and/or re-install brick veneer, where applicable. Although Table 7 does not include floodproofing recommendations for these structures, the cost estimates are provided in the event that the structure is able to be mitigated in the future.

As previously described, the current flood fighting method conducted by the City is the construction of a 1,250-foot-long temporary flood wall for flood events starting at approximately the 10% AEP event (10 Yr.). The estimated construction cost is approximately $700,000 (FY23), indicating that the estimated average annual cost of construction, assuming a 10% AEP frequency, is approximately $70K per year. In comparison, the estimated cost of dry floodproofing structures in the 1% AEP floodplain is approximately $697,000 (FY23). The estimated annual cost of dry floodproofing is approximately $25,000 over a 50-year period. The formula for computing the annual cost for these alternatives calculates the payment annually for an investment over a specific time with a fixed interest rate.

When comparing the cost estimates associated with the possible flood mitigation recommendations, it appears that dry floodproofing of the structures is more cost effective. While there may be higher up-front costs for installing the mechanisms on structures (such as stop logs on door openings and low profile windows), it remains a more cost effective approach in the long term compared to repeatedly constructing a full-length temporary floodwall during each flood event over the 50-year period of analysis. Although the costs developed for dry floodproofing is a parametric estimate and does not incorporate standard construction contingencies, this type of mitigation for the study area remains a cost-effective and competitive alternative for flood mitigation for the City of Alton. It should be noted that the cost estimate for floodproofing of structures does not include a potential cost associated with labor for individuals to physically place (and later remove) floodproofing systems, such as stop logs or barriers, however this installation can typically be done in with only one or two people and takes less time and manpower than constructing a temporary floodwall.

As previously stated, dry floodproofing methods can be deployed more efficiently compared to the construction of a temporary floodwall, which requires significant labor to deploy. When comparing costs over a 50-year period of analysis, dry floodproofing measures would prove more effective since it requires limited ongoing maintenance, less permanent storage space for the wall and fill material, less time and distance from the storage area to the construction site, etc.

7.5 Benefits

The benefits for determining which floodproofing method that will be the most effective and efficient depends on the total economic impact of the flooding within the study area. To determine the maximum extent of damage that the flooding can cause, the total market value of all the flooded structures were analyzed. The total market value of the structures that are impacted by flood waters at the 1% AEP (100 Yr.) is $6,270,141. The market valuations for the structures were determined from Madison County Assessor's structure valuations (excluding land values) which were multiplied by three (per county assessor policy). The total maximum possible structure damage to the Alton area is a good metric to use to compare the mitigation recommendations and associated costs. A full benefit cost analysis was outside of the scope of the report.

8.0 Conclusion

Flooding from the Mississippi River will likely always be a threat to the City of Alton. For the majority of structures located in the study area, the average first floor elevation corresponds with the average 1% AEP (100 Yr.) flood inundation depth. Therefore, it can be expected that impacts from flood damages will continue to occur within the downtown Alton area without the implementation of flood risk reduction measures.

This report evaluated both structural and nonstructural flood risk management and includes general recommendations for city officials to make informed decisions to reduce flooding impacts to the city of Alton. While the construction of a structural measure, such as permanent floodwall alignment shown in Options 1-4, would likely provide the most effective level of flood risk reduction, it is not considered a viable option mainly due to high cost of construction. Also, for structures that receive flood depths higher than the first floor elevation, acquisitions / buyouts could be considered an effective mitigation approach. However, this method is generally cost-prohibitive and is likely not feasible or desirable given the structural and cultural characteristics within the study area.

In conclusion, dry floodproofing is a viable option for the majority of structures within the study area to reduce future structural damage caused by flooding at a 1% AEP flood event. These structures are shown in blue in Figure 23 below. See Section 7 for details regarding options that can be considered for those structures that cannot be mitigated with dry floodproofing. Finally, the temporary floodwall construction that the City of Alton is experienced in installing is a viable option moving forward although it could be less economically justified in the long term depending on the frequency and duration of future flood events.

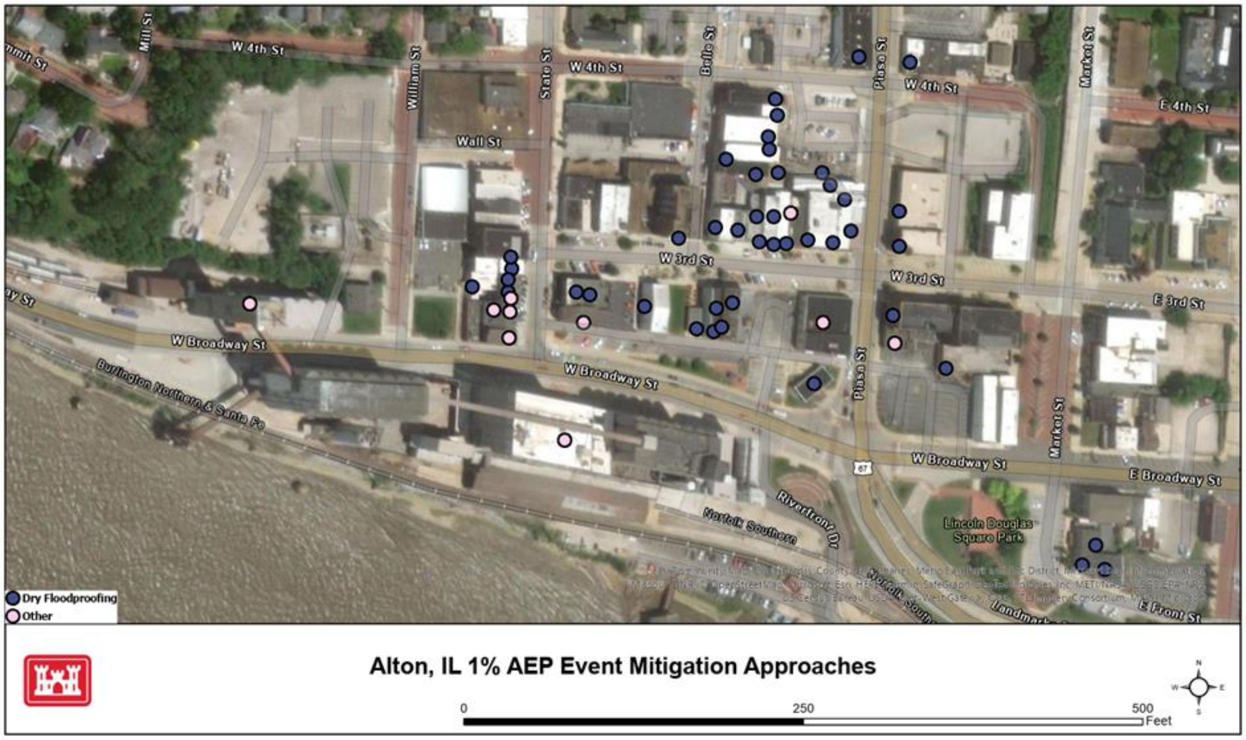


Figure 23. Alton, IL 1% AEP Mitigation Approaches

9.0 Recommended Future Studies

9.1 Future Studies

It is recommended that future analysis be conducted on areas, including but not limited to the following:

- Under seepage analysis to address water coming underneath the floodwall and/or through the ground near floodwall construction
- Interior drainage analysis to address ponding issues as well as potential storm water drainage issues.
- A detailed field survey of structures and site-specific evaluation in order to ensure accurate cost estimates.

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Appendix A: Hydraulics and Hydrologic Analysis

1.0 Introduction

The main tasks for the Hydraulic and Hydrologic Analysis include the following:

- Investigation of prior hydraulic and hydrologic analyses
- Inventory of additional data and reference materials
- No-Rise Assessment of proposed design alternatives

2.0 Models

2.1 Original Model

A 1D steady-state hydraulic model was developed and calibrated by USACE in 2004 following the 2004 Upper Mississippi River Flow Frequency Study. This model was developed in HEC-RAS 3.3 and used surveyed terrain and bathymetry data for cross-sectional computations across the Mississippi Floodway. A regulatory floodway, as described by FEMA, is “the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.” Depending on the base flood bounds, 1% AEP in this case, parts of the floodplains may not be included in the model.

2.2 Revised Model

The original model required modifications to provide useful results for this study. As mentioned in Section 3.1, some portions of the Mississippi River floodplain were not included in the cross-sections of the original model. LiDAR terrain was utilized to acquire terrain information for the extended portions of the cross section. Cross sections around the study area were extended in the floodplain. Additionally, new cross sections were interpolated between existing cross sections to provide additional detail for hydraulic computations. Model extents were also trimmed to a 40-mile reach on the Mississippi River, from RM 180-218. This updated model schematic is shown in Figures A.1 and A.2.

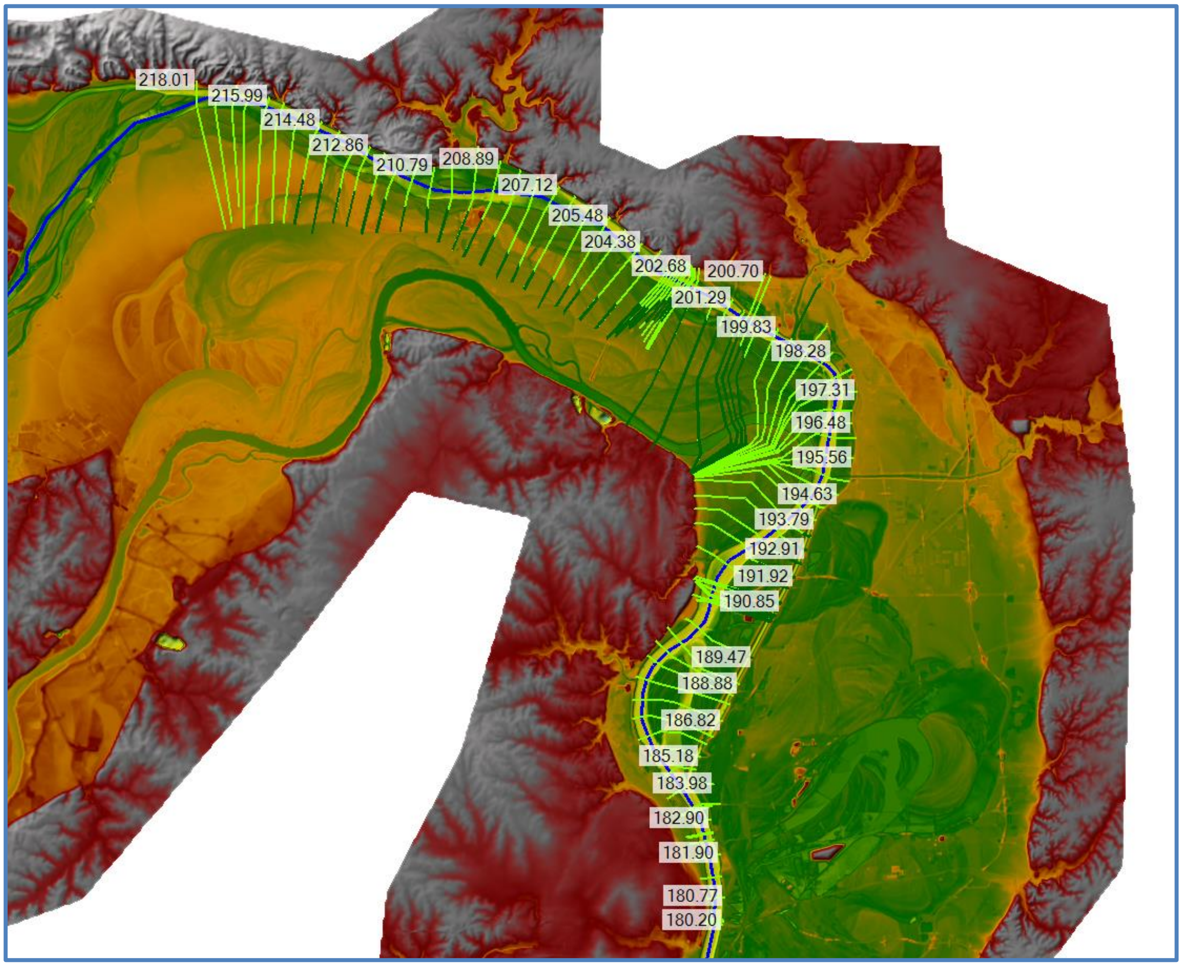

Figure A.1: Revised Mississippi River Floodway HEC RAS model schematic with terrain

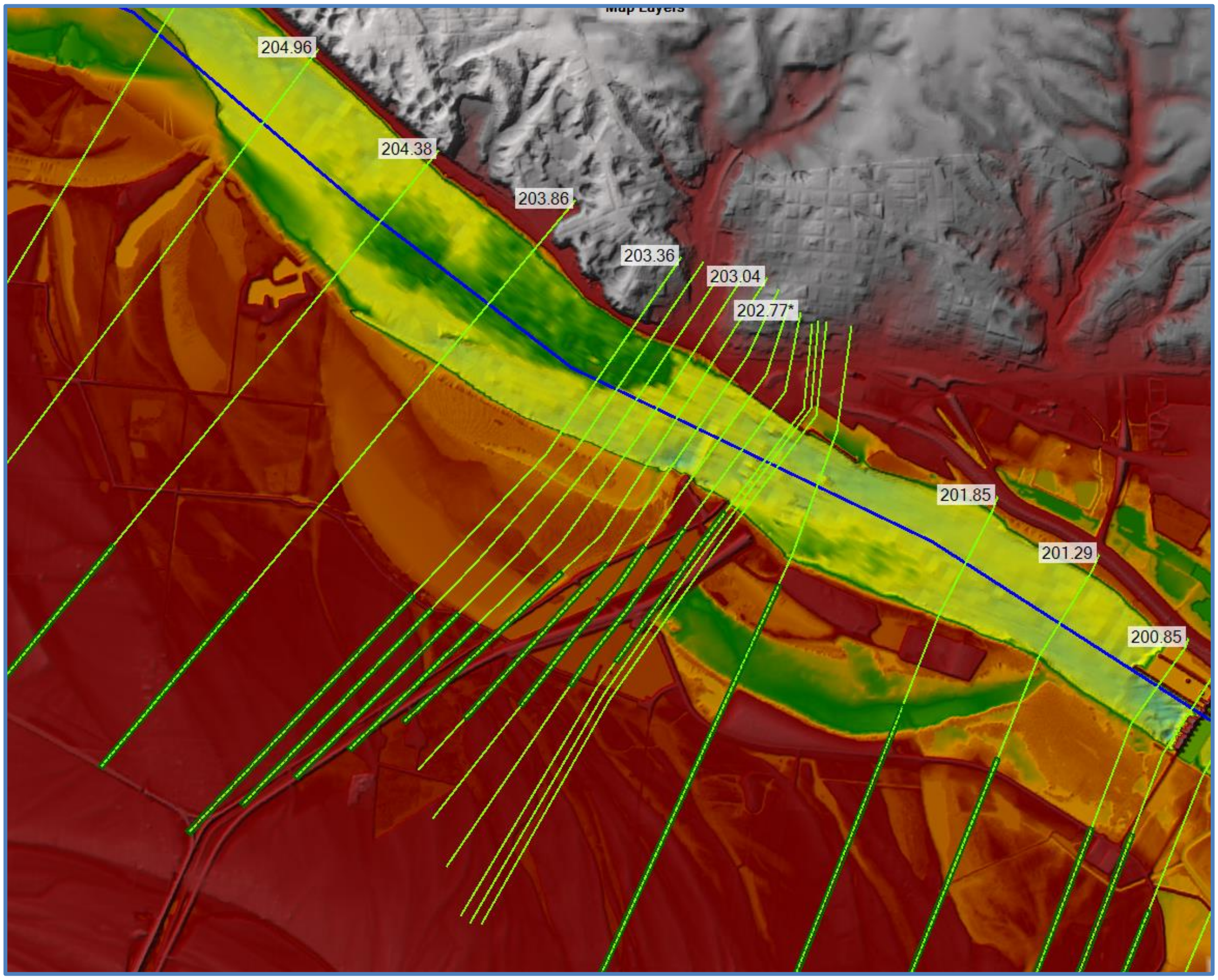

Figure A.2: Study Area in Alton HEC RAS model schematic with terrain

The original model utilized flow frequencies developed in the 2004 Flow Frequency Study for model inputs to approximate water surface elevation for those same frequencies. Water surface elevations from the study were input into the model as "observed water surface" elevations so that the model could be slightly calibrated at the study location to produce results in better agreement with the expected flow frequencies. Calibration was achieved by adjusting manning's "n" values and flow roughness factors. Table A.1 provides additional information on technical model modifications made to the original model.

Table A.1 Study Model Modifications

	Original	**Modified**
Units	Feet	Feet
Horizontal Datum	NAD83, UTM Zone 15	NAD83, UTM Zone 15
Vertical Datum	NGVD1929	NAVD88
HEC-RAS version	3.3	6.2
Terrain	N/A	LiDAR, 2m and 10m

3.0 Hydraulic Model Outputs

In order to evaluate and design the proposed flood risk reduction measures, the water surface elevation calculated for each flood frequency was assessed and shared with the civil design engineer and economic analyst. Profiles assist with designing structural and nonstructural options by providing key elevations for an array of flood frequencies. These flood frequency elevations along the centerline of the Mississippi River are shown in Figure A.3.

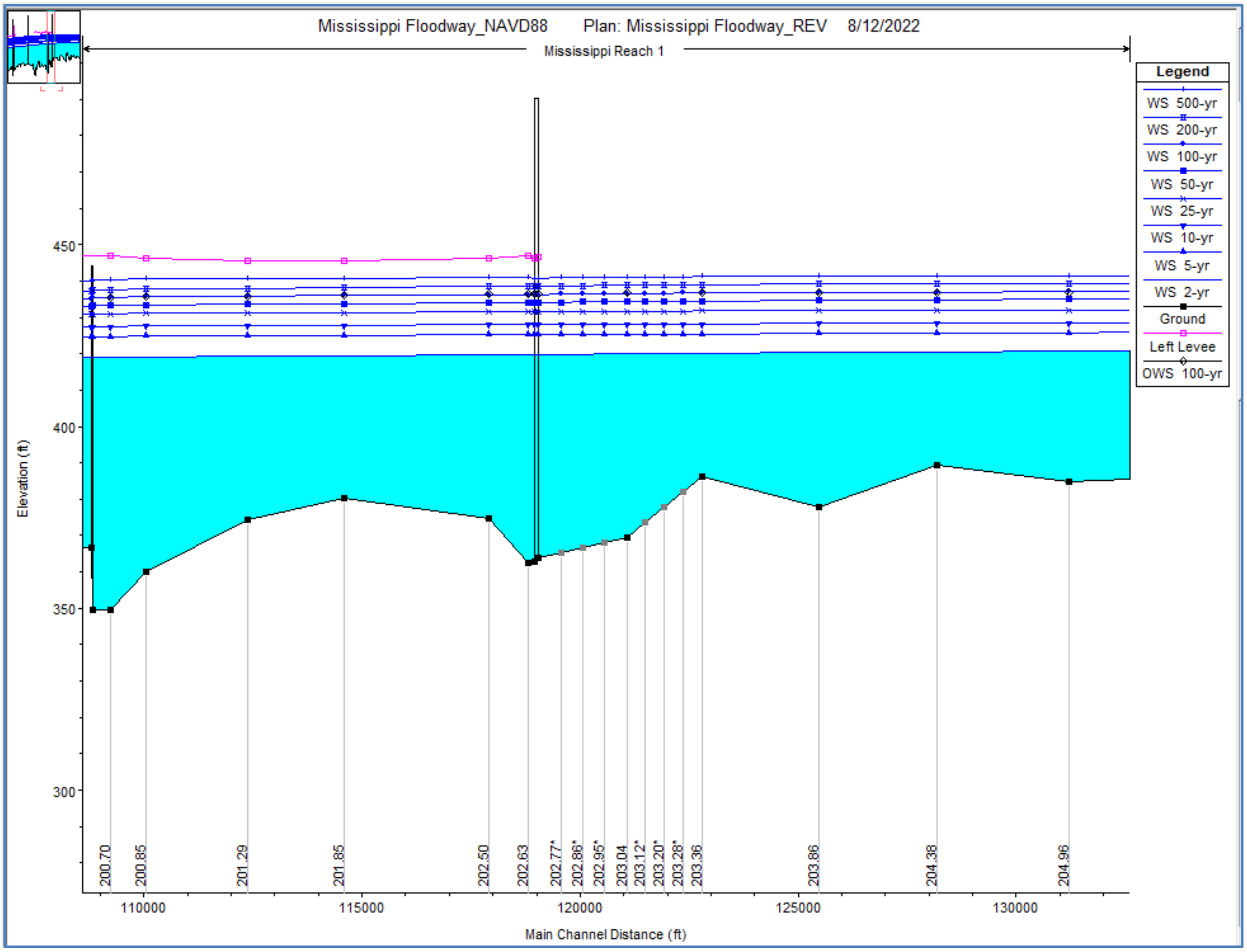

Figure A.3: Mississippi River Flood Profiles at Alton for 0.5, 0.2, 0.1, 0.04, 0.02, 0.01, 0.005. 0.002 AEP

The economic analysis for this study also required HEC-RAS model output in additional formats, including the HEC-RAS output “HDF” file for each flood profile. For visualization of flood impacts by event frequency, GIS outputs called Depth Grids were also produced for each flood frequency and design profile. These gridded (raster data) output maps show the depth of flooding across the extent of the study area for each flood profile. A representative depth grid on the model terrain is shown in Figure A.4.

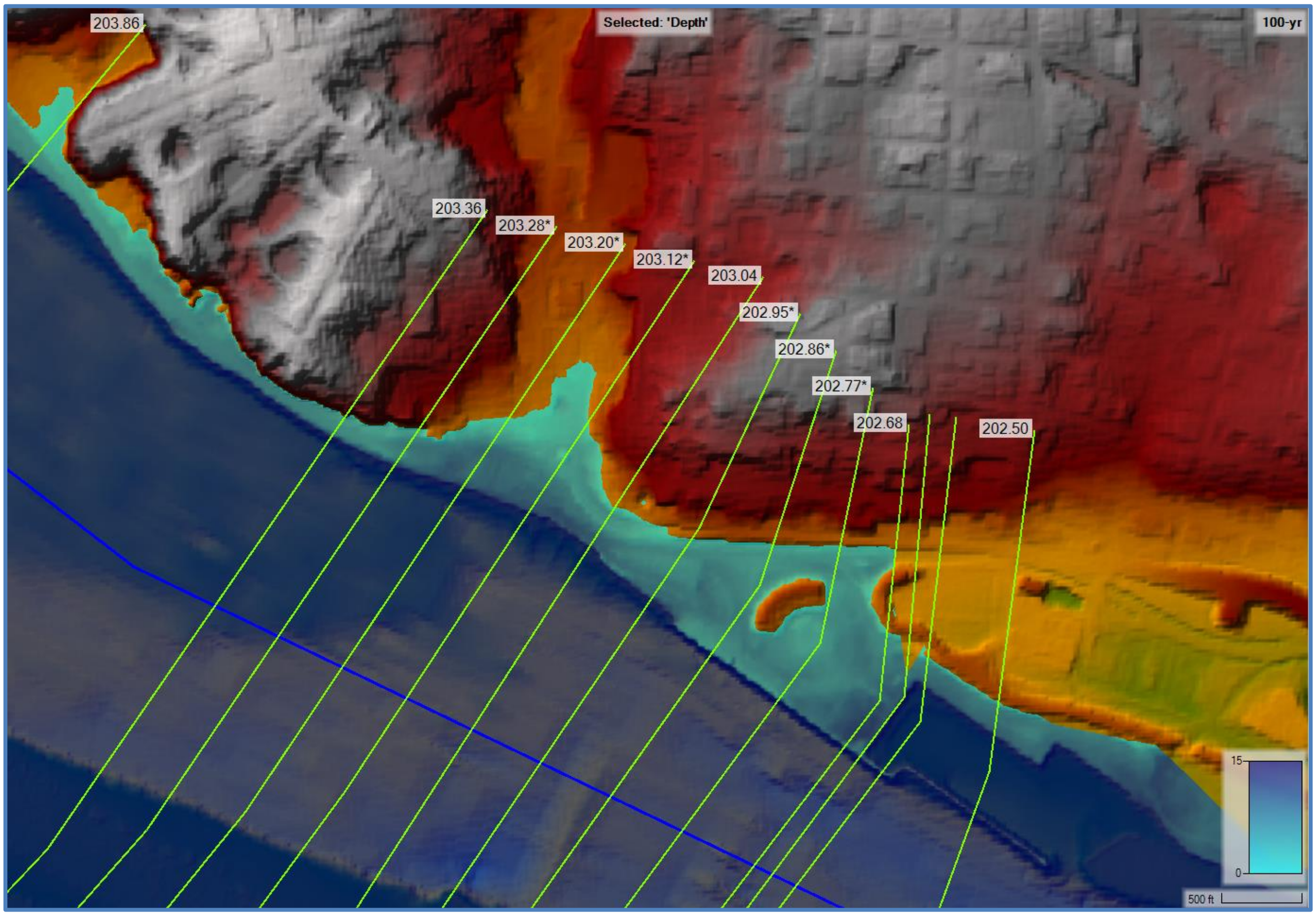

Figure A.4: Mississippi River Flood depth grid for 1% AEP at Alton, Illinois

4.0 No Rise Assessment

The proposed structural options for this study included various alignments for floodwalls to be built in Downtown Alton. To model possible effects of constructing a permanent wall and reducing current storage area for the river floodway, a proposed structure was included into the cross sections. This proposed structure would encroach on the river floodway, and per the Illinois Department of Natural Resources (IDNR) regulations (17 ILL. ADM. CODE CH. I, SEC. 3700), anything built in the floodway must not increase existing base flood elevations by greater than 0.1 feet. FEMA regulations (44 CFR 60.3(d)(3) prohibit encroachments within the regulatory floodway that increase flood levels from the base flood elevation. Water surface elevations in the model were compared between the existing conditions and the structural floodwall alternative. There was no significant change between these elevations. Additional analysis should be considered and conducted during a design feasibility study. A comparison of water surface elevations at the most upstream cross section of the hydraulic model with and without a floodwall option (Options 1-5) are shown below in table A.2. It should be noted that hydraulic modeling was only performed for Option 1 as this option encroached most on the floodway. All other options were set back further inland and would not impact water surface elevations more than Option 1.

Table A.2 Water surface elevations upstream with/without floodwall

River Sta	Profile	W.S. Elev (ft) (No Floodwall)	W.S. Elev (ft) (With Floodwall)	Difference
218.01	2-Yr.	424.14	424.14	0
218.01	5-Yr.	428.07	428.07	0
218.01	10-Yr.	430.52	430.52	0
218.01	25-Yr.	433.48	433.48	0
218.01	50-Yr.	436.37	436.37	0
218.01	100-Yr.	438.4	438.4	0
218.01	200-Yr.	440.57	440.58	-0.01
218.01	500-Yr.	442.23	442.23	0

5.0 Uncertainty

The typical accuracy of water surface elevations based on similar studies is within 0.4 to 0.8 feet. Flow frequencies are developed based on past historical data and can change as additional data is being recorded daily. The 2004 Flow Frequency Study used for this analysis is currently being updated, so changes to expected flow and stage frequency based on up-to-date flood history is possible. Additionally, model geometry, including river cross sections, were not updated with the most current terrain data available, as this was out of the project scope. Further study of this area should include incorporation of current terrain and updated flow frequency. A full analysis of uncertainty was beyond the scope of this study and would only be evaluated for a feasibility study.

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Appendix B: Inventory of Flood prone Structures

1.0 Inventory of Flood prone Structures

Table B-1 includes a flood prone structure inventory sorted by depth of flooding relative to the first-floor elevation. First floor elevation is defined as the ground surface elevation plus the elevation of the foundation height. A positive value of “5” can be interpreted as flood waters inundate the structure with 5 feet of water above the first floor, typically relative to where the front door of the structure is. A negative value of “-2” can be interpreted as 2 feet of water below the first floor, meaning floodwaters have the probability of inundating subfloor areas but may not reach the first floor of the structure. An Esri ArcGIS shapefile that includes the study data will be provided to the City of Alton.

Table B-1 City of Alton, IL Inventory of Flood prone Structures

Parcel ID	Address		Appraised Value	Foundation Height	Ground Surface Elevation	Depth of Flooding Relative to 1st Floor			
						4% AEP(25Yr)	2% AEP (50Yr)	1% AEP (100Yr)	0.2% AEP (500Yr)
1220576803	100	W 3RD	$ 157,504	1	433.7	NA	0.77	2.95	7.48
1220577781	101	W 3RD	$ 141,986	1	432.8	NA	1.58	3.76	8.29
1220576955	104	W 3RD	$ 700,405	1	434.0	NA	0.43	2.61	7.13
1220576853	108	W 3RD	$ 315,369	4	433.8	NA	0.59	2.77	7.29
1220576853	108 B	W 3RD	$ 312,153	1	432.3	NA	2.09	4.27	8.79
1220576845	110	W 3RD	$ 276,094	1	435.9	NA	NA	0.74	5.26
1220576850	112	W 3RD	$ 156,740	1	431.2	NA	NA	0.84	5.35
1220576955	114 A	W 3RD	$ 159,353	1	435.9	NA	NA	0.74	5.26
1220576856	114 B	W 3RD	$ 197,824	1	436.3	NA	NA	0.37	4.89
1220576486	117	W 3RD	$ 141,986	1	434.6	NA	NA	1.99	6.51
1220576486	117 B	W 3RD	$ 356,855	1	434.8	NA	NA	1.80	6.32
1220576489	119	W 3RD	$ 159,353	4	434.0	NA	0.40	2.58	7.10
1220576495	123	W 3RD	$ 103,595	1	434.9	NA	NA	1.71	6.23
1220576903	200	W 3RD	$ 104,842	4	439.4	NA	NA	NA	1.73
1220577104	200 A	W 3RD	$ 209,067	1	436.2	NA	NA	0.40	4.92
1220576515	203	W 3RD	$ 100,500	1	434.7	NA	NA	1.94	6.45
1220576897	206	W 3RD	$ 134,630	1	439.0	NA	NA	NA	2.14
1220576903	208	W 3RD	$ 276,094	1	439.0	NA	NA	NA	2.14
1220576903	208 B	W 3RD	$ 195,050	1	439.2	NA	NA	NA	1.99
1220576837	214 A	W 3RD	$ 104,842	1	439.3	NA	NA	NA	1.84
1220576837	214 B	W 3RD	$ 104,842	4	440.2	NA	NA	NA	0.96
1220576546	215	W 3RD	$ 137,725	1	431.0	0.78	3.51	5.69	10.20
1220576546	215 B	W 3RD	$ 276,094	1	433.7	NA	0.79	2.97	7.49
1220577991	118	4TH	$ 117,665	1	439.3	NA	NA	NA	1.83
1220576926	300	BELLE	$ 199,633	1	436.9	NA	NA	NA	4.20
1220576991	315 A	BELLE	$ 199,633	1	436.2	NA	NA	0.40	4.92
1220576991	315 B	BELLE	$ 218,286	4	438.2	NA	NA	NA	2.89
1220576955	319	BELLE	$ 315,369	1	436.3	NA	NA	0.31	4.82
1220577213	329	BELLE	$ 184,277	1	437.3	NA	NA	NA	3.83
1220572488	331	BELLE	$ 201,281	1	438.1	NA	NA	NA	3.08
1220576124	8	W BROADWAY	$ 109,786	1	442.3	NA	NA	NA	NA
1220576232	145	W BROADWAY	$ 5,667,155	1	425.0	5.33	8.06	10.24	14.76
1220576484	306	W BROADWAY	$ 63,436	1	432.0	NA	2.49	4.67	9.18
1220575353	111	MARKET	$ 100,500	1	439.1	NA	NA	NA	2.00
1220575353	115	MARKET	$ 184,277	1	437.1	NA	NA	NA	3.97
1220576618	204	STATE	$ 197,824	1	431.6	0.06	2.80	4.98	9.50
1220576618	206 A	STATE	$ 289,279	1	434.0	NA	0.46	2.65	7.16
1220576618	206 B	STATE	$ 289,279	4	435.1	NA	NA	1.52	6.03
1220576478	206 C	STATE	$ 289,279	4	433.5	NA	0.93	3.11	7.62
1220576618	208	STATE	$ 104,842	1	436.2	NA	NA	0.46	4.97
1220576773	216	STATE	$ 296,676	1	436.2	NA	NA	NA	2.47
1220576911	302	STATE	$ 290,887	1	440.7	NA	NA	NA	0.41
1220576752	210	WILLIAM	$ 296,234	3.4	437.0	NA	2.75	4.94	9.44
1220576811	217	WILLIAM	$ 137,725	1	440.9	NA	NA	NA	0.29

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Appendix C: Hazardous, Toxic, and Radioactive Waste (HTRW)

1.0 Introduction

The Hazardous, Toxic, Radioactive Waste (HRTW) information provided as part of this report is a summary of possible HTRW issues in vicinity of the City of Alton Floodplain Analysis Study. This does not meet the ASTM E1527-21 standard for Phase I Environmental Site Assessments (ESA) due to the fact a site visit was not conducted and questionnaires from knowledgeable persons was not completed. Information included in this input came from the Environmental Protection Agency (EPA) EnviroFacts website, Illinois Hazmat cleanup records, and past Phase I and IIs conducted near the study footprint. A review of the EPA's EnviroFacts site showed the following areas that may be of concern in the study footprint. Figure C-1 and Table C-1 provide information on the HTRW areas on concern.

The main area that may be of concern is a pay parking lot located on 5th St., Piasa St., 4th St., and Belle St. (38.892469, -90.186961). This site is part of a cooperative agreement with Southwestern Illinois Development Authority (SIDA, CA#: BF00E94001). The soil in this this area is possibly contaminated by metals including arsenic, mercury, cadmium, chromium, lead, selenium, and silver. The groundwater in this area could be contaminated by benzo anthracene. The area is a former site of a gas station and may have contamination from petroleum products. SIDA conducted a Phase I ESA on 08/02/2011, during this Phase I there was no signs of significant soil or groundwater contamination. During the field visit, the site assessors did not observe any obvious impact such as staining, odors, or elevated photo-ionization detector (PID) readings. A Phase II ESA was conducted on 01/10/2012 the results of this Phase II were not available for review. This area is currently capped by the asphalt surface which acts as a barrier to exclude the industrial/commercial ingestion exposure pathway. This site is likely only to be an area of concern if the project plans take out the asphalt cap or excavate soil in the area. SIDA should be consulted before any construction takes place on this site.

The Ardent Mills LLC, located at 145 West Broadway (38.890416, -90.188791) in another area of concern. Ardent Mills is an active flour mill which has had no Clean Air Act, Clean Water Act, or RCRA violations in the past 12 quarters. The mill does have active air monitoring under the Clean Air Act (identifier: 100000111238). Since 1988 the mill has reported using chlorine to the Toxics Release Inventory with usage from 1988 to 2002 being above the required reporting amount, usage from 2003 to 2021 not exceeding 500 pounds. This site has no history of non-compliance which makes it unlikely that the mill would impact this project.

Another possible area of concern is Frontier Furnishings Spray booth located at 7 West 4th St (38.891898, -90.18556). This area is classified as an active very small quantity generator of ignitable waste under the Resource Conservation and Recovery Act (RCRA, ID: ILR000052225). This site does not have a history of noncompliance, so it is unlikely to impact the project.

There have been three spills in the study area with the latest occurring on 01/03/2013 at 401-411 Piasa Steet when an unknown amount of waste oil spilled from a leaking underground storage tank. The Illinois hazmat team estimate the spill extant was a 10 by 7-foot area and Envirolife consulting was contact for cleanup. On 05/14/2008 150 gallons of number 2 diesel fuel was spilled at 1 Piasa Street due to a pump failure. The spill was contained, and Heritage Environmental Service were contacted for cleanup. On 11/30/1993 at 145 West Broadway, an unknown amount of heating oil was spilled from an underground storage tank. There is no record of cleanup, but due to the age of this spill it is unlikely to impact the project.

Figure C-1. Alton, IL FPMS - Potential HTRW areas of concern

Table C-1: Alton IL FPMS - List of Potential HTRW areas of concern

Site Name	Latitude	Longitude	Address	Statute	Area of concern	Compliance Status	Last Compliance Monitoring	Overall Status
Alton, City Of	38.89087	-90.18393	101 E. 3rd St.	Clean Water Act	Urban Stormwater Permit	Unknown	2/6/2020	Expired, 02/28/2021
Alton One Hour Cleaner	38.89201	-90.18844	329 State St.	RCRA	Waste of Ethene, tetrachloroethylene	No violation identified	11/18/2010	Inactive
Former Lenhardt Tool & Die Company	38.89315	-90.18631	501 Piasa St.	Brownfield Property/EPA Cleanup	PCBs and Petroleum Product contamination	Phase I Environmental Site Assessment completed on 09/20/2018		Cleaned up in 2022. (per City of Alton)
Lenhardt Tool & Die	38.893424	-90.186282	575 Piasa St.	RCRA	Unspecified	No violation identified	12/30/2008	Inactive
Lenhardt Tool & Die Co.	38.893679	-90.186257	6th & Piasa St.	Clean Water Act	Special dies, tools, jigs, and fixtures	No violation identified	3/31/2022	Pending Individual IU Permit
Snyder & Sears Buildings	38.8911069	-90.1865235	3rd & Piasa St.	Possible Cleanup	Petroleum products and asbestos	Phase II Environmental Assessment completed 05/12/2010		Cleaned up between 2011-2015. (per City of Alton)

Resources:

1. Envirofacts: Envirofacts Report

2. Illinois Emergency Management Agency: https://public.iema.state.il.us/FOIAHazmatSearch/

3. Illinois EPA LUSTs: https://www2.illinois.gov/epa/topics/cleanup-programs/bol-database/Pages/leaking-ust.aspx

4. City of Alton via email dated 24 March 2023.

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Appendix D: Map of Alton, IL National Register

Historic Districts and Historic Structures

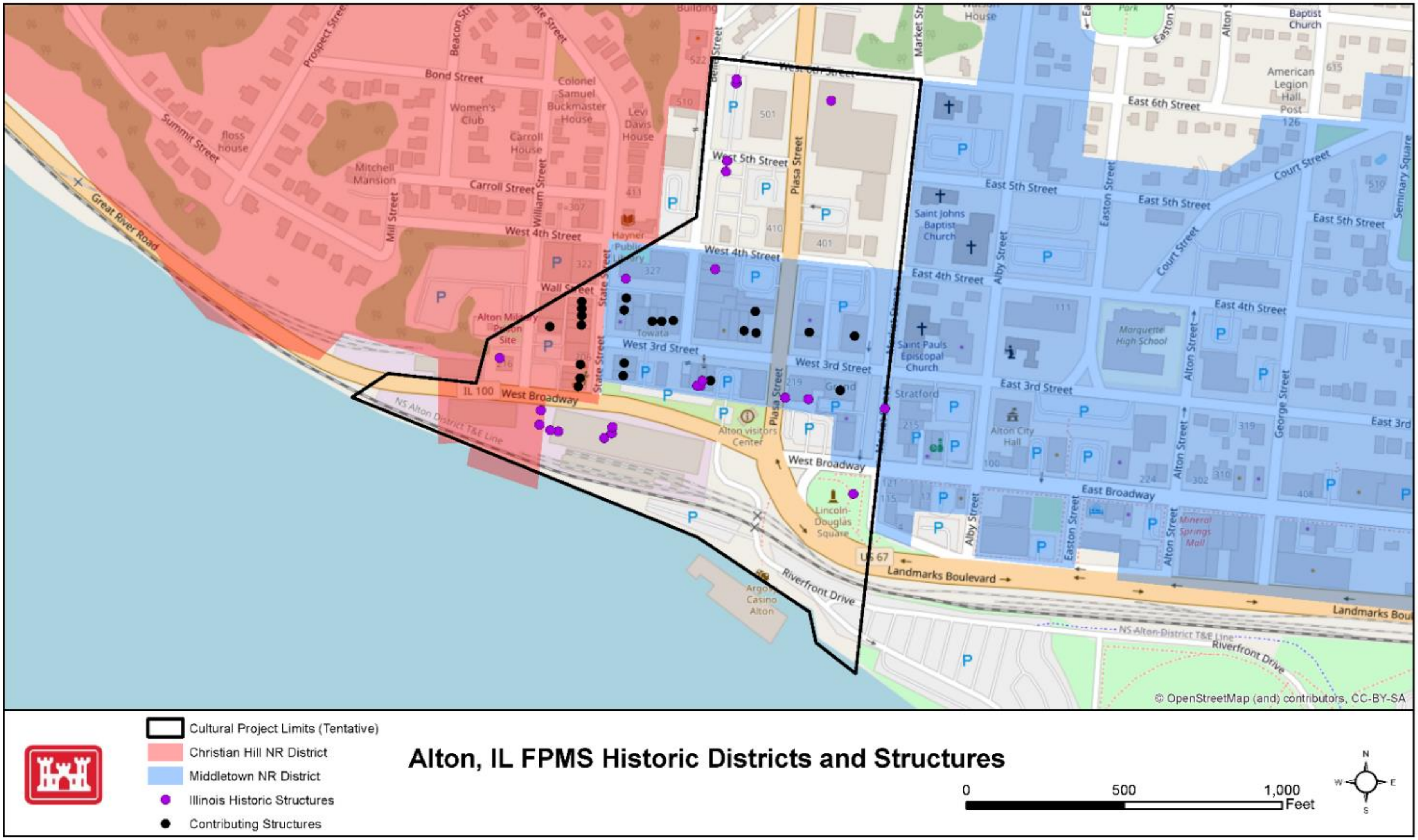

Figure D-1: Alton, IL National Register Historic Districts and Historic Structures

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Appendix E: Cost Estimates

PROJECT: FPMS Alton 19-Jan-2023

SUBJECT: Option 1 (Mississippi River to railyard to Wood River Levee System)

ITEM	ESTIMATED AMOUNT
Mobilization and Demobilization	$ 1,250,000.00
Floodwall, T-Type	$ 30,000,000.00
Closure Structures	$ 13,300,000.00
Pump Station	$ 8,029,000.00
SUBTOTAL:	$52,579,000
CONTINGENCIES: (39%)------------------------	$20,521,000
SUBTOTAL:-------------------	$73,100,000
ENGINEERING & DESIGN (15%)--------------------	$11,000,000
CONSTRUCTION MANAGEMENT (10%)---------	$7,310,000
TOTAL COST	**$91,410,000**

PROJECT: FPMS Alton 19-Jan-2023

SUBJECT: Option 2 (Along McAdams Parkway/Broadway to Wood River Levee System)

ITEM	ESTIMATED AMOUNT
Mobilization and Demobilization	$ 1,250,000.00
Floodwall, T-Type	$ 31,520,000.00
Closure Structures	$ 13,300,000.00
Pump Station	$ 8,029,000.00
SUBTOTAL:	$54,099,000
CONTINGENCIES: (39%)------------------------	$21,101,000
SUBTOTAL:-------------------	$75,200,000
ENGINEERING & DESIGN (15%)------------------	$11,300,000
CONSTRUCTION MANAGEMENT (10%)---------	$7,520,000
TOTAL COST	**$94,020,000**

PROJECT: FPMS Alton 19-Jan-2023

SUBJECT: Option 3 (Along Broadway, Railyard to Market Street)

ITEM	ESTIMATED AMOUNT
Mobilization and Demobilization	$ 1,250,000.00
Floodwall, T-Type	$ 13,244,000.00
Closure Structures	$ 13,300,000.00
Pump Station	$ 8,029,000.00
SUBTOTAL:	$35,823,000
CONTINGENCIES: (39%)------------------------	$13,977,000
SUBTOTAL:-------------------	$49,800,000
ENGINEERING & DESIGN (15%)-------------------	$7,470,000
CONSTRUCTION MANAGEMENT (10%)---------	$4,980,000
TOTAL COST	**$62,250,000**

PROJECT: FPMS Alton 19-Jan-2023

SUBJECT: Option 4 (Along Broadway, William Street to Market Street)

ITEM	ESTIMATED AMOUNT
Mobilization and Demobilization	$ 1,250,000.00
Floodwall, T-Type	$ 7,007,000.00
Closure Structures	$ 9,975,000.00
Pump Station	$ 8,029,000.00
SUBTOTAL:	$26,261,000
CONTINGENCIES: (39%)------------------------	$10,239,000
SUBTOTAL:-------------------	$36,500,000
ENGINEERING & DESIGN (15%)---------------------	$5,480,000
CONSTRUCTION MANAGEMENT (10%)----------	$3,650,000
TOTAL COST	**$45,630,000**

PROJECT: FPMS Alton 19-Jan-2023

SUBJECT: Option 5 (City's Proposal)

ITEM	ESTIMATED AMOUNT
Mobilization and Demobilization	$ 1,250,000.00
Floodwall, T-Type	$ 5,775,000.00
2-Foot Muscle Wall Extension	$ 10,769.00
SUBTOTAL:	$7,035,769
CONTINGENCIES: (39%)------------------------	$2,744,231
SUBTOTAL:-------------------	$9,780,000
ENGINEERING & DESIGN (15%)--------------------	$1,470,000
CONSTRUCTION MANAGEMENT (10%)----------	$978,000
TOTAL COST	**$12,228,000**