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West River Wall Reconstruction
Planning and Preliminary Design

Interim Report – Site Reconnaissance and Inventory of Current Conditions

July 3, 2014

City of Rochester
Bureau of Architecture and Engineering Services
City Hall , Room 300 B
30 Church Street
Rochester, NY 14614

This document was prepared for the New York State Department of State with funds provided under Title 11 of the Environmental Protection Fund

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

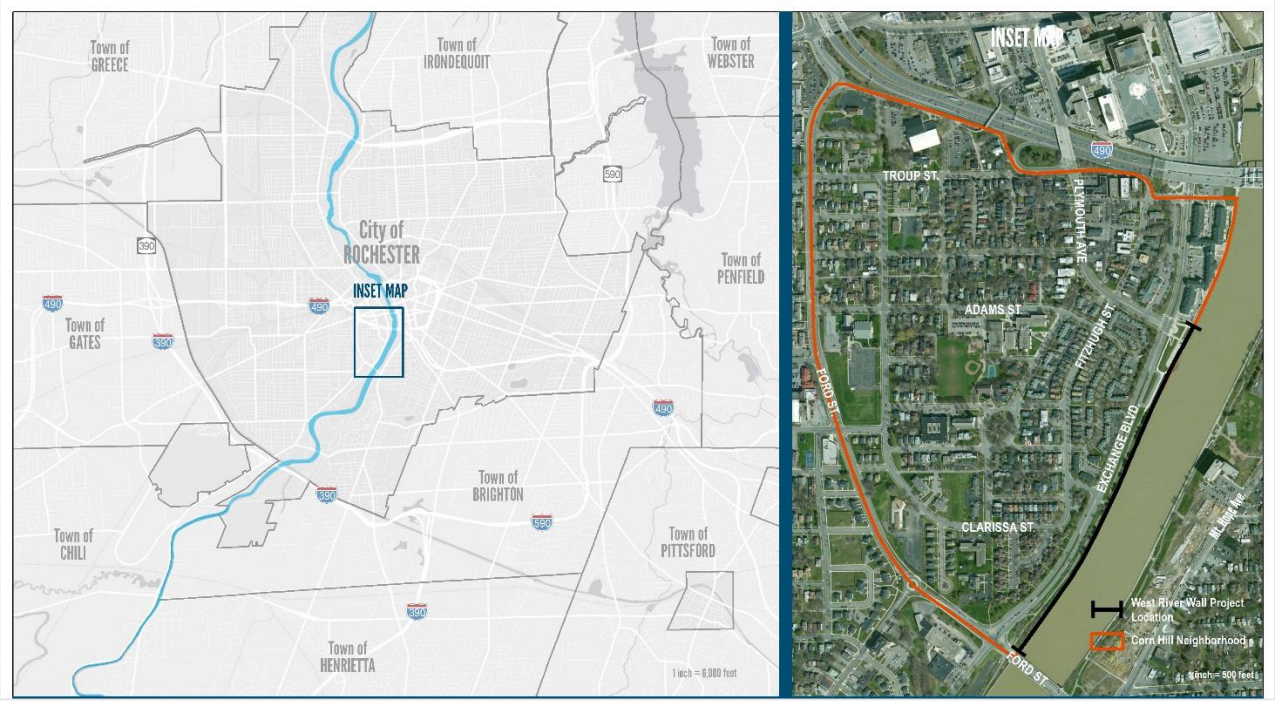
The City of Rochester received a matching grant from the New York State Department of State, with funds provided under Title 11 of the Environmental Protection Fund, to conduct engineering and planning services for the west river wall, located on the west side of the Genesee River in the Corn Hill neighborhood. The purpose of the project is threefold:

1) Evaluate the condition of the west river wall;
2) Develop schematic plans for improvements;
3) Develop a master plan for improving public spaces and physical/visual access to the River.

The project study area, shown in Figure 1-1, includes approximately 2,200 linear feet of the west river wall located on the west side of the Genesee River between Plymouth Avenue and Ford Street, south of downtown Rochester and directly east of the Corn Hill neighborhood.

Given the river wall's proximity and relationship to the Corn Hill neighborhood, the project was conceived and funded with a primary objective of selecting a wall reconstruction solution that meets short-term flood protection goals while responding to long-term public access and safety improvements desired by the City of Rochester and the Corn Hill Neighborhood Association.

Figure 1-1. West River Wall Project Location



Source: Bergmann Associates

1.2 PAST PLANNING EFFORTS

Over the last few decades, various public and neighborhood entities have developed plans and design concepts for the area in and around Corn Hill and the south Genesee River corridor. These include:

- Genesee River South Corridor Land Use and Development Plan (1986)
- Local Waterfront Revitalization Plan (1990)
- New York State Canal Recreationway Plan (1995)
- Erie Canalway National Heritage Corridor Preservation and Management Plan (2006)
- Corn Hill Community Vision Plan (2012)
- Vacuum Oil Brownfield Opportunity Area Plan (2013)

Many of the recommendations presented in these plans were incorporated into the Corn Hill Community Vision Plan, recently completed by the Corn Hill Neighborhood Association and the Rochester Regional Community Design Center. Key principles from the Vision Plan that are most relevant to this project include recommendations for improved connections to the Genesee River, including:

- Protect, improve, and utilize the River
- integrate the River into the daily lives of Corn Hill residents
- Highlight the River as a destination for recreation, entertainment and activities
- Create safe pedestrian crossings
- Improve gateways and construct amenities such as seating, pedestrian lighting and signage.

The City and consulting team consider these recommendations among the key guiding principles for the project and will be incorporated into planning and preliminary design recommendations developed in later phases of this project.

1.3 OVERVIEW AND PURPOSE OF THIS REPORT

The purpose of this interim report is to described the results of the team's initial technical evaluation. It includes the following components:

- **Section 2 Technical Analysis** includes an analysis of flood protection and water management issues, a structural assessment of the wall's condition and stability, and a technical description of wall retrofit considerations.
- **Section 3 Neighborhood Conditions** describes the socio-economic and physical conditions of the Corn Hill neighborhood, highlighting possible user needs and key physical factors that will influence the character and scope of future improvements to the public spaces within the river wall study area.
- **Section 4 Key Findings** summarizes the conclusions of the technical analysis and identifies key issues for consideration.

Future reports will include schematic plans for the preferred wall reconstruction alternative and a master plan for the west river wall study area.

1.4 HISTORICAL CONTEXT

The historic relationship between the Corn Hill neighborhood, the Genesee River and the west river wall is a key factor that will influence recommendations for reconstruction of the wall itself, as well as the design of future public spaces within the vicinity. [1]

The Corn Hill neighborhood was established along the west side of the Genesee River in the early 19th Century and is the oldest neighborhood in Rochester. The neighborhood was originally known as "Rochesterville" and later as the Third Ward. The neighborhood's current day boundaries are defined by the I-490 to the north, the Genesee River to the east and Ford Street to the south and west.

Construction of the river wall (undated photo)

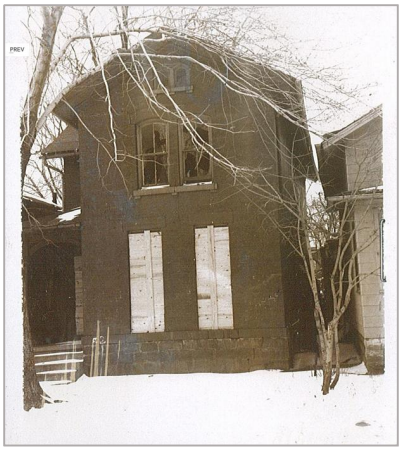
Corn Hill's early growth and development were directly influenced by its proximity to the Genesee River and the opening of the Erie Canal in 1825. In 1918, the New York State Canal Corporation constructed the west river wall for the purpose of protecting the Corn Hill area from frequent flooding of the Genesee River. At that time, the area was referred to as the "stuffed shirt" neighborhood, named for the merchants, craftsmen, and professionals who built homes in the years after the Erie Canal was completed.

Historic Mansions in Corn Hill

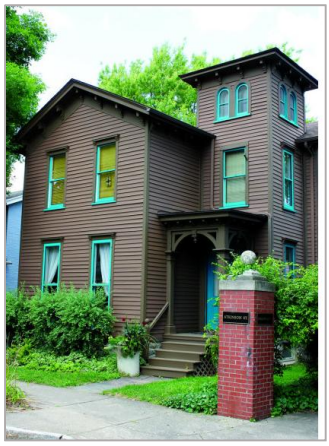
Hervey Ely House (undated photo)

The city's prominent residents built homes in the neighborhood, including Nathaniel Rochester (founder of the City of Rochester), Hervey Ely (owner of a flour mill) and William Kimball (a tobacco manufacturer). Though many of the homes were later demolished, some remain today, including the Hervey Ely home, which was purchased in 1920 by the Daughters of the American Revolution. Today the neighborhood contains numerous other examples of mid-19th century architecture, such as Greek Revival, Italianate mansions, worker's cottages and carriage houses.

[1] Sources of historical information include the Corn Hill Neighborhood Association, the Landmark Society of Western New York, the *Corn Hill Neighborhood Vision Plan*, the Monroe County Library website, and the City of Rochester website description of the Corn Hill neighborhood.



Home at 102 Adams Street, demolished in 1969.



Historic home featured in the Holiday Tour of Homes

By the 1960s, many of the neighborhood's homes had fallen into disrepair and were scheduled for demolition as part of the City's urban renewal efforts. In response, a group of neighbors called "New Rochester" organized to protect and rehabilitate many of the homes and other structures in the neighborhood.

In the mid-1970s, portions of the neighborhood were placed into two distinct historic districts (one national and one local). Properties in the locally designated Preservation District are subject to the City's Preservation Ordinance, which defines the process to manage physical changes to these properties.

1.5 CORN HILL AND THE WEST RIVER WALL TODAY

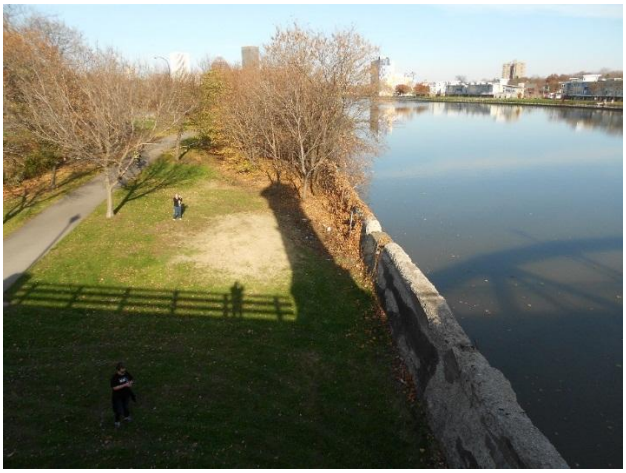
The Corn Hill neighborhood is now home to a mix of commercial, residential, community service, and office uses. More recent development includes construction of the Mark IV townhomes and apartments in the early 1980s and the Corn Hill Landing mixed-use development directly, in 2008.

There are numerous commercial uses located in the northern part of the neighborhood (north of Plymouth Avenue), which includes offices for small businesses, non-profit organizations and restaurant/retail establishments. In addition, the Corn Hill neighborhood hosts multiple annual events and festivals. These include the Clarissa Street Reunion, the Holiday Tour of Homes, and the Corn Hill Arts Festival. The Arts Festival began in 1968 and is considered to be one of Rochester's premiere summer festivals, attracting between 175,000 and 200,000 visitors per year.

Mixed-use commercial/residential uses at Corn Hill Landing, looking south along Exchange Boulevard

The Rivertrail at Corn Hill Landing, looking north towards Downtown Rochester

The Corn Hill neighborhood and Genesee River have undergone significant changes in the nearly 100 years since the original construction of the west river wall. The Court Street Dam was improved in 1926 and the Mount Morris Dam was constructed in 1952. Together these facilities have provided considerable flood control and protection for the area. While the west river wall continues to play a role in flood protection, it is considered a redundant facility. At the same time, the condition of the wall has deteriorated, with limited documented maintenance and repair efforts.



The Riverway Trail and the west river wall, looking north from the Ford Street bridge.

An obstructed view of the River from the Riverway Trail

In its current condition, the west river wall today exists as a physical and visual barrier between the Corn Hill community and the Genesee River. Exchange Boulevard further separates the neighborhood from the River and the existing Riverway Trail, as there are limited safe locations for pedestrians to cross the street. The Corn Hill community has expressed a desire to improve access to the River and enhance the public spaces between the River and Exchange Boulevard.

The relationship between the Corn Hill neighborhood and the river wall as it exists today is a key consideration for this project. Understanding this relationship is central to ensuring that recommended design improvements are sensitive to the neighborhood context and incorporate the needs and desires of the Corn Hill neighborhood.

2 TECHNICAL ANALYSIS

2.1 FLOOD PROTECTION AND WATER MANAGEMENT

This section describes key considerations for flood protection and management in and around the river wall, including an updated hydrologic and hydraulic analysis of the Genesee River and a sedimentation analysis.

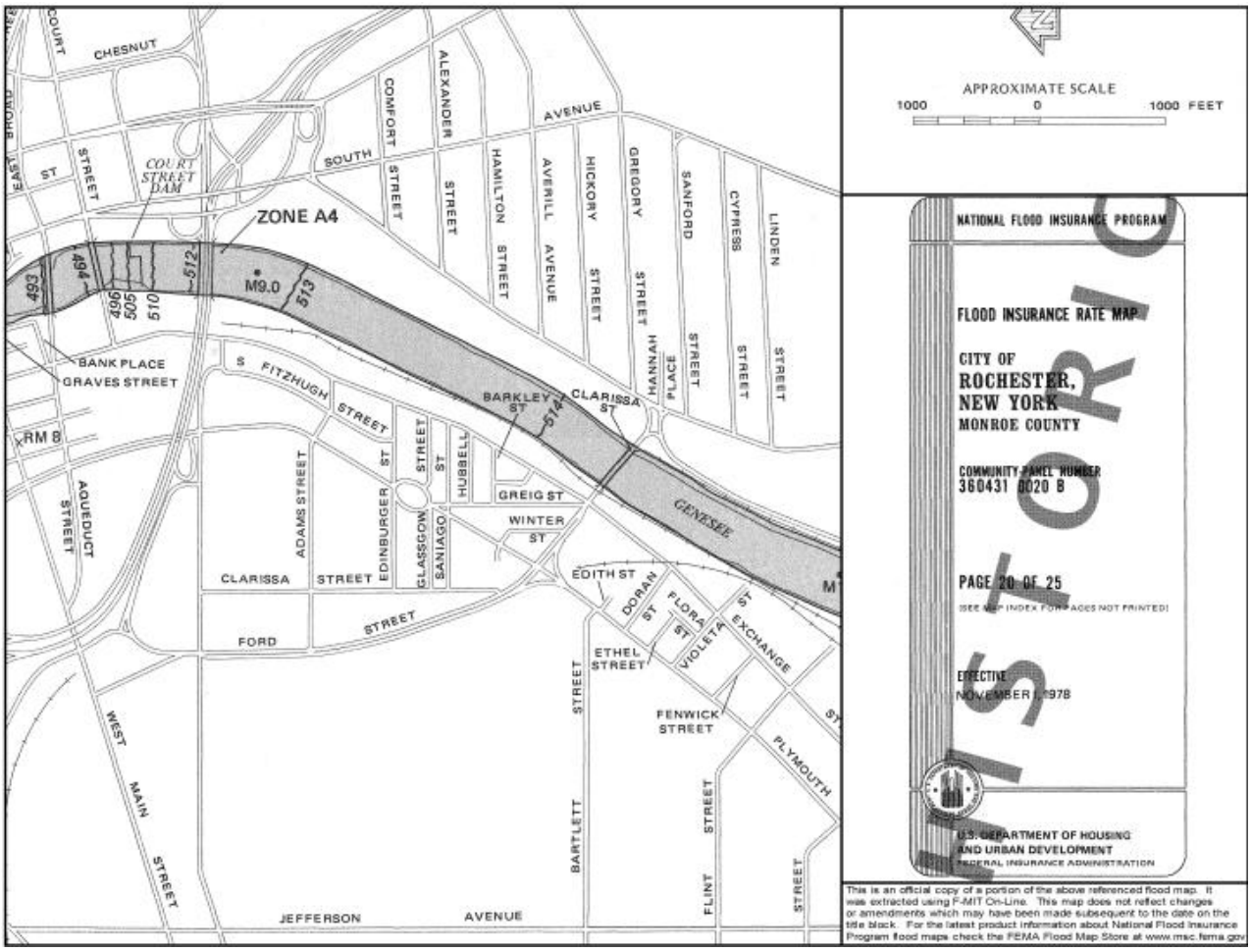
2.1.1 Background

Protection from Genesee River flooding in the Corn Hill area has historically been provided by the floodwall, constructed around 1918 by the New York State Canal Corporation (NYSCC). The construction of the Mount Morris Dam, completed in 1952 by the U.S. Army Corps of Engineers, Buffalo District, provides considerable flood control by storing the volume of the floodwaters behind the dam. In 1972, Hurricane Agnes caused considerable flooding throughout western New York State. However, Mount Morris was filled to capacity during this event and minimal flooding occurred downstream. It is estimated that this dam averted over $200 million in damages in Rochester. This project has made the floodwall less important as a flood control measure.

In addition to these structural flood control measures, the City of Rochester practices floodplain management through its participation in the National Flood Insurance Program (NFIP). This program, run by the Federal Emergency Management Agency (FEMA), provides for otherwise unavailable flood insurance, in return for the City adopting and enforcing a Flood Damage Prevention Ordinance. This ordinance requires all new and substantially improved structures in the mapped floodplain to be elevated to at or above the 100-year flood elevation (frequently referred to as the Base Flood Elevation, or BFE). In New York State, through the state's requirement of adoption of higher standards, new and substantially improved construction in the mapped floodplain must be 2.0 feet above BFE. An additional provision of the NFIP is a requirement to purchase flood insurance for properties purchased with federally-insured mortgages.

In the City of Rochester, there are 88 flood insurance policies in force with an average yearly premium of $1,360 (as of 4/30/2014). FEMA's privacy policies do not allow the locations of individual policy holders to be released, but it is reasonable to assume that many of these policy holders are in the Corn Hill area. The historic FEMA floodplain maps, issued in 1977 (see Figure 2-1), showed the floodwall providing flood protection and the Corn Hill area as being located outside of the floodplain.

Figure 2-1 Historic FEMA Floodplain Map



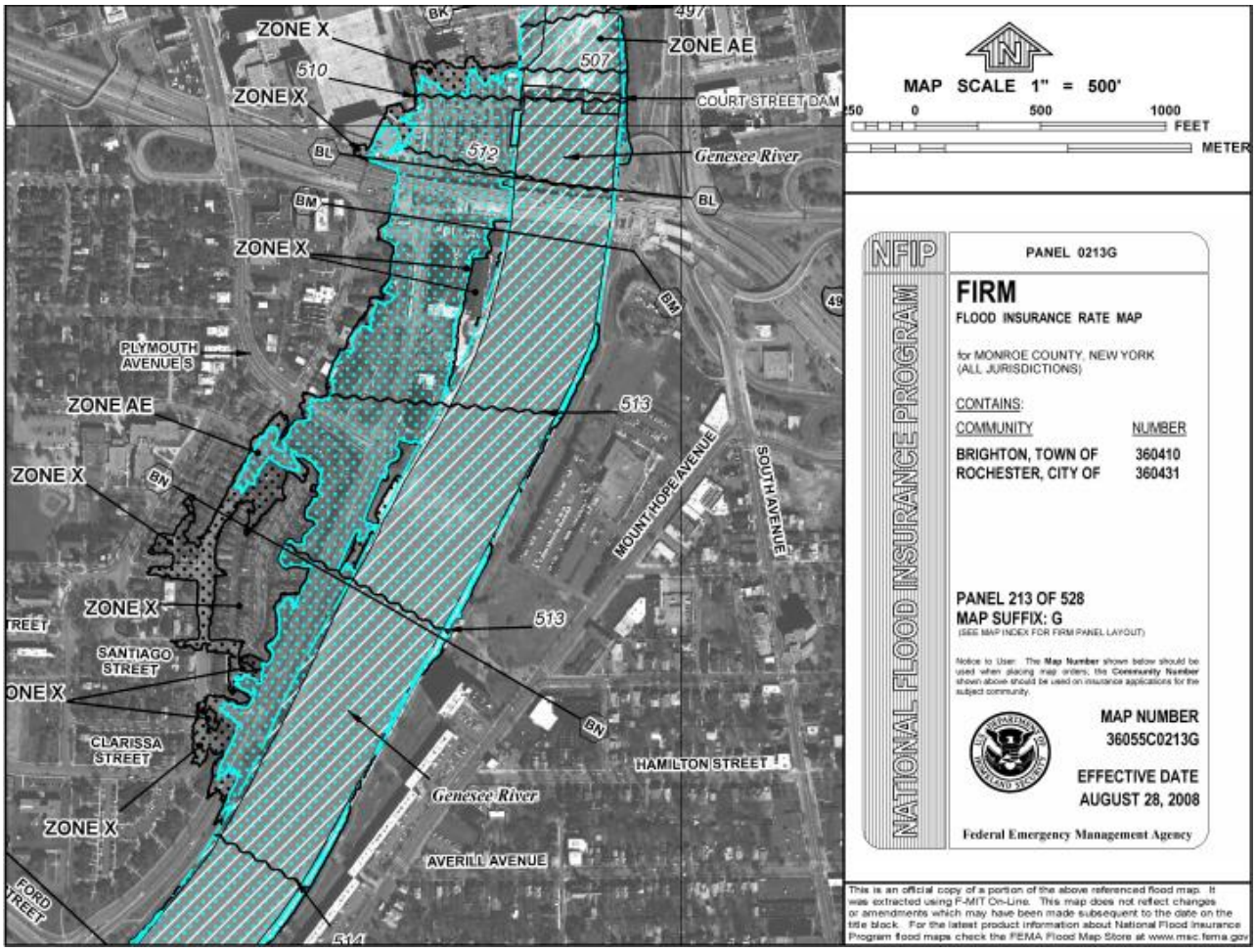
Source: FEMA (Elevations are according to National Geodetic Vertical Datum of 1929)

When FEMA produced a seamless county-wide map for Monroe County in 2008, the agency used hydraulic analyses from the historic maps and mapped the new floodplain with:

- Updated topographic information (from Monroe County LiDAR);
- A datum conversion for the floodwall (1929 Mean Sea Level to 1988 North American Vertical Datum); and
- Floodwall no longer shown as providing flood protection.

As shown in Figure 2-2 there are areas in Corn Hill that are in the newly mapped floodplain.

Figure 2-2 Flood Insurance Rate Map



Source: FEMA (Elevations are according to the NAVD88 Datum. The conversion from NAVD88 to is City of Rochester +1.56' for the project site.)

It is believed that many of the flood insurance policy holders in the City of Rochester are property owners in the Corn Hill area who are financing their home purchase with a mortgage and are therefore required to do obtain insurance. Reconstruction of the floodwall to meet FEMA criteria for levees and floodwalls would relieve this financial burden.

2.1.2 Analysis

Our approach to the floodwall improvements is based to a large extent on an updated hydrologic and hydraulic analysis of the Genesee River to establish an appropriate flood elevation for design purposes. One of FEMA's criteria for indicating on its maps that a floodwall provides protection is that it has 3 feet of freeboard. Therefore, the project team developed an updated representation of the 100-year flood conditions of the Genesee River for presenting to FEMA for a map update.

The historic hydrologic analyses used a regression equation to estimate the 100-year discharge. Our approach was to use the US Geologic Survey gaging station records near Ford Street--using only data from the time after Mount Morris began operation. Our Log Pearson statistical analyses of the years 1956 to 2013 resulted in a 100-year flow of 24,493 cubic feet per second (cfs). When compared with the historic hydrologic 100-year flow of 32,500 cfs, our analyses resulted in a significant flow

reduction. The USGS gage recorded 22,500 cfs in 1972 (during Hurricane Agnes) which compares favorably with our results.

The hydraulic analyses were intended to reflect actual operations during flood conditions, specifically, (1) Mount Morris Dam gate closure and (2) lowering of sector gates at Court Street Dam.

In addition, the team conducted a sediment survey incorporated the results into the hydraulic analyses. The results are shown in Figure 2-3.

Figure 2-3 Hydraulic Analyses Results

Distance u/s of Court St Dam (ft)	FEMA Map Cross Section	Current FEMA 100-yr (ft) (NAVD88)	Proposed FEMA 100-yr (ft) (NAVD88)	Required Top of Wall (ft) (NAVD88 // City Datum)	Comments
0		511.0	509.5		DAM
350	BL	511.9	510.5		
					490 BRIDGE
562	BM	512.3	510.6		
2000			511.3	514.3 // 515.9	APPROX D/S LIMIT OF PROJECT AREA
2146	BN	513.0	511.3	514.3 // 515.9	
2200			511.3	514.3 // 515.9	
2300			511.4	514.4 // 516.0	
2400			511.4	514.4 // 516.0	
2500			511.5	514.5 // 516.1	
2600			511.5	514.5 // 516.1	
2700			511.5	514.5 // 516.1	
2800			511.6	514.6 // 516.2	
2900			511.6	514.6 // 516.2	
3000			511.7	514.7 // 516.3	
3100			511.7	514.7 // 516.3	
3200			511.7	514.7 // 516.3	
3300			511.8	514.8 // 516.4	
3400			511.8	514.8 // 516.4	
3500			511.9	514.9 // 516.5	
3600			511.9	514.9 // 516.5	
3700			511.9	514.9 // 516.5	
3800			512.0	514.9 // 516.6	
3900	BO	513.6	512.0	514.9 // 516.6	APPROX U/S LIMIT OF PROJECT AREA
					FORD ST BR
4090	BP	513.8	512.1		

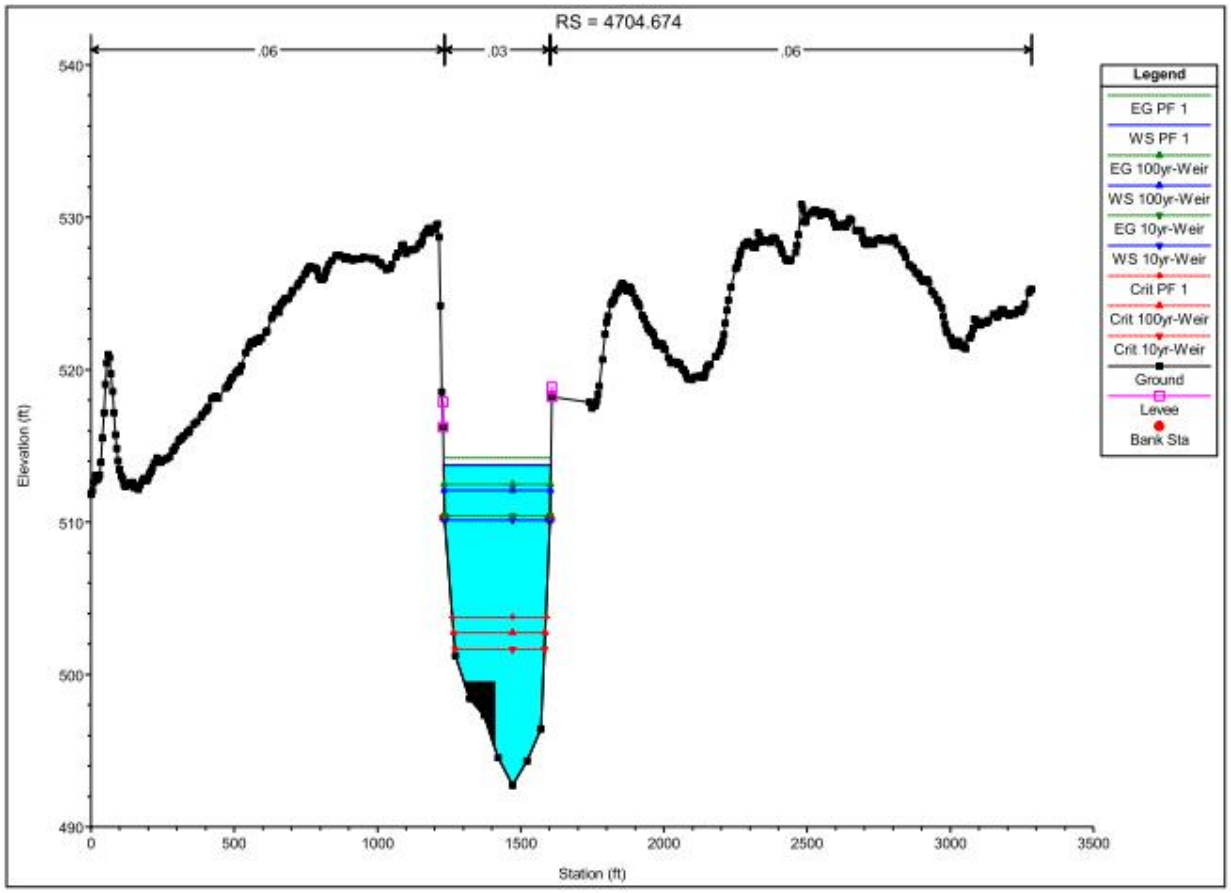
West River Wall study area limits

Figure 2-3 shows the required top-of-wall assuming 3.0 feet of freeboard above the revised 100-year elevation.

The findings of the hydraulic analysis indicate a required top of wall ranging from El. 516.6 (near Ford Street) to El. 515.9 (near Corn Hill Landing), according to City Datum. The original top of wall surface ranges from El. 519.8 (near Ford Street) to El. 518.7 (near Corn Hill Landing), per City Datum. Hence, this suggests that the top of the wall could be lowered on the order of 2 ¾ feet to 3 ¼. feet

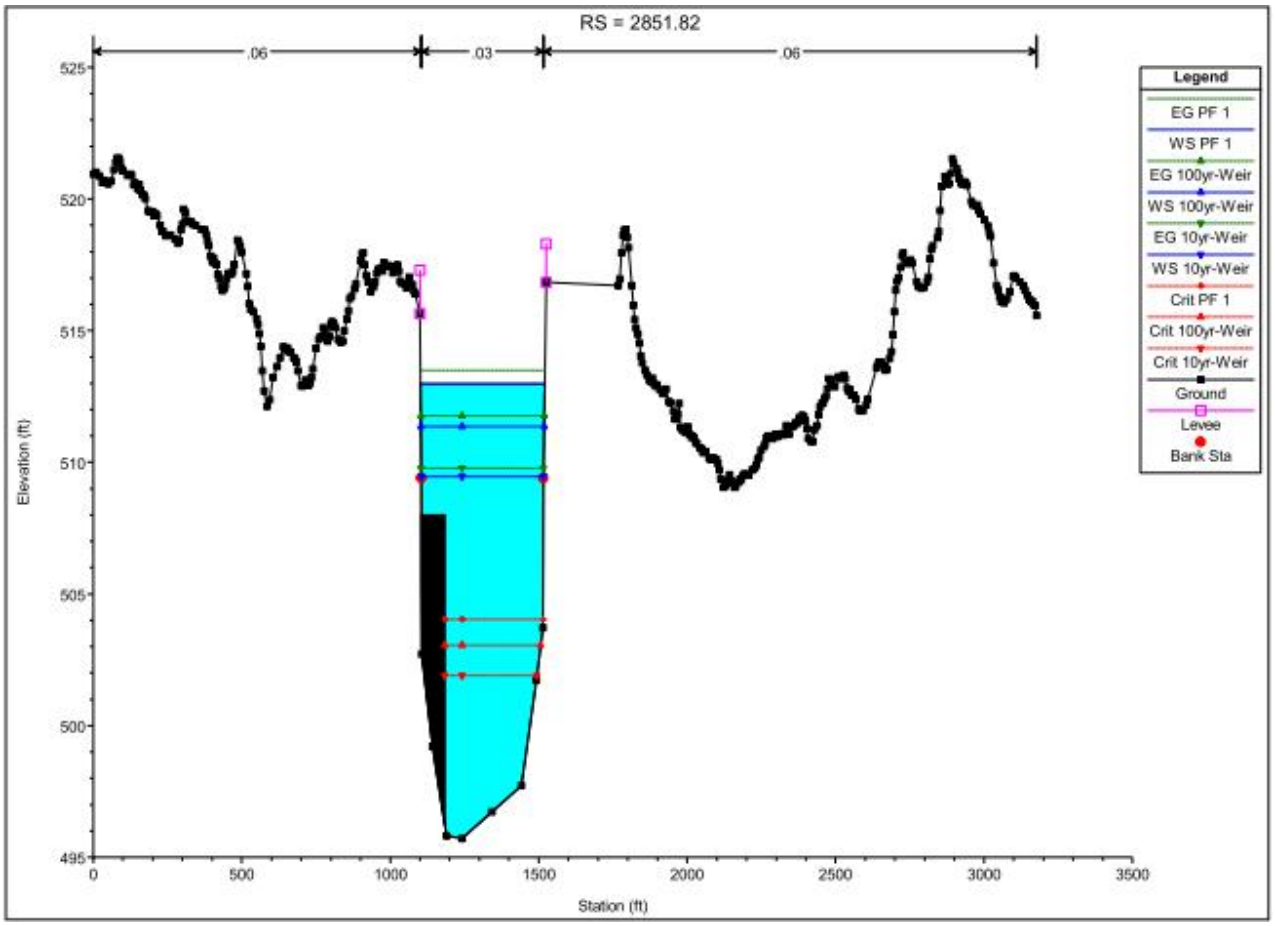
For an analysis of sedimentation impacts, the current sediment conditions in the vicinity of the West River Wall were field surveyed form a boat. These sediment elevations were incorporated into the channel cross-section in the hydraulic model as shown in the following figures:

Figure 2-4 South Cross-Section (south end of the project area)



Note: Elevations in figure are according to the NAVD88 Datum. The conversion from NAVD88 to is City of Rochester +1.56' for the project site.

Figure 2-5 North Cross-Section (north end of the project)



Note: Elevations in figure are according to the NAVD88 Datum. The conversion from NAVD88 to is City of Rochester +1.56' for the project site.

An analysis of the sedimentation rate resulted in about 0.073 (0.87 inches) feet per year. Assuming this sedimentation rate would continue for another 20 years, the resulting water surface elevations would increase by about 0.5 feet.

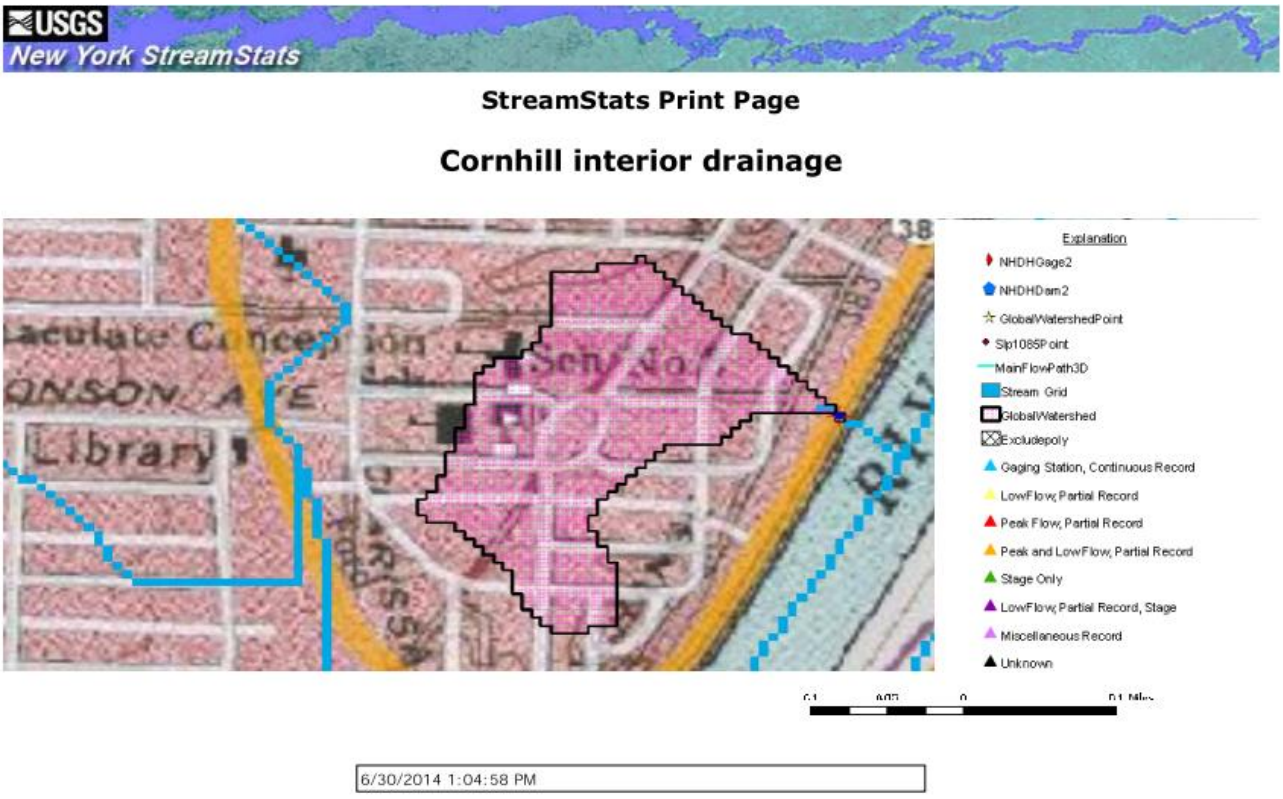
The number of properties removed from the floodplain as result of the new analyses is dependent on a number of factors. For finished construction, FEMA considers the following two criteria when determining whether a structure is in or out of the floodplain:

- Low Adjacent Grade (LAG), or the lowest spot elevation where the structure makes contact with the ground surface; and
- Base Flood Elevation (BFE).

If the LAG is equal to or above the BFE, the structure is considered by FEMA to be out of the floodplain. If the LAG is lower than the BFE, the structure is considered to be in the floodplain. Also, if the reconstructed floodwall meets FEMA criteria for accreditation, all structures behind it will be considered not in the regulatory floodplain.

The LAG was surveyed for nine structures in the Corn Hill area. Our revised hydraulic analyses indicate four of these could be removed from the floodplain prior to the wall reconstruction.

One of the criteria for FEMA to accredit a floodwall is consideration of interior drainage behind the wall. Using the USGS application *StreamStats*, the largest drainage area behind the wall is about 22.6 acres, as shown below:



Interior drainage can be managed in one of the following ways:

- Backflow valves to prevent Genesee River flood elevations from flooding into the area. This is appropriate if the duration and timing of peaks from the interior drainage will be short compared with high waters on the Genesee River; or
- Pumping station behind the wall, if the interior hydrograph compared with high Genesee River elevations, indicate that interior flooding would occur without a pump station.

It appears that backflow valves will be sufficient. This will need to be confirmed during later phases.

2.2 WALL STRUCTURAL EVALUATION

This section describes the conditions of the existing concrete river wall, presents its work history, indicates wall stability results, and provides potential alternatives to modify or rehabilitate the existing wall as part of the subject project. The following sections are related to the condition assessment and structural evaluation of the existing west river wall.

- Appendix A – Land and Bathymetric Survey
- Appendix B.1 – River wall Photos
- Appendix B.2 – Riverside and Dive Inspection Report
- Appendix B.3 – Landside Inspection Report
- Appendix B.4 – Concrete Core Results
- Appendix D.1 – Wall Analysis Geotechnical Parameters Memorandum
- Appendix D.2 – Wall Stability Assessment

Figure 5.1 indicates the location and limits of this site. This figure also denotes nearby features impacting the site, such as the Court Street Dam, and shows the vicinity of other completed projects involving river wall work adjacent to the project site.

For this interim report submission, Appendix B.2, B.3, and B.4 are currently under development (or in progress) and are therefore not included. Furthermore, although this section does outline some potential wall rehabilitation options, detailed repair scope and associated costs are not included here. Such information will be provided as the project progresses.

2.2.1 Introduction

The West River Wall consists of a concrete gravity wall with a battered stem and concrete footing. Record drawing suggest the wall was originally constructed in about 1918 and is founded on bedrock, according to the New York State Canal Corporation (NYSCC) record drawings (Contract No. 59.). The wall structure lines the Genesee River and is owned by the NYSCC. Although the wall continues further in either direction, the limits of wall being considered as part of this project extend from the Ford Street Bridge (southerly limit) to Corn Hill Land (northerly limit). This translates to approximately 2,200 linear feet of wall.

The wall is made up of a series on concrete monoliths with joints spaced from approximately 25 to 40 feet in length. The top of the wall varies and is sloped in the downstream direction (1’ in 2000’), starting at an approximate elevation (El.) of 519.8 (City Datum) near the Ford Street Bridge and transitioning to El. 518.7. Depth to bedrock also varies at this site ranging from approximately El. 494 to El. 499. There are two different wall sections at the site, which are similar in makeup. Where rock is deeper, the wall transitions from a Type ‘B’ wall to a slightly enlarged Type ‘C’ wall. Figure 5.2 shows the elevation of the wall and two sections according the original construction drawings (Contract No. 59). The wall is typically shown to be founded on bedrock, but the foundation is not shown to be keyed into the bedrock. The concrete structure is largely unreinforced, but does indicate some reinforcement running along the backside of the stem (into the heel), extending through a mid-height construction joint, and at the toe of the footing. The battered stem of the wall measures 2’-6” wide at the top and the footing is 13’-0” to 13’-6” wide, for a Type ‘B’ and Type ‘C’ wall, respectively.

The wall is furnished with periodic mooring cleats along the top of the wall (see Photo B.1-15) and includes recessed ladders on the riverside (see Photo B.1-14), spaced approximately 500 feet apart. At the land area behind the wall was a missing manhole cover and a fixed ladder (see Photo B.1-

16). It is suspected that this manhole was constructed to provide access to the vitrified tile pipe drainage system indicated on the record drawings. The manhole was filled with brush and would need to be cleaned out to see if the manhole and drainage system are present and function properly. Although not observed in the field, it is possible that other manhole structures may exist at the site, but are concealed by vegetation and debris.

The original construction drawings indicate that an 18-inch diameter vitrified sewer pipe is present along the back side of the wall, including a 6-inch diameter vitrified drainage line (Figure 5.2). Manholes, as mentioned above, are shown on the record drawings that extend down to these pipes. It is unknown if the system remains active. It is suspected that the 6-inch vitrified pipe was installed to provide drainage and limit hydrostatic pressures along the back side of the wall. It is not known if the drainage system is open (cleared) and works effectively to drain soils behind the wall. No other utilities are known to with be located within the immediate vicinity of the wall.

Both a topographic land and bathymetric survey were performed as part of this project and are included within Appendix A. The soil on the backside of the river wall is nearly even with the top of the wall at the northerly limits (see Photo B.1-4), but the backside of the wall can be exposed by about 8 feet at the southerly project limits near Ford Street (see Photo B.1-9). The exposed wall height transitions randomly along the length of the wall. River sediments on the river side of the wall also vary along the length of wall and range from approximately El. 510 at the northerly limits to about El. 502 at the southerly project limits near Ford Street.

An aluminum floating dock system and gangway are located at the north end of the site. The dock system is anchored to the river wall. Depending on water levels, the dock system may become hung up on accumulated river sediment (see Photo B.1-5 and B.1-6). The docks system and wall connections appear to be in distress and may require repair. Use of the dock system is also somewhat impeded by the presence of high river sediment, which greatly limits allowable boat draft.

Figure 2-6 Project Limits and Adjacent Sites

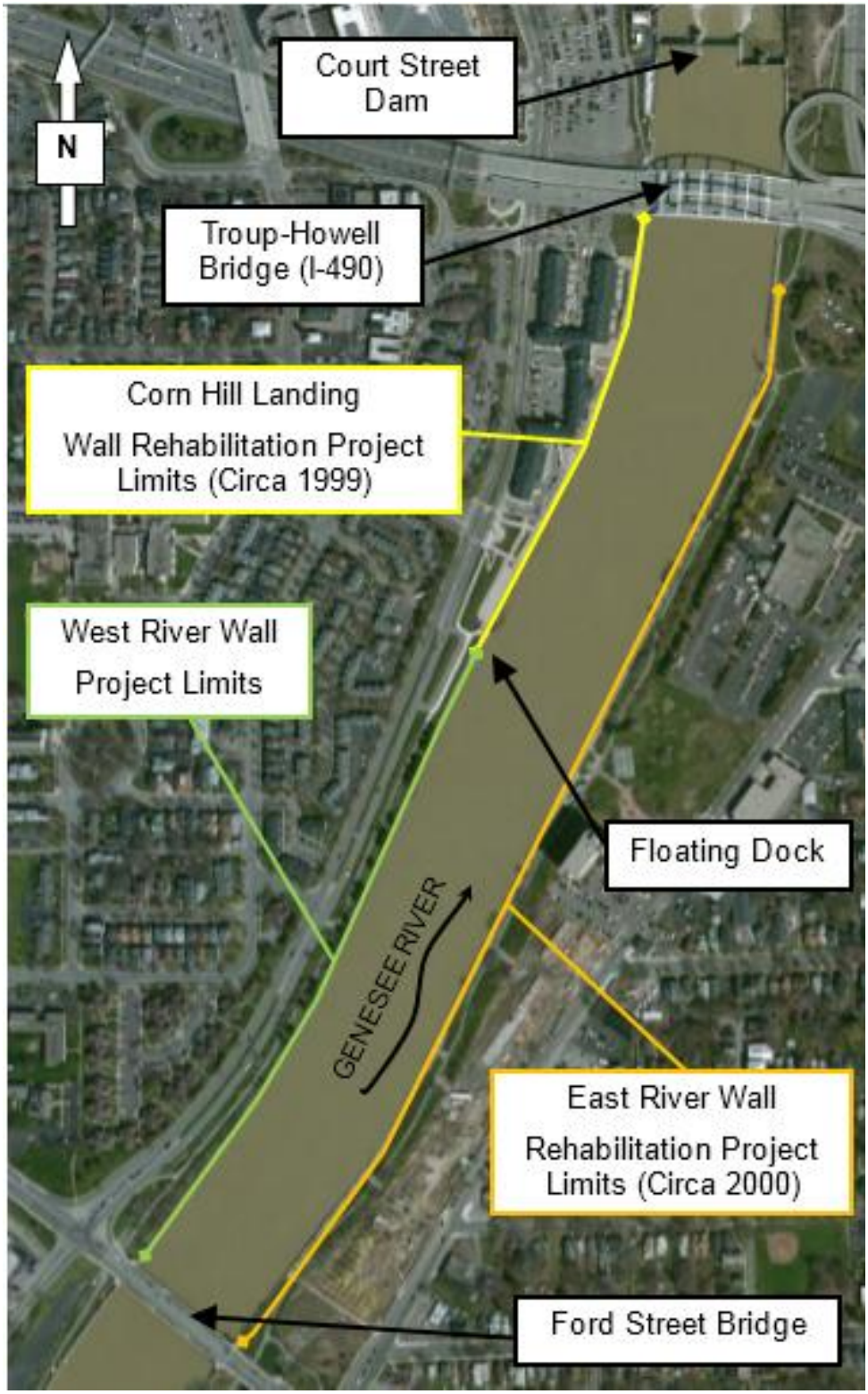
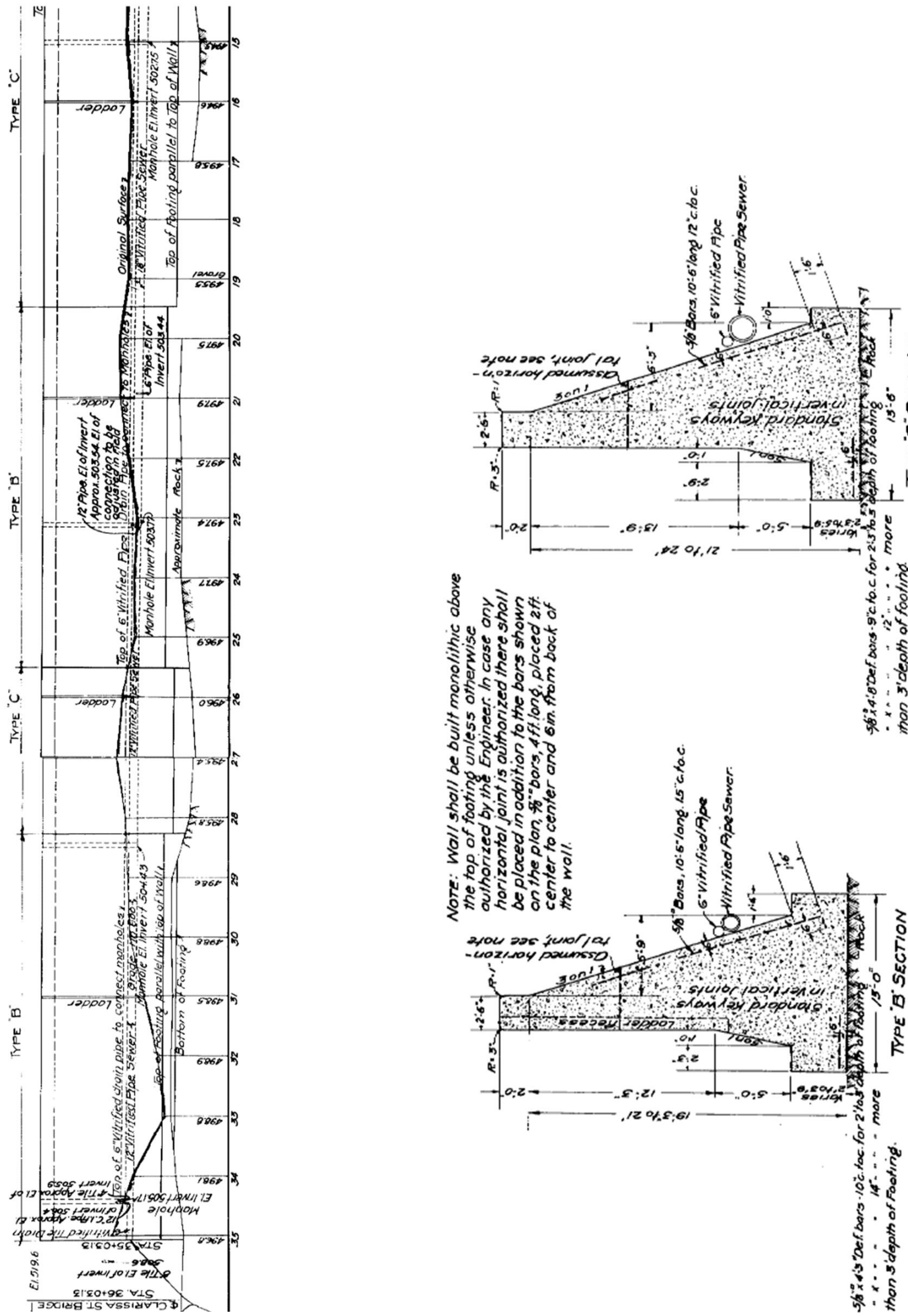


Figure 2-7 Elevation and Sections of Wall (Type B & C - from NYSCC Contract 59 Drawings).



2.2.2 Background

There have been very few documented wall repair or renovation efforts since the walls original construction. One area of the wall appears to have recently undergone minor repair, as fresh concrete was place on the top portion of the wall, extending for short length (see Photo B.1-8). Previous inspection reports have suggested that concrete repairs were made to the wall from 1941 to 1943 by "State Maintenance Forces", indicating that seventeen of the 40 foot long panels on the west river wall were repaired. These previously repaired panels are now showing signs of distress, but stand out in contrast of the non-repaired panels (see Photo B.1-11).

Although not within the projects limits for this wall, similar nearby wall renovation efforts have previously been conducted as part of the East River Wall Project (2000) and Corn Hill Landing (1999). Previous wall failures have been reported on the east river wall, which in configured similarly to the west river wall, prior to the 2000 repair. However, there are no known wall failures that have occurred on the west river wall near the project limits.

Several documents are available that are related to the existing west river wall. The following documents were used as a reference for the development of this report:

- Geotechnical Investigation for Promenade at Erie Harbor, by ROC Geotechnical for the City of Rochester (dated 2013).
- Contract Drawings for Erie Harbor – East River Wall Rehabilitation Project, prepared by LaBella Associates and Reimann-Buechner (dated 2000).
- Wave Reflection Study for the Erie Harbor Basin), prepared by LaBella Associates and Han-Padron Associates for the City of Rochester (dated 2000).
- Contract Drawings for Canal Wall Rehabilitation and Site Improvements at Rochester Harbor at Corn Hill Landing, prepared by the Sear-Brown Group (date 1999).
- 1999 Diving Inspection, prepared for NYSCC and NYSTA (dated 1999).
- Preliminary Planning and Engineering Report for Erie Harbor – East Riverwall Rehabilitation Project, prepared by LaBella Associates and Reimann-Buechner (dated 1998).
- Erie-Harbor East River Wall Concrete Core Testing Results, prepared by LaBella Associates and CME Associates (dated 1998).
- Structural Calculations for River Wall, prepared by LaRue Associates and MRP Associates for NYSDOT (dated 1989).
- Concrete Retaining Wall Inspection, Genesee River, prepared by NYSDOT (dated 1985).
- Concrete Retaining Wall Inspection and Core Testing, Genesee River, prepared by NYSDOT (dated 1979).

2.2.3 Wall Condition Assessment

Assessment of the existing river wall was conducted by both inspection and coring of the concrete walls. Wall stability assessment is discussed in the next section. The visual, non-intrusive, inspection of the wall (above and below water) was conducted in the spring of 2014 as part of this project and detailed inspection findings are presented within Appendix B.1 and B.2. *However, preparation of these inspection reports is pending and results and findings are to be included at a later date.* A general description of the wall is provided herein to summarize its overall condition.

The wall is generally in poor condition and displays significant degradation from freeze-thaw deterioration and likely ice and debris impact damage (see Photo B.1-4 and B.1.7). Many of the monolith sections are deeply eroded at the waterline. In a few areas the depth of loss near the waterline was estimated to be 20 inches. More typically, the depth of deterioration ranged closer to 4 to 8 inches, except where monolith had previously been repaired and deterioration is less. Previous wall repairs are briefly noted within Section 192.2.2.The deterioration at the waterline can be observed in Photos B.1-11 and B.1-15. Numerous efflorescent covered cracks existed all over the non-scaled surfaces and sounded areas of the wall were generally hollow.

The top of the wall is scaled, rounded off, and could be picked apart by hand. The top of wall elevation is also notably less than the original wall profile due to the extent of deterioration in many areas (See Photo B.1-11). Deterioration at some monolith joints was severe enough to form a groove in the wall (see Photo B.1-10).

Heavy vegetation, including ivy and trees, is present along the back side of the wall (see Photo B.1-1 and B.1-12). The presence of vegetation limited observation of the wall in some areas. The vegetation may be causing damage to the wall concrete and should be removed.

Despite the poor concrete condition, no major signs of a progressing stability failure were identified, such as displacement between monolith joints or a tilting/rotated wall section. However, the deep and progressing deterioration near the waterline greatly increases the risk of a potential wall failure mid-height of the wall. Hence, repair of these areas is recommended to mitigate such risks.

Concrete coring work for this project is pending and results and findings are to be included within this report at a later date. However, some conclusions can be made based on cores previously taken in the vicinity of this project. The findings of this previous coring work is summarized below:

- East River Wall Cores (1998) – 2 cores taken:
- Overall condition on concrete denoted as fair to poor.
- Cement pastes was relatively soft and porous.
- Concrete has poor durability and was not purposefully air entrained.
- Petrographic results denoted the following:
- Course aggregate up to 3” was fair to poorly graded.
- Fly ash pozzolanic admixture was not observed.
- Paste was judged to be medium to soft and slump estimated to be medium to high (4” to 8”). Paste/aggregate bond was considered fair to good.
- Depth of carbonation was not applicable.
- Water/cement ratio estimated between 0.48 to 0.57 with approximately 6-10% unhydrated cement particles.
- Compressive strength tests ranged from 4160 to 9320 psi for the two samples.
- West River Wall Cores (1979) – 4 cores taken:
- Cores were inspected visually, no compressive or petrographic testing conducted.
- One 20.5” deep core indicated depth of deterioration over its full length (20.5 inches).
- A 19.5 inch deep core indicated 11 inches depth of deterioration.
- An 11.5 inch deep core indicated 8 inches depth of deterioration.

- An 11.5 inch deep core, taken within a previously repair area (1940's) indicated no depth of deterioration at the time the coring was conducted.

The result of the previous coring work suggest that the wall concrete is not air entrained and is therefore subject to a higher risk of deterioration, particularly at the waterline. This condition is highly evident in the field observations. The depth of deterioration indicates that more extensive concrete repair measures would be needed to remove existing deteriorated wall concrete and re-build the wall section to its original profile. This is similar to the concrete repair details utilized on nearby wall concrete repair projects at the East River Wall and Corn Hill Landing.

2.2.4 Wall Stability Assessment

Previous Stability Assessment

A previous wall stability assessment was performed (Structural Calculations for River Wall, prepared by LaRue Associates and MRP Associates for NYSDOT (dated 1989)). This analysis indicated the following results:

- Overturning Factor of Safety (F.O.S.) of 2.97.
- Toe Pressure of 4200 psf and heel pressure of 1550 psf.
- If the wall is bearing on soil, than the soil coefficient of sliding friction must be at least 0.4 to provide a F.O. S. of 1.5.

However, the simplified analysis is dependent upon several assumptions. Based on more recent information, the two assumptions below are believed to be inappropriate for analysis and could vastly impact results.

- The riverwall is assumed to be bearing on rock and is either on dowels or keyed into bedrock. However, record drawings do not suggest use of dowels and do not show the footing being keyed into rock.
- Backfill is of unit weight not exceeding 120 pcf and has a minimum angle of repose of 30 degrees. Based on borings from the East River Wall project (1999), the backfill use in this area is expected to be of a greater unit weight and lesser angle of repose.

For the reasons stated above, the result of this previous stability analysis are largely discounted.

Stability Criteria

The existing wall primarily acts as a retaining structure; however, it also serves as a floodwall. Because the wall is responsible to provide flood protection, use of FEMA and U.S. Army Corps of Engineers (USACE) design criteria is considered appropriate. The structure was analyzed using the gravity method and elastic techniques according to the following U.S. Army Corps of Engineers (USACE) guidelines:

- EM 1110-2-2100 - Stability Analysis of Concrete Structures (2005)
- EM 1110-2-2502 - Retaining and Flood Walls (1989)

The applied loads include hydrostatic water pressures, uplift pressures, silt pressures, and the self-weight of the structure. Pseudo-static seismic forces, including active soil and hydrodynamic loads, were applied and calculated in accordance with Chakrabarti, et al.'s Seismic Design of Retaining Walls and Cellular Cofferdams (ASCE, 1978). The horizontal coefficient for seismic acceleration is based on the peak ground acceleration reported by Roc Geotechnical for the nearby site of the proposed promenade at Erie Harbor. Vertical seismic acceleration is neglected in the stability

analysis in accordance with the direction of the USACE EMs listed above for sites with horizontal acceleration coefficients less than 0.2. Cases with forces from ice on the river are neglected as the application of an ice force would be adding to the resisting loads and improve both sliding and overturning results. Ice cases are assumed not to control by inspection.

In all cases the "Friction Factor of Safety" method was used to calculate the sliding safety factor. Given the character of assumed foundation material, no cohesion resistance is included in the calculation of total sliding resistance capacity. The required minimum factor of safety on sliding for each case is listed for comparison against the calculated value in the stability results in Section 2.2.4.

Uplift was assumed to vary linearly between the full pool or groundwater pressures from the high water side to the low water side. Depending on the case being evaluated, either side of the wall could be the high or low water side. Evaluation of the foundation bearing stresses conservatively includes hydrostatic uplift pressures on the foundations to maximize applied bearing pressures consistent with USACE EM 1110-2-2200 (Section 3-3.k(3)). Where loads resulted in a cracked base condition (less than 100% bearing at base) on the high water side of the wall, the uplift was iterated with uniform high water pressure acting along the full length of the crack (length not in bearing), the remaining un-cracked length varies uniformly to low water pressure.

Section 2.1 of this report provides detailed information on hydraulics for this project site. Below is an abbreviated summary of key water levels used for assessment of the wall. All elevations listed below are according to City Datum.

Operating Pool:

- El. 512.6 to El. 513.1 (usual condition) indicates operating pool levels during the Erie Canal navigation season (generally early May to mid-November) controlled by the Court Street Dam, just downstream from the project site.
- El. 511.0 minimum (usual condition) indicates operating pool levels during the Erie Canal non-navigation season (generally mid-November to early May) controlled by the Court Street Dam, just downstream from the project site.

Low Water:

- El. 507.0 (taken as unusual condition) indicates the approximate minimum pool elevation according to the assessment and rehabilitation documents developed for the East River Wall project developed in 1998. Although not previously documented as such, it is suspected that this elevation is related to an unusual event where the movable crest gates at the Court Street Dam suddenly drop in elevation and allow a rapid and unanticipated drop in pool. However, it is understood that dam operating procedures limit the duration of this sort of event.

For preliminary stability analyses, the pool differential across the wall was typically taken as a 2' drop from the high water side to the low water side. This allowance for partial cutoff by the wall and foundations is roughly consistent with the reported river pool and groundwater elevations reported in the Subsurface Cross Sections include in the Figures of the East River Wall Rehabilitation Preliminary Report (1998).

Stability Results

Stability evaluations of the wall were performed along the length of the wall to capture results for varying wall geometries (Type 'B' and 'C'), varying bedrock depth, varying sedimentation elevation, and varying landside soil elevations. In general, the wall was evaluated approximately every 100 ft. The wall analysis sections and all forces applied were calculated on a "per foot" basis. For full

documentation of structural stability calculations see Appendix D. Abbreviated results are presented within this section.

Geotechnical parameters used for the wall analysis are based on information obtained from exploratory efforts implemented at nearby sites. There is no known geotechnical information specific to this site. Based on review of available geotechnical information from adjacent sites, and assuming similarities to this project site, soil parameters were developed for the stability analysis. A memorandum, provided by Fisher Associates, containing the suggested analysis parameters is included as Appendix D.1.

Wall stability checks were performed for sliding, overturning, and bearing for usual, unusual, and extreme loading conditions, as defined by USACE design criteria. The results of the stability analyses for the existing condition are summarized in Figures Figure 2-8 and Figure 2-9 below. Detailed stability calculations for each load case are provided in Appendix D. The existing structure, evaluated at various locations along its length, does not meet the required factors of safety for sliding stability from EM 1110-2-2502 “Retaining and Flood Walls.” The stability of the structure was checked for three (3) load cases: usual (normal), unusual, and extreme (seismic).

Listed below are major factors and assumptions contributing to stability results:

- The structure is assumed to be founded on bedrock, as generally indicated in the original construction drawings.
- Uplift was assumed to vary linearly between full pressures from the high water side to the low water side.
- At-rest earth pressure (vs. active/passive) is assumed, primarily due to the fact the concrete wall is considered rigid and founded on rock.
- Geotechnical conditions are assumed based on information from geotechnical investigation performed at adjacent sites. It is assumed that variations between sites are minimal in nature.
- The wall is analyzed according to the original section profile. No account has been made for loss of deteriorated concrete for purposes of the stability calculations. Weight reductions, as a result of significant concrete deterioration, would be expected to have an adverse effect on stability results.
- Two conditions for river sediment were considered; one where the river sediment acts to provide river-side support to the wall where present, and one neglecting the presence of the river sediments (down to the bottom of footing elevation). The absence of the river sediments is anticipated as a reasonable case due to potential future dredging or potential erosion. Results for this case are provided within Figure 2-8. Wall stability results including existing sediment levels are provided within Figure 2-8.

Figure 2-8 Stability Results: Existing Conditions Excluding River-Side Sediment in Front of Wall

Stability Section	Load Case	FOS Against Sliding		Percent Bearing of Base		Maximum Vertical Bearing Pressure (ksf)	
		Req'd	Calc'd	Req'd	Calc'd	Allow	Calc'd
STA. 0+00 thru STA. 3+08	1 Usual	1.50	1.00	100%	82%	20	5.12
	2 Unusual	1.33	0.78	75%	58%	23	7.21
	3 Extreme	1.10	0.79	>0%	30%	30	13.90
STA. 3+62 thru STA. 11+62	1 Usual	1.50	1.70	100%	100%	20	2.85
	2 Unusual	1.33	1.11	75%	99%	23	3.71
	3 Extreme	1.10	1.07	>0%	79%	30	4.36
STA. 12+62 thru STA. 17+62	1 Usual	1.50	1.49	100%	100%	20	3.05
	2 Unusual	1.33	1.06	75%	96%	23	3.82
	3 Extreme	1.10	1.03	>0%	76%	30	4.62
STA. 18+62 thru STA. 20+62	1 Usual	1.50	3.42	100%	100%	20	2.26
	2 Unusual	1.33	1.53	75%	100%	23	2.90
	3 Extreme	1.10	1.42	>0%	95%	30	3.31

Reported values above are averages of the calculated results for the group of sections identified. See complete calculations in appendix for results of individual analyses at the 21 selected stations along the project length.

Figure 2-9 Stability Results: Existing Conditions Including River-Side Sediment in Front of Wall

Stability Section	Load Case	FOS Against Sliding		Percent Bearing of Base		Maximum Vertical Bearing Pressure (ksf)	
		Req'd	Calc'd	Req'd	Calc'd	Allow	Calc'd
STA. 0+00 thru STA. 3+08	1 Usual	1.50	1.51	100%	92%	20	4.89
	2 Unusual	1.33	1.25	75%	80%	23	5.93
	3 Extreme	1.10	1.82	>0%	68%	30	6.43
STA. 3+62 thru STA. 11+62	1 Usual	1.50	3.46	100%	100%	20	2.85
	2 Unusual	1.33	2.09	75%	100%	23	3.58
	3 Extreme	1.10	3.93	>0%	100%	30	3.61
STA. 12+62 thru STA. 17+62	1 Usual	1.50	1.65	100%	100%	20	3.11
	2 Unusual	1.33	1.13	75%	97%	23	3.88
	3 Extreme	1.10	1.21	>0%	79%	30	4.51
STA. 18+62 thru STA. 20+62	1 Usual	1.50	3.85	100%	100%	20	2.27
	2 Unusual	1.33	1.61	75%	100%	23	2.94
	3 Extreme	1.10	1.59	>0%	96%	30	3.31

Reported values above are averages of the calculated results for the group of sections identified. See complete calculations in appendix for results of individual analyses at the 21 selected stations along the project length.

As indicated by highlighting within Figures Figure 2-8 and Figure 2-9, several areas along the length of the wall do not satisfy stability criteria, particularly for Figure 2-8where the river sediment is excluded. It is noteworthy that the wall is generally more stable at the upstream limits (near Ford Street) where landside soils are at a lesser elevation. This suggests that reducing the landside soil elevation may improve stability result. However, it is unlikely that this improvement alone will be enough to satisfy the criteria and the need for additional stability improvement measures is anticipated.

2.2.5 Wall Retrofit Considerations

Given the poor condition of concrete that makes up the existing river wall, concrete repair should be included for long-term rehabilitation of the wall. This would include removal of existing deteriorated concrete, doweling of new reinforcement into existing competent concrete, installing reinforcement, and casting the wall back to its original profile. Should lowering of the wall be desired, as dictated by the hydraulic evaluation described in Section 2.1, the wall could be reconstructed to a lower elevation as part of the wall reconstruction work. Regardless of selected wall height, the reconstruction on the riverward face may need to extend below the waterline, which may require water-tight forms or cofferdams. Use of precast concrete panels along the riverside of the wall may be another option to utilize as part of the long-term concrete reconstruction work in lieu of complete cast-in-place concrete construction.

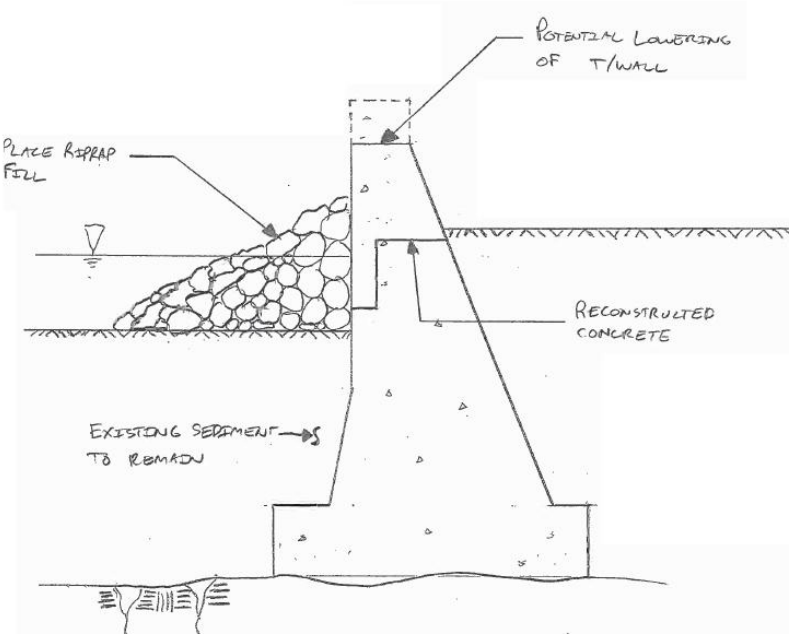
Aside from concrete repair work, portions of the wall are likely to require some improvements to satisfy stability requirements. Such stability improvement concepts could include the options outlined below. Each of the options outlined herein, or a combination thereof, should be considered to improve the stability performance and concrete condition of the wall. Some of the options outlined,

such as the vertical rock anchor alternative, may require the implementation of a site-specific geotechnical investigation to verify rock parameters and soil properties. The stability results previously presented herein denote the stability of the wall in its existing condition according to presumptive parameters from adjacent sites. Depending on the options to be pursued, and its sensitivity to satisfying stability criteria, a site-specific geotechnical investigation may be warranted in the future.

The retrofit should also include removal of all vegetation along the length of the wall. Future plantings and growth within the vicinity of the wall should be maintained to avoid damage to the wall and allow for future inspection of the wall.

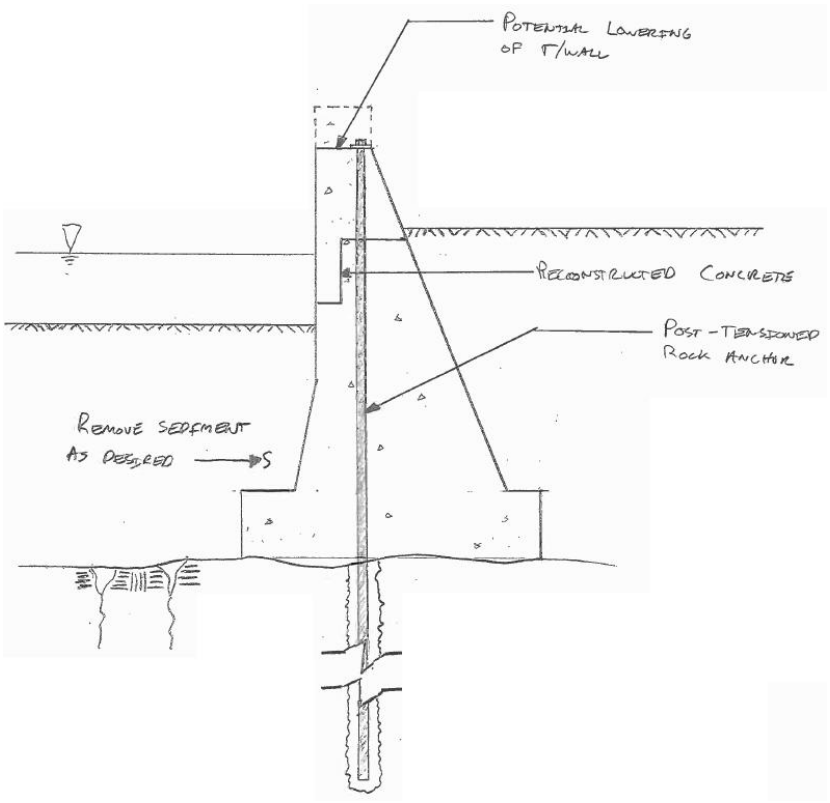
Option 1 - Placement of stone fill riverside of the wall:

- Provides increased resisting side pressured to stabilize the wall structure.
- Would likely restrict navigation in front of the wall.
- Improves wave attenuation (improves conditions in channel for recreational rowing).



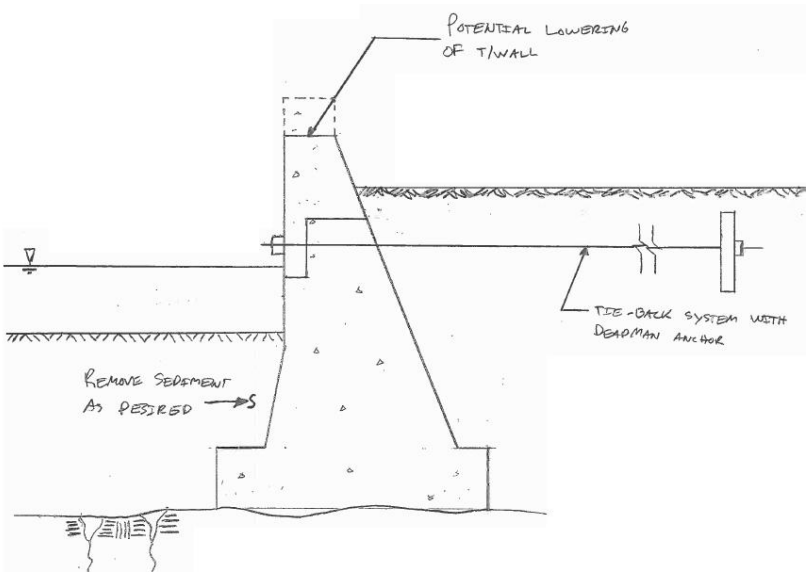
Option 2 - Install vertical post-tensioned rock anchors through wall:

- Provides sliding and overturning resistance to stabilize the wall.
- Would allow for future dredging/erosion in front of the wall and permit navigation in front of the wall.



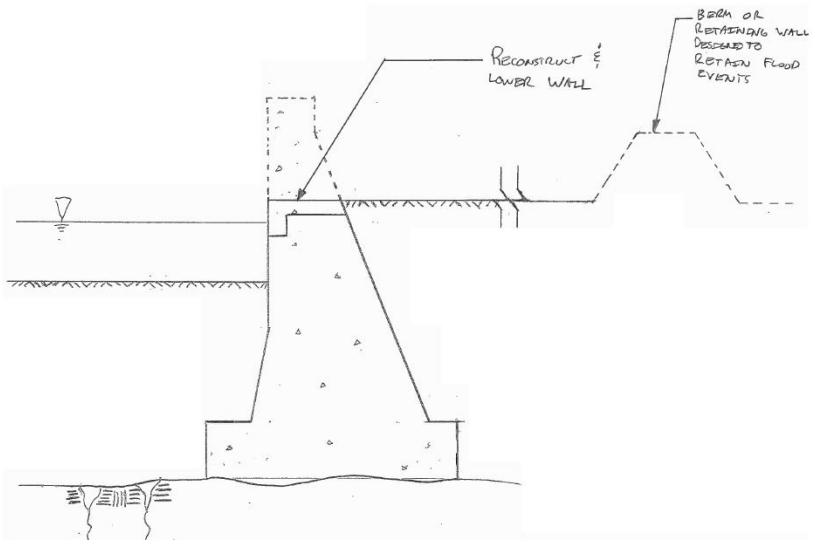
Option 3 - Install tie-backs and deadman system:

- Provides sliding and overturning resistance to stabilize the wall.
- Tiebacks and deadman result in poor access to utilities and may hinder future use of land (interfere with tie-backs).
- Requires a high level of earthwork disturbance for tie-back installation.



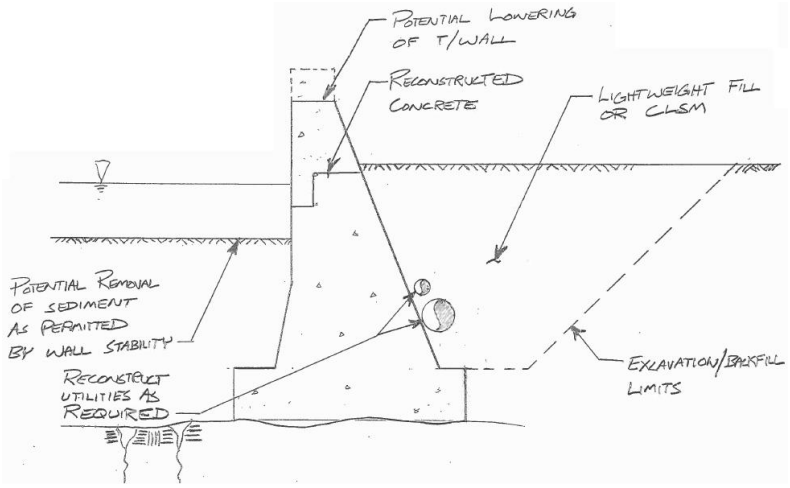
Option 4 - Lowering of the wall and lowering of landside soils:

- Lowering of the wall is limited by flood protection requirements. Hence, as secondary wall/berm or terrace may be needed to provide offset flood protection.
- Lowering of landside soils would improve stability results.



Option 5 - Excavation behind a backfill with lightweight or self-supporting materials (CLSM).

- Provides reduced driving side soil pressures in selected areas and may improve wall stability to satisfy criteria.



3 NEIGHBORHOOD CONDITIONS

Improving access to the Genesee River is a long standing objective of the City of Rochester's Local Waterfront Revitalization Plan (LWRP). The west river wall and its vicinity is viewed as an area of critical importance for improving access to the River, both visual and physical, while still protecting the Corn Hill neighborhood from flood events. Future master planning efforts must take into consideration neighborhood characteristics in order to program space effectively and in a manner that best serves its primary users.

Given that, this section provides a description of the neighborhood, its residents and the existing relationship to the River. The subsections below describe the following factors: (1) basic socio-economic indicators, (1) relevant physical characteristics and (3) key issues identified by the City and the Corn Hill Neighborhood Association.

3.1 SOCIO-ECONOMIC CHARACTERISTICS OF THE NEIGHBORHOOD

The population of the Corn Hill neighborhood in 2013 was 2,120, approximately one percent of the city's total population (Figure 3-1). The neighborhood experienced an 8.8 percent increase in population between 2000 and 2013, accounting for 170 new residents during that time period. By contrast city's population declined by 5 percent over the same time period. Corn Hill and the City of Rochester are projected to experience population declines over the next five years, while Monroe County is projected to continue growing (albeit at a relatively slow rate).

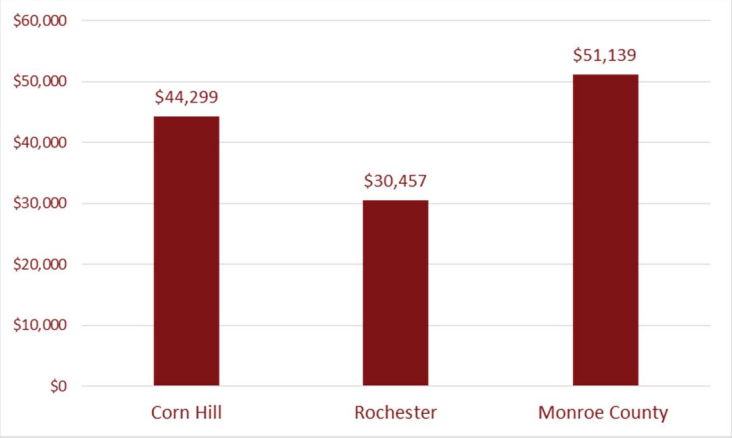
Figure 3-1. Total Population 2000-2018

					Projected 2013 - 2018		
Area	2000	2013	% Change	AAGR	2018	%Change	AAGR
Corn Hill	1,948	2,120	8.8%	0.7%	2,026	-4.4%	-0.9%
Rochester	219,921	208,952	-5.0%	-0.4%	208,004	-0.5%	-0.1%
Monroe County	735,343	746,719	1.5%	0.1%	751,974	0.7%	0.1%

Source: ESRI
Note: AAGR = Average Annual Growth Rate

The median income in Corn Hill in 2013 was $44,299, which was higher than the city as a whole, $30,457, but lower than in the county, which was $51,139 (Figure 3-2).

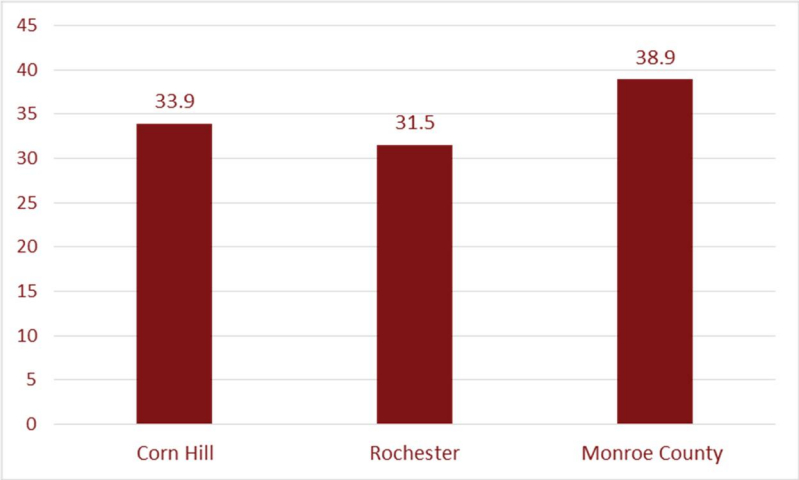
Figure 3-2. Median Household Income, 2013



Source: ESRI

At 33.9 years, the median age in Corn Hill is slightly higher than the city as a whole, 31.5, but lower than Monroe County, 38.9, suggesting that residents of the Corn Hill neighborhood are, on average, older than the city's population, but younger than the county's population (Figure 3-3).

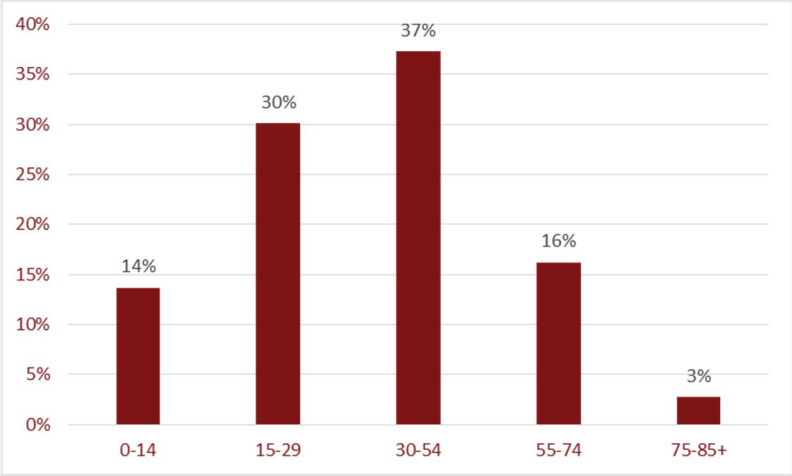
Figure 3-3. Median Age, 2013



Source: ESRI

The age distribution of the Corn Hill neighborhood indicates that 37 percent of the neighborhood's population is between the ages of 30-54 and almost 20 percent of the neighborhood's population is over the age of 55 (Figure 3-4). Children under 14 account for 14 percent of the neighborhood. This suggests that the neighborhood is made up of residents of all ages. Further the presence of a children and seniors will need to be a consideration for any proposed pedestrian access improvements to the River.

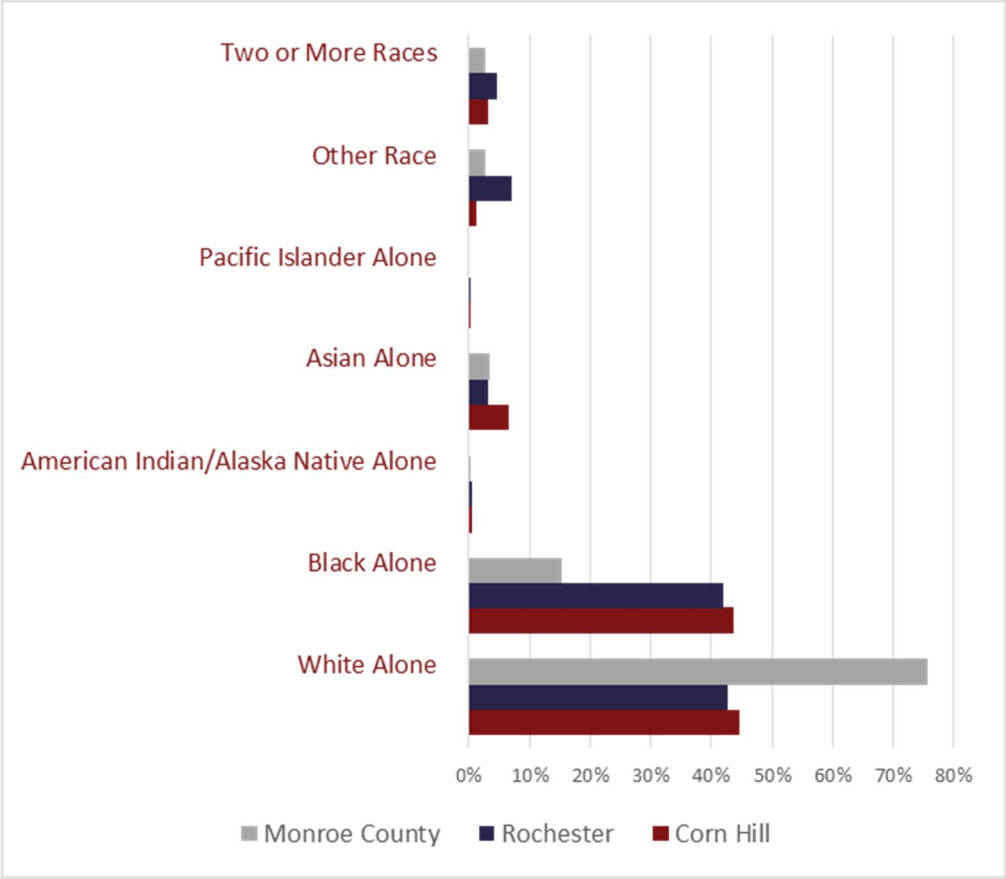
Figure 3-4. Age Distribution, Corn Hill Neighborhood, 2010



Source: ESRI

The Corn Hill neighborhood's racial composition is similar to the city as a whole, with the exception of the Hispanic population, which accounts 5 percent of the population in Corn Hill, but 17 percent city-wide. Similar to the city, the Corn Hill neighborhood includes almost equal percentages of white and black populations. Corn Hill has a higher proportion of Asian residents than the city as a whole, but a lower percentage of those indicating "two or more races" or "other race." The populations of both Corn Hill and the City of Rochester are more diverse than Monroe County (Figure 3-5)

Figure 3-5. Racial Composition, Corn Hill, Rochester, Monroe County



Source: ESRI

The percentage of owner-occupied homes in Corn Hill is 22 percent, which is lower than city-wide, 33 percent, and in Monroe County, 60 percent (Figure 3-6). Though a relatively low percentage of homes are owner-occupied, the neighborhood contains a wide variety of housing units—both in age and type. These include recently constructed apartments, townhomes, condominiums, and single-family homes, as well as historic homes, apartment buildings and mansions that have been converted to apartments. At 12 percent, the percentage of vacant residential units in Corn Hill is higher than the city, at 10 percent, and the county at 6 percent.

Figure 3-6. Housing Tenure, 2013

	Corn Hill		Rochester		Monroe County	
2013 Total Housing Units	1,284	100%	96,279	100%	322,406	100%
Owner Occupied	287	22%	31,777	33%	192,363	60%
Renter Occupied	837	65%	54,808	57%	109,922	34%
Vacant	160	12%	9,693	10%	20,121	6%

Source: ESRI

3.1.1 Summary

The measures described above suggest the following conclusions about the Corn Hill neighborhood, relative to the city and the county:

- The Corn Hill neighborhood has experienced population growth of almost 9 percent since 2000, which accounts for approximately 170 new residents over that time period. By contrast the city as a whole experienced a 5 percent decline.
- With higher median and per capita incomes, the Corn Hill neighborhood is generally more prosperous than the city as a whole, but less so than Monroe County, which has higher incomes than both the neighborhood and the city.
- On average, the neighborhood is slightly older than the city as a whole, but younger than the county. The neighborhood includes a significant proportion of residents under 30 years old, 44 percent.
- Similar to the City of Rochester, Corn Hill is a diverse neighborhood, with almost equal proportions of white and black populations. The proportion of Hispanic residents in Corn Hill is lower, at 5 percent, than the city as a whole, at 17 percent.
- The proportion of owner-occupied homes in the neighborhood is lower than the city as a whole and the county, at 22 percent. Though there is a variety of housing unit types in the neighborhood, the majority are renter-occupied, 65 percent.

3.2 PHYSICAL CHARACTERISTICS OF THE CORN HILL NEIGHBORHOOD

The west river wall is a defining feature of the study area's physical characteristics. Understanding its relationship to existing land use, ownership, transportation infrastructure, and parks and open space will play an integral role in defining master plan recommendations.

3.2.1 Land Use

The neighborhood's compact arrangement of uses includes residential, commercial, and community services (Figure 3-7). The interior of the neighborhood is primarily residential in character, while commercial uses, such as restaurants, bars, offices, and small shops are located north of Plymouth Avenue and at Corn Hill Landing *(Note: the City of Rochester classifies apartments as commercial uses. The commercially designated area located between the Ford Street Bridge and Clarissa Street is primarily made up of apartments and townhomes).*

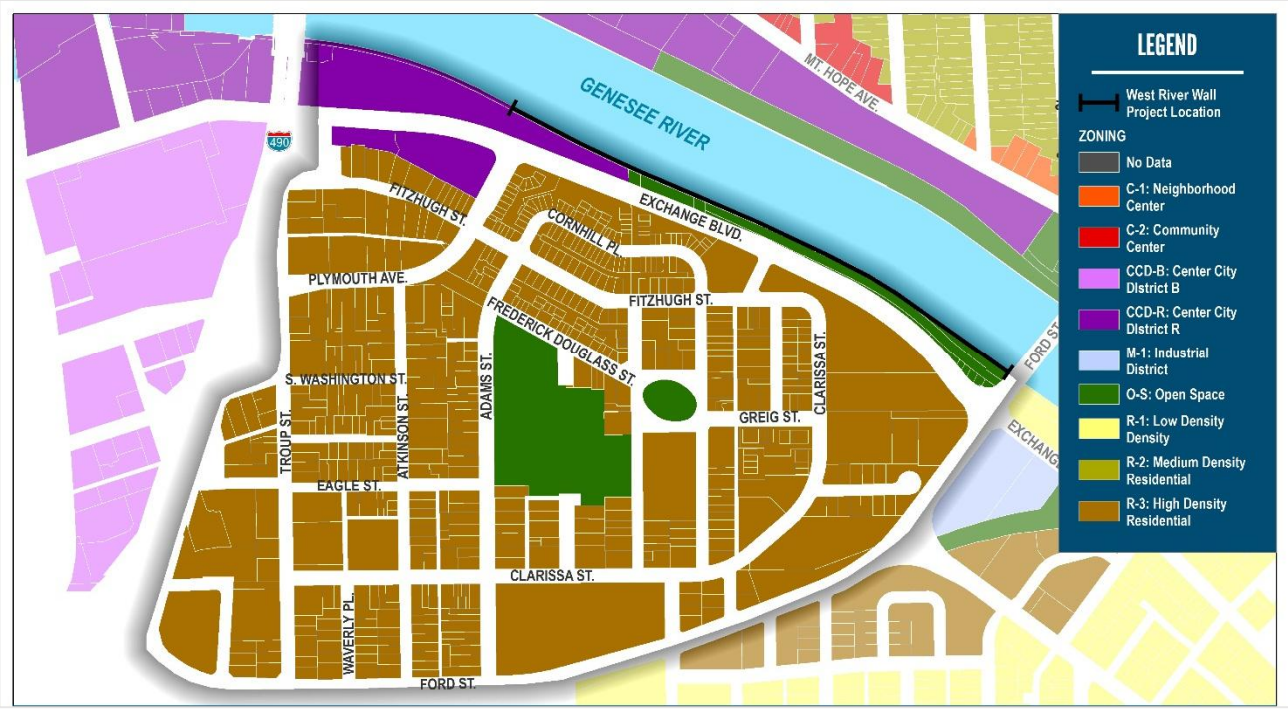
Figure 3-7 Existing Land Uses

Source: City of Rochester Parcel Data, 2014

3.2.2 Zoning

The majority of the neighborhood is zoned High Density Residential (R-3), as shown in Figure 3-8. A small portion of the commercial area north of Plymouth Avenue is zoned CCD-R Center City Commercial District-R. The southern portion of the landside area between the river wall and Exchange Boulevard is zoned Open Space while the northern section of the landside area is zoned CCD-R (in and around Corn Hill Landing).

Figure 3-8 Current Zoning



Source: City of Rochester Parcel Data, 2014

3.2.3 Property Ownership

The majority of parcels in the neighborhood are privately owned, including the riverfront area at Corn Hill Landing (illustrated in Figure 3-9). The New York State Canal Corporation owns the river wall itself. The City of Rochester owns the parks, the Nathanial Rochester Community School, and the Riverway Trail and the open space riverfront area. The State of New York owns a correctional facility in the southern part of the neighborhood.

Figure 3-9 Property Ownership

Source: City of Rochester Parcel Data, 2014

3.2.4 Transportation

Figure 3-10 shows annual traffic volumes on major streets in the neighborhood (Average Annual Daily Traffic). There are12,996 trips per day along Exchange Boulevard and 12,663 trips along Plymouth Avenue within the study area. A key factor in the planning and preliminary design for the river wall and adjacent public spaces is the location and configuration of Exchange Boulevard: it is a four-lane boulevard with two lanes in each direction, divided by a median. The street in its current configuration does not offer convenient pedestrian access or crossings to the river side. There is a sidewalk along the west side of the street and there is a trail on the east side (set back from the curb). There is one formal pedestrian crossing on Exchange Boulevard within the study area, located at Plymouth Avenue, leading pedestrians to cross at unsafe locations. There is limited on-street parking located on the north end of the street (north of Fitzhugh Street), but the majority of the street within the study area lacks on-street parking, further contributing to an unappealing pedestrian environment.

Figure 3-10 Average Annual Daily Traffic

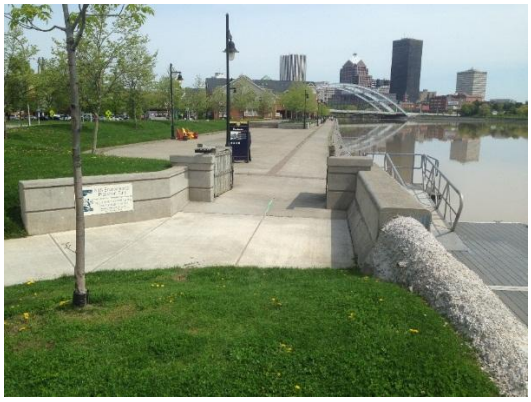
Source: City of Rochester Parcel Data, 2014

3.2.5 Parks Open Space Opportunities

The west river wall and adjacent public spaces are part of the overall park and open space system in the Corn Hill neighborhood, which also includes Lunsford Circle Park (formerly Plymouth Circle Park) and the Ralph Avery Mall. Both of the neighborhood parks contain landscaping and seating. In addition to these parks, a major recreational feature in the neighborhood is the Riverfront Trail, located on the east side of Exchange Boulevard. There are currently no formalized connections between the neighborhood parks and the riverfront areal/Riverway Trail.

Lunsford Circle Park

Ralph Avery Mall



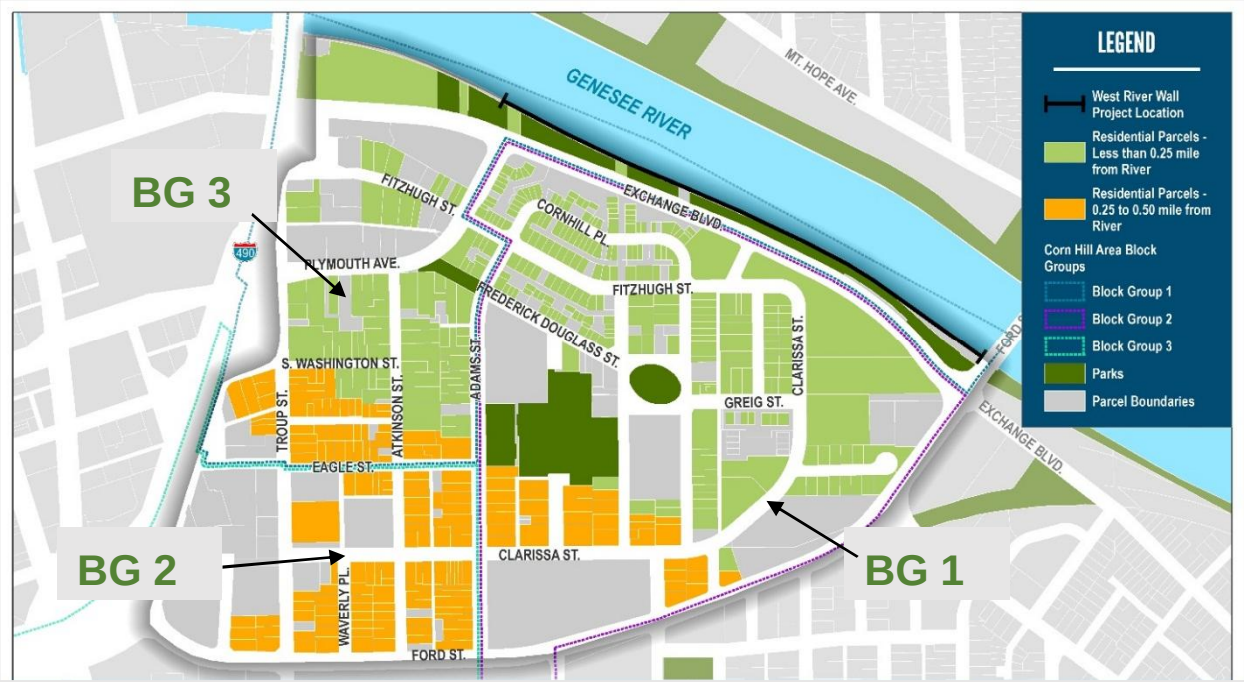
The RiverwayTrail looking north towards Corn Hill Landing, showing existing flood gates and the transition from old to the new sections of the river wall.

The RiverwayTrail looking south. The Genesee River is to the left. Exchange Boulevard is to the right.

3.2.6 Access to the River

The existing character of access points to the River is a key consideration for this project, as the overall limitations to River access has been an ongoing concern for Corn Hill residents. An accessibility analysis conducted for all residential parcels in the neighborhood shows parcels within a quarter-mile and half-mile of the Riverway Trail (Figure 3-11). While much of the Corn Hill neighborhood is within convenient walking distance of the Riverway Trail, safe access from the neighborhood to the Riverway Trail is limited. Exchange Boulevard acts as a barrier between the neighborhood and the Genesee River, as formal crosswalks are limited to one location at the intersection of Exchange Boulevard and Plymouth Avenue. There are no other crosswalks along Exchange Boulevard in the study area.

Figure 3-11 Accessibility Analysis



Source: City of Rochester Parcel Data, 2014

An analysis of the residents within different Census Block Groups in the neighborhood shows that the part of the neighborhood furthest from the Riverway Trail, Block Group 3, also contains the largest proportion of residents under the age of 20. The area closest to the Riverfront, Block Group 1, contains the largest percentage of those over 55 years old. This suggests that proposed improvements to the riverfront area will need to consider ways for children and families, as well as seniors, to safely cross Exchange Boulevard and access the riverfront from all parts of the neighborhood.

4 KEY FINDINGS

- **Flood protection.** Hydrologic and hydraulic analysis of the Genesee River, in accordance with FEMA criteria, suggests that the existing top of river wall could be lowered by a maximum of 2 ¾ feet to 3 ¼ feet.
- **Condition of the river wall.** Given the poor condition of concrete that makes up the existing river wall, concrete repair should be included for long-term rehabilitation of the wall.
- **Wall stability.** Portions of the wall are likely to require some improvements to satisfy stability requirements. Such stability improvement concepts could include those options outlined herein, or a combination thereof. Depending on the options to be pursued, and its sensitivity to satisfying stability criteria, a site-specific geotechnical investigation may be warranted in the future.
- **Lack of safe and convenient connections to the River and Riverway Trail.** There is one location that offers a formal connection (crosswalk) between the Corn Hill neighborhood and the River. The connection is located at the intersection of Exchange Boulevard and Plymouth Avenue. There are no other crosswalks along the Exchange Boulevard within the study area. This limits safe access to the River from many locations in the neighborhood.
- **Obstructed of views of the River and obstructed access to the River.** The configuration of the river wall and existing landscaping currently obstructs views and access to the River.
- **Uninviting/unappealing aesthetic appeal of the Riverway Trail and river wall.** The river wall and surrounding greenspace areas include few pedestrian amenities or improved landscaping enhancements, which creates an unwelcoming atmosphere for pedestrians.