



# STORM WATER MASTER PLAN

*for the Hague*

APRIL 2010



*City of*  
**Norfolk**

CITY OF NORFOLK  
ENVIRONMENTAL STORM WATER MANAGEMENT DIVISION

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APPENDIX A - PROPOSED IMPROVEMENTS MAPS

APPENDIX B - DETAILED ESTIMATES OF CONSTRUCTION COSTS

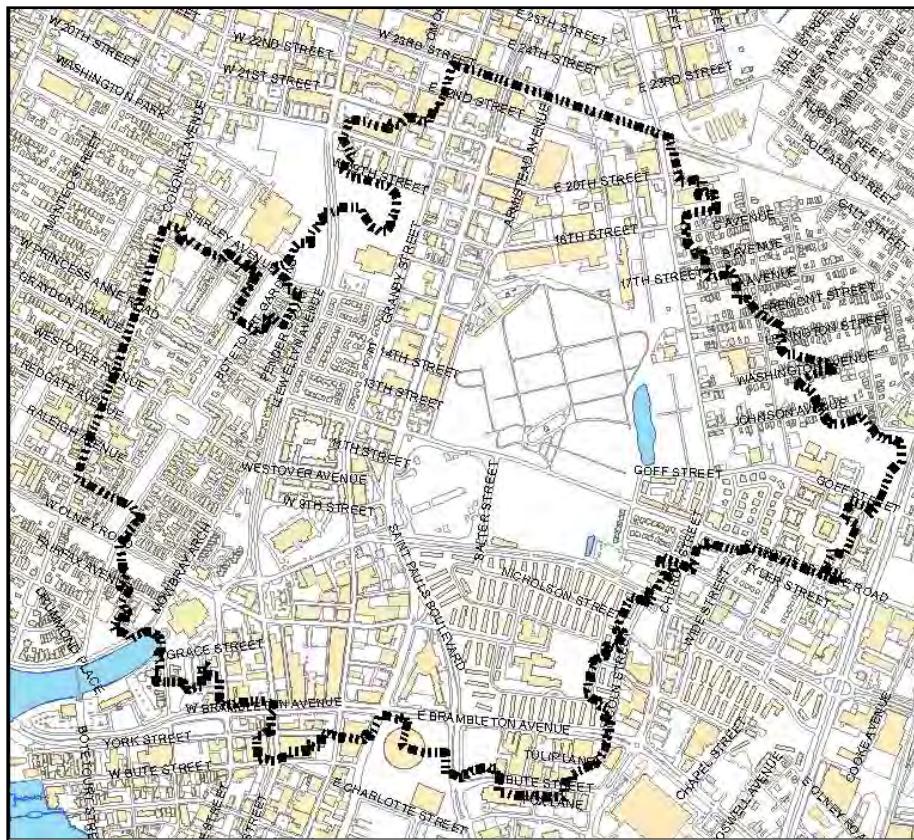
## I. GENERAL

The Hague storm drain system was surveyed, inspected, and recorded into a Geographic Information System (GIS) inventory using Environmental Systems Research Institute's (ESRI) ArcInfo software. Drainage sub-areas, times of concentration, and general physical features were added and associated with each structure within the right-of-way or easement. All data is shown in the previously submitted *Geodatabase obtained from the City*.

The Hague drainage area is approximately 570 acres and discharges to Smith's Creek located within the Elizabeth River drainage basin as shown in **Figure 1**. The approximate limits of the project area are west to Colonial Avenue and east Church Street, including a portion of Huntersville. The drainage boundary extends north to the Norfolk Southern Railroad and south to Brambleton Avenue.

The Hague storm drain system is an urban drainage system composed of manholes and curb and grate drop inlets connected by various sized concrete, corrugated metal, clay, plastic, ductile iron pipes and box culverts to drain facility rooftops, parking lots, streets, and residential communities. Zoning within The Hague includes Downtown Cultural and Convention Center Districts (D-4), Planned Development Mixed Use (PDMU), Granby/Monticello Corridor Mixed Use District (G-1), Institutional Districts (IN-1), Corridor Commercial District (C-2), Limited Industrial District (I-1), Light Industrial District (I-2) and General Industrial (I-3), Moderate Low-Density Housing (R-8, R-9), Townhouse District (R-10) Moderate Density Multi-Family Housing (R-11), Moderate High-Density Multi-Family (R-13), and Open Space Preservation District (OSP). The Hague contains significant cultural resources including the Chrysler Museum of Art and the Harrison Opera House, portions of the historical Ghent District, major businesses such as Hampton Roads Transit and Coca-Cola Enterprise, and several public cemeteries including Cedar Grove (first est. in 1825), Elmwood (est. 1853) and West Point Cemetery (est. 1874), a registered historical site. Much of the drainage area is impervious but contains pervious areas associated with school grounds, residential developments and the cemeteries. Portions have undergone redevelopment and some areas that were previously developed and impervious are now grass

lots. This is typically occurring along Monticello Avenue between 14<sup>th</sup> Street and 17<sup>th</sup> Street. The analysis assumes these areas are fully-developed consistent with the zoning.



## Figure 1 The Hague Drainage Area

The Hague trunk line conveys runoff from three major laterals: Olney Road, Princess Anne Road and Elmwood Cemetery and Armistead Avenue.

## II. WATERSHED MODELING

Due to the size of the drainage area, the study area was modeled using Expert System's software Stormwater Management Model (SWMM). The existing conditions and proposed improvements condition were modeled for a 10-year NRCS Type II, 24-hour rainfall distribution pattern for a total rainfall depth of six (6) inches. Drainage pipes, contributing laterals and smaller catchment, areas prone to flooding and basin storage such as Anne Outten Pond were modeled to assess the extent of deficiencies in the system. Upon analysis, determinations were made as to whether or not the system had the capacity to handle each design storm. Where the existing drainage system was found to be deficient, it was improved to convey the 10-year design storm. Due to the nature of flooding in The Hague, elimination of peak flooding was not feasible in most cases. Historically, much of the flooding in The Hague is influenced by wind-generated waves from low pressure events such as Nor'easters and tropical storms that impede stormwater discharge in the Chesapeake Bay and its tributaries compounded by tide cycles and cannot be addressed with storm drain improvements. Though not evaluated in this study, these conditions would require a pump station and flood control system similar to Downtown Norfolk.

For discussion and to breakdown the cost of storm drain conveyance improvements, the model is subdivided into various systems as shown in **Figure 2**. These sub-systems include:

1. The Hague Main Trunk Line
2. East Ghent System
3. Llewellyn Avenue System
4. Armistead Avenue System
5. Church Street / Cemetery System
6. Olney Road System
7. Grace Street System

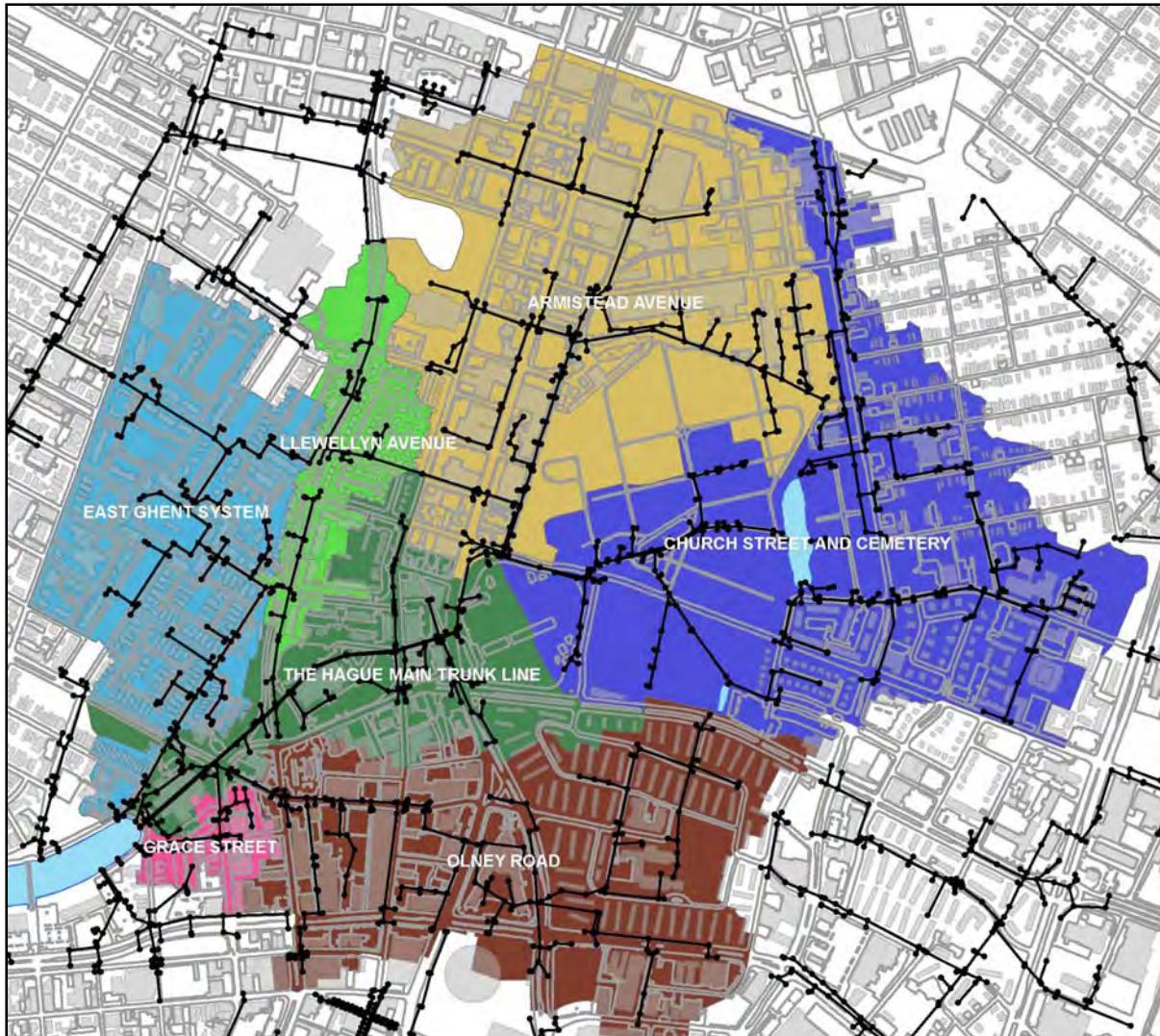


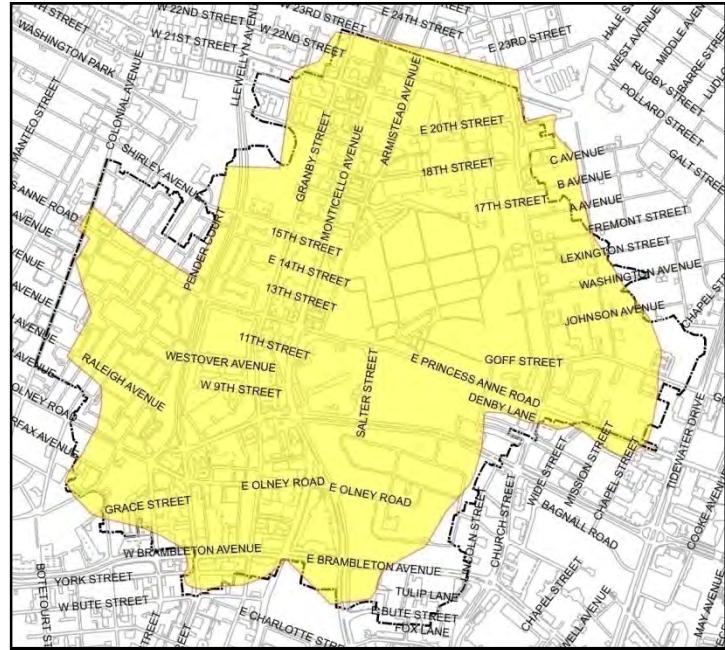
Figure 2 The Hague Sub-Systems Map

### III. EXISTING CONDITIONS

The Prioritization Plan developed by Clark Nexsen in 2003 showed that the majority of The Hague system is subject to flooding due to a combination of inadequate storm drainage systems and tidal flooding. Ground elevations range from 2 to 13. The lowest elevations are generally at the outfall and along portions of Virginia Beach Boulevard and Llewellyn Avenue to Monticello Avenue and generally follow the path of the trunk line or Smith's Creek before it was filled. The highest elevations are located in Cedar Grove and Elmwood Cemeteries, Cedar Grove Parking Lot and Young Terrace. Many intersections are prone to flooding during storms and can severely incapacitate travel. Historically, these areas are subject to wind-generated waves compounded by high tide cycles due to the duration of these events (12 hours to 48 hours). These areas have flooded during nor'easters, tropical storms and winter storms numerous times for the past decades and have experienced flooding of similar magnitudes for more than 100 years. **Table 1** shows the highest recorded elevation at the Sewell's Point tide station. This table does not cover every storm, just a selection of storms since 2003. While not shown, the station has seen high water elevations since the early 1900's some reaching or exceeding the conditions of Hurricane Isabel.

TABLE 1		
HIGHEST RECORDED WATER SURFACE ELEVATION AT SEWELL'S POINT		
DATE	WATER SURFACE ELEVATION AT SEWELL'S POINT	EVENT
09-18-2003	6.24	Hurricane/TS Isabel
11-12-2009	6.10	November Nor'easter
11-22-2006	5.13	Nor'easter
10-07-2006	4.89	Nor'easter
12-19-2009	4.54	Nor'easter
09-25-2008	4.20	Nor'easter
02-06-2010	4.16	Winter Storm
09-01-2006	3.89	Tropical Storm Ernesto

The actual elevations that occurred at The Hague are projected to have been higher than those recorded at the tide station. These areas are subject to flooding due to normal high tide cycles and spring tides combined with an inadequate drainage systems. Generally there are sufficient structures present to collect runoff. **Figure 3** shows the approximate limits established during the Prioritization Plan illustrating the extent of flooding and ponding within the study area. Notice the majority of the study area is located within this problem area.

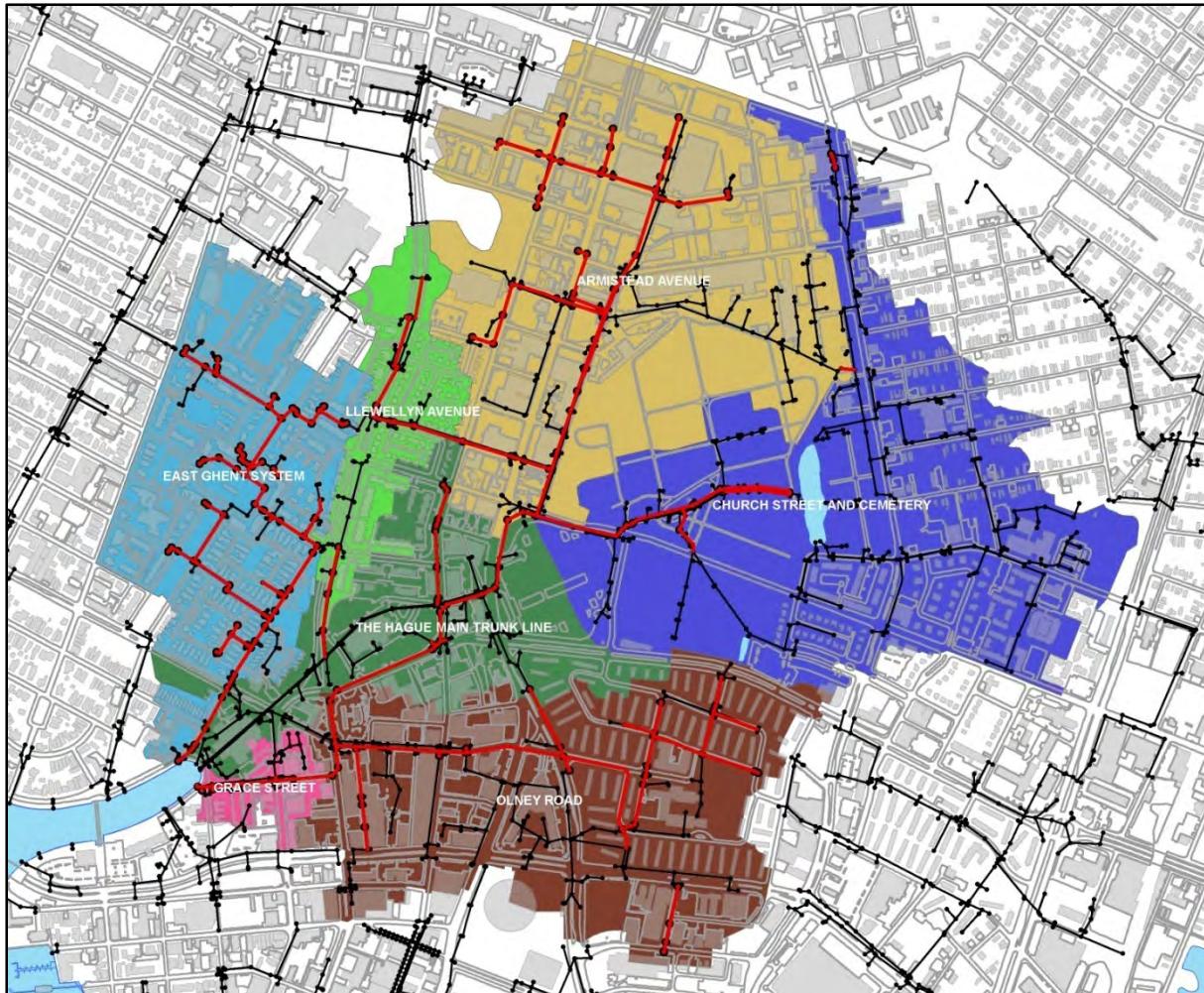


Goff Street is heavily flooded during storms and will flood portion of Church Street along this route, which also contains the primary conveyance (a 5 foot x 3.5 foot box culvert) for this system. The majority of Church Street does not flood during these events due to higher surface elevations. In most cases the pond while attenuating runoff to the downstream system, which passes through Elmwood Cemetery, may assist flood control; it also exacerbates flooding in these areas by subjecting the adjacent properties to prolonged flooding.

#### IV. PROPOSED IMPROVEMENTS

Extensive drainage improvements are proposed to reduce flooding within The Hague. The improvements in most cases do not eliminate flooding but do reduce the magnitude and duration of flooding within the study area. Since it is expected that a pump station will ultimately be required to provide full protection to this area, a normal tailwater to maximize storage within the existing and proposed pipes was assumed. Applying a tailwater increased the size of the pipe improvements dramatically to compensate for a design high tide of 1.80. The design high tide fills the majority of the trunk line further reducing the amount of storage and head available to convey the 10-year design storm runoff.

The East Ghent system and The Hague systems are evaluated separately since they are disconnected. Proposed improvement maps for all systems are shown in Appendix A of this report. The improvements show the Overview Map as seen previously and are followed by key maps for each respective area. The key map then references specific sheets for improvements in that System. Those sheets zoom into a particular area and show all improvements within the viewport. The various systems are defined so that improvements can be viewed and related to adjacent system improvements. Notes are provided to designate the terminus of one system from another since improvements can overlap. This is done mainly to show how construction costs are estimated.



**Figure 4 The Hague Overall Proposed Improvements Map**

**Table 2** below shows the cost of all improvements for East Ghent and The Hague.

TABLE 2	
STORM WATER MASTER PLAN FOR	
EAST GHENT AND THE HAGUE	
10-YEAR STORM CONSTRUCTION COST ESTIMATE SUMMARY	
AREA	CONSTRUCTION
East Ghent – Mowbray Arch from Outfall to Westover Avenue	\$5,344,176
East Ghent – Princess Anne Road to Westover Avenue at Mowbray Arch	\$3,819,080
<b>SUBTOTAL - East Ghent</b>	<b>\$9,163,256</b>
The Hague Main Trunk Line – Grace Street System, New Outfall from Olney Road at Boush Street	\$3,461,047
The Hague Main Trunk Line from Armistead Avenue and Princess Anne Road to Olney Road	\$7,200,275
Llewellyn Avenue from Princess Anne Road to The Hague Main Trunk Line	\$233,693
Armistead Avenue Trunk Line from 22 <sup>nd</sup> Street to Princess Anne Road	\$5,383,600
13 <sup>th</sup> Street to Armistead Avenue Trunk Line (includes portion of Llewellyn Avenue)	\$1,466,486
17 <sup>th</sup> Street to Armistead Avenue Trunk Line	\$1,484,977
20 <sup>th</sup> Street to Armistead Avenue Trunk Line	\$2,091,509
Church Street and Huntersville through Elmwood Cemetery to Princess Anne Road and Armistead Avenue	\$1,871,526
Olney Road Trunk Line from Young Terrace to Boush Street	\$4,434,976
Olney Road at Young Terrace	\$1,438,181
<b>SUBTOTAL – The Hague</b>	<b>\$29,651,495</b>

Detailed survey of these areas is required prior to finalizing improvements. It is assumed that municipal utility adjustments will be required for cost estimating purposes though the full extent of these improvements is unknown due to limited utility data. Impacts to private utilities are unknown but it is understood that duct banks and large (>10 inches) gas lines and HRSD force mains are located in the project area and may require offsets to fit the proposed improvements. Not included in the cost is the potential for contaminated soil mitigation within the vicinity of the old VEPCO easement mentioned in the Prioritization Plan.

Below is a summary of the proposed improvements for each System. These summaries should be reviewed with the Proposed Improvement Maps in Appendix A of this report.

### ***East Ghent System***

The majority of this system, which is conveyed through existing 36 inch and 48 inch pipes, is not adequate for the 10-year design storm. Proposed improvements significantly increased capacity in these systems with a double 5 foot by 5 foot box culvert. The proposed box runs from Westover Avenue along Mowbray Arch to a chamber at the bulkhead at Smith's Creek. Areas upstream of Westover Avenue are conveyed through a 6 foot by 4 foot box culvert along Botetourt Gardens to an 8 foot by 4 foot box culvert along Westover Avenue. Significant improvements would be required to mitigate flooding at the most upstream reaches on Princess Anne Road near DeBree Avenue. The upstream area receives runoff from Hague Towers, Harris Teeter and adjacent strip mall parking facilities. This area also receives runoff from redeveloped townhomes and the parking garage on Princess Anne Road. There are no apparent storm water management facilities in this area. The remaining area is generally residential.

### ***Grace Street System and The Hague Main Trunk Line System***

The Grace Street and The Hague Main Trunk Line Systems represent the greatest improvement to the study area. The purpose of these improvements is to provide additional capacity to the existing trunk line in order to convey runoff from the Armistead Avenue System, the Church Street and Cemetery System and the Olney Road System.

The Grace Street System is an extension of The Hague Main Trunk Line System starting at Olney Road and ending at the outfall at Smith's Creek. This additional 10 foot by 8 foot box culvert runs down Boush Street to Grace Street and follows it to the outfall. Adjacent drainage systems are tied directly to it.

The Hague Main Trunk Line starts at Armistead Avenue and Princess Anne Road, around the outer edge of the Cedar Grove Parking Lot paralleling Monticello Avenue, passing beneath Monticello Avenue and along 9<sup>th</sup> Street to Granby Street. The system turns onto Virginia Beach Boulevard and parallels the road until reaching Boush Street. This system connects to the Grace Street System improvements and provides a connection for the Olney Road System improvements.

### ***Llewellyn Avenue System***

Llewellyn Avenue System improvements are divided into two separate components. The Llewellyn Avenue System at Princess Anne Road drains to the existing trunk line near the Harrison Opera House. A parallel storm drain system provides capacity to convey the majority of the runoff but the upper reach at Princess Anne Road with lower ground elevations showed reduced flooding.

The upper reach of the Llewellyn Avenue System conveys a portion of the roadway and adjacent areas east to the Armistead Avenue Trunk Line along 13<sup>th</sup> Street. The improvements included replacing several inadequate pipes but generally constructing a parallel system to convey the runoff. The cost of improvements for improvements from Llewellyn Avenue to Armistead is a combined cost in **Table 2**.

Ideally, disconnecting this drainage area from Armistead Avenue is preferred but would require traversing the 42 inch HRSD Force Main, which clearly separates this system.

### ***Armistead Avenue System***

The Armistead Avenue System conveys considerable runoff from the majority of the commercial and industrial districts in The Hague watershed. Monticello Avenue and Granby Street are major commercial corridors that parallel Armistead Avenue. Limited, light and general industrial businesses are present from the Norfolk and Southern Railroad to 19<sup>th</sup> Street. Much of the runoff generated by these sites is concentrated at the headwater of the various storm drain systems. Therefore, the laterals at 13<sup>th</sup>, 17<sup>th</sup> and 20<sup>th</sup> Streets require substantial improvements to convey the design 10-year peak storm runoff to the Armistead Avenue Trunk Line. The existing Armistead Avenue Trunk Line is composed of a 5 foot by 3.5 foot box culvert from 18<sup>th</sup> Street to Princess Anne Road. The existing box culvert is equally insufficient to convey runoff and must be upgraded to provide essential capacity. The analysis considers the addition of a parallel box culvert ranging in size from a 7 foot by 4 foot box to an 8 foot by 4 foot box. Based on the current survey data, this requires a partial realignment of the existing 5 foot by 3.5 foot box culvert between 18<sup>th</sup> Street and 16<sup>th</sup> Street. While the improvement reduced flooding in this area, it does not eliminate flooding.

### ***Church Street and the Cemetery System***

This system conveys runoff from Church Street and Huntersville to The Hague Main Trunk Line at Armistead Avenue and Princess Anne Road. Major flooding exists on Goff Street from Anne Outten Pond to areas east of Church Street. The Goff Street drainage system is generally inadequate to convey runoff from the 10-year peak storm and would intern require improvements. These were identified during the Huntersville Storm Water Master Plan. Those costs are not reflected in this report. Aside from the flooding on Goff Street, only minor flooding exists in the Church Street and Cemetery System. However, to improve conveyance of runoff from Anne Outten Pond, improvements to the trunk line through Elmwood Cemetery are proposed. These improvements are advanced along Princess Anne Road to Armistead Avenue. Much of the system within Elmwood Cemetery is not well-defined and could not be adequately surveyed due to inaccessible structures and flooded pipe conditions. Additional evaluation of this system is proposed. Proposed improvements included a parallel 42 inch pipe from Anne Outten Pond to a parallel 5 foot by 4 foot box culvert near Princess Anne Road and Salter Street. The existing and proposed parallel improvements would be conveyed through a proposed parallel 10 foot by 4 foot box culvert along Princess Anne Road to Armistead Avenue.

### ***Olney Road System***

The Olney Road System conveys runoff from Princess Anne Road at Young Terrace, through Young Terrace, across Saint Paul's Boulevard, through the Norfolk Plaza Hotel, behind commercial sites and along Olney Road until reaching the Chrysler Museum of Art at Virginia beach Boulevard. This system is inadequate to convey the 10-year design storm runoff leading to flooding on Olney Road, Granby Street, Saint Paul's Boulevard, Brambleton Avenue and portions of Young Terrace. Improvements to the drainage system include a parallel 6 foot by 4 foot box culvert from Young Terrace to the existing 5 foot by 3.5 foot box culvert on Olney Road. The route of the proposed box culvert takes it across Saint Paul's Boulevard along Olney Road and away from the Norfolk Plaza Hotel. This in turn reduces runoff contribution to the existing drainage system under the Norfolk Plaza Hotel. These improvements will not eliminate major flooding on Granby Street near the Norfolk Plaza Hotel. The ground elevations in this area are less than 4.5 feet. A parallel 8

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foot by 4 foot box culvert then extends from just east of Granby Street and Olney Road to the proposed Hague Main Trunk Line.

## **V. ALTERNATIVE ANALYSIS**

Several alternatives were considered for improving the system, such as adding a storm water management pond or adding a storm water pump station or a combination of these. While not evaluated for this study, the level of protection required to reduce the flooding in The Hague will require a pump station and floodwall or other flood control mechanism. This pump station would need to be optimized to account for storage in the box culverts that convey runoff through the trunk line to the station and operate as part of the wet well. However, the cost of the drainage improvements to that of the pump station and its future maintenance will need to be evaluated as a cost-benefit to determine the optimal design.

Another consideration involves the design of a storm water management pond in Young Terrace should it undergo redevelopment in the future. This pond could be used to mitigate improvements to the Olney Road System and thereby reduce the improvements at Saint Paul's Boulevard and Granby Street near the Norfolk Plaza Hotel.

## VI. RECOMMENDATIONS

Based on the conditions of the existing system and the limited accuracy of the survey data due to inaccessible structures and tidal conditions, the minimum recommendation is to clean and TV the trunk line from Anne Outten Pond to Smith's Creek, including Olney Road from Saint Paul's Boulevard to Virginia Beach Boulevard at the Chrysler Museum of Art, and the Armistead Avenue from 20<sup>th</sup> Street to Princess Anne Road. Additionally, the storms drain of East Ghent should be cleaned from Westover Avenue at Botetourt Gardens to Mowbray Arch at the Chrysler Museum of Art. This approach will answer questions on connectivity, pipe size and the true condition of the box culverts and other major storm drain systems. Few manholes or structures are present on these trunk lines and no confined space entry inspections were performed under this scope.

TABLE 3 DEWATER, CLEAN AND CCTV MAIN LINES IN THE HAGUE <sup>1</sup>				
PIPE SIZE	LENGTH (ft)	COST PER LINEAR FOOT	TOTAL COSTS	GENERAL LOCATIONS
36" - 42" RCP	1903	\$25.00	\$47,575	Westover Avenue, Elmwood Cemetery
48" RCP	1989	\$28.00	\$55,692	Mowbray Arch
66" RCP or RCB	615	\$35.00	\$21,525	Chrysler Museum of Art
5' x 3.5' RCB	5552	\$45.00	\$249,840	Armistead Avenue, Princess Anne Road, Olney Road
6'x4' RCB	4741	\$55.00	\$260,755	Monticello Avenue, 9 <sup>th</sup> Street, Harrison Opera House, Llewellyn Avenue, Chrysler Museum of Art
<b>TOTAL</b>			<b>\$635,387</b>	

<sup>1</sup> Budget level costs quoted by Tri-State Utilities April 21, 2010.

Because the majority of the drainage system is inadequate and due to numerous reports of flooding, storm drain improvements are recommended through the entire study area. The aggregate costs of storm drain improvements for East Ghent are **\$9,163,356**. The aggregate costs for all storm drain improvements in The Hague are **\$29,651,495** (excludes East Ghent). The grand total cost of all storm drain improvements is **\$38,814,851**.

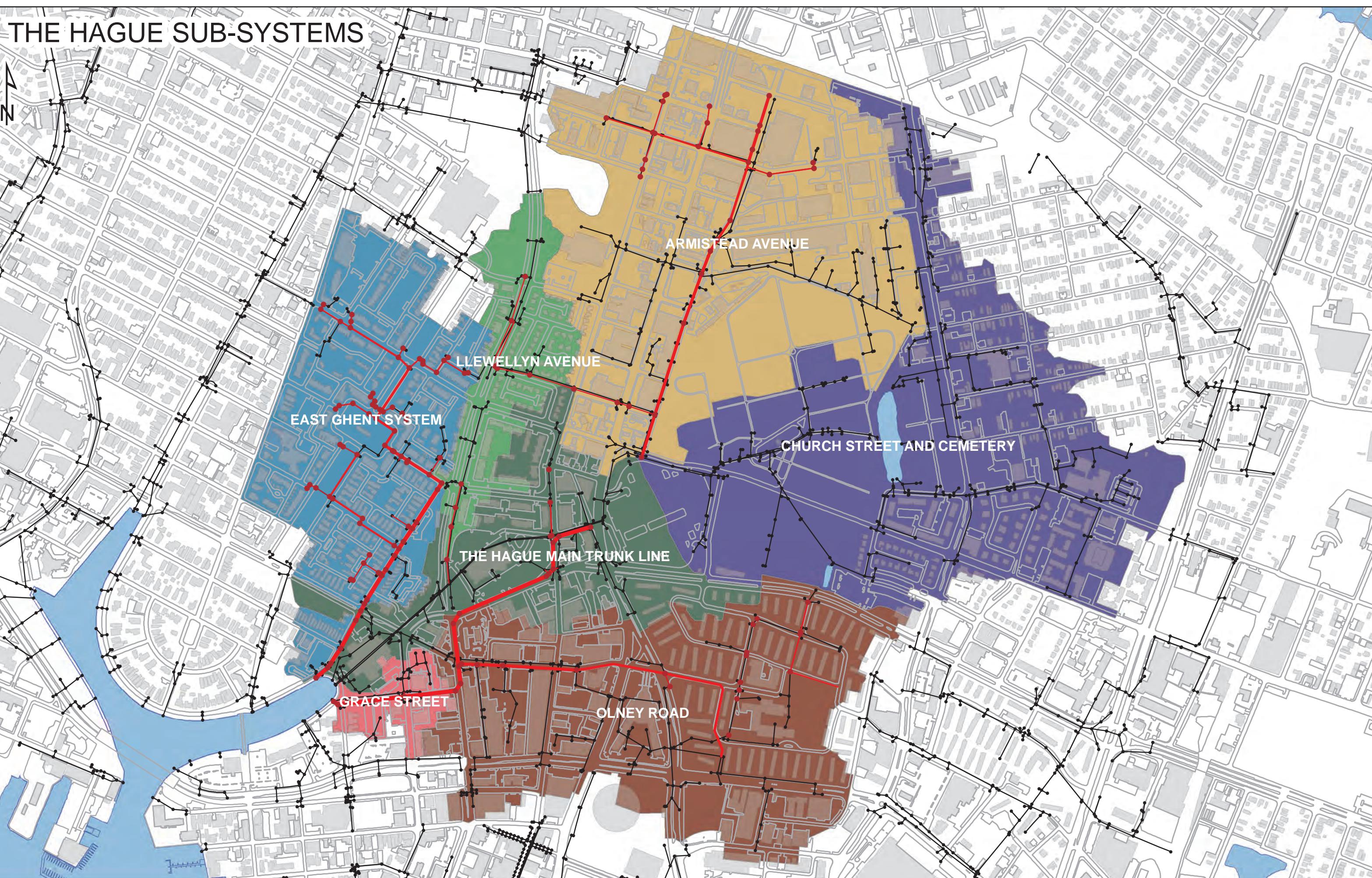
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The final recommendation involves a more detailed analysis of the storm drain improvements with a pump station at Smith's Creek. The storm drain improvements should be evaluated in conjunction with a pump station to determine an optimal design and cost-benefit analysis of both features. Installing the storm drain improvements alone will not prevent flooding that often impacts this area.

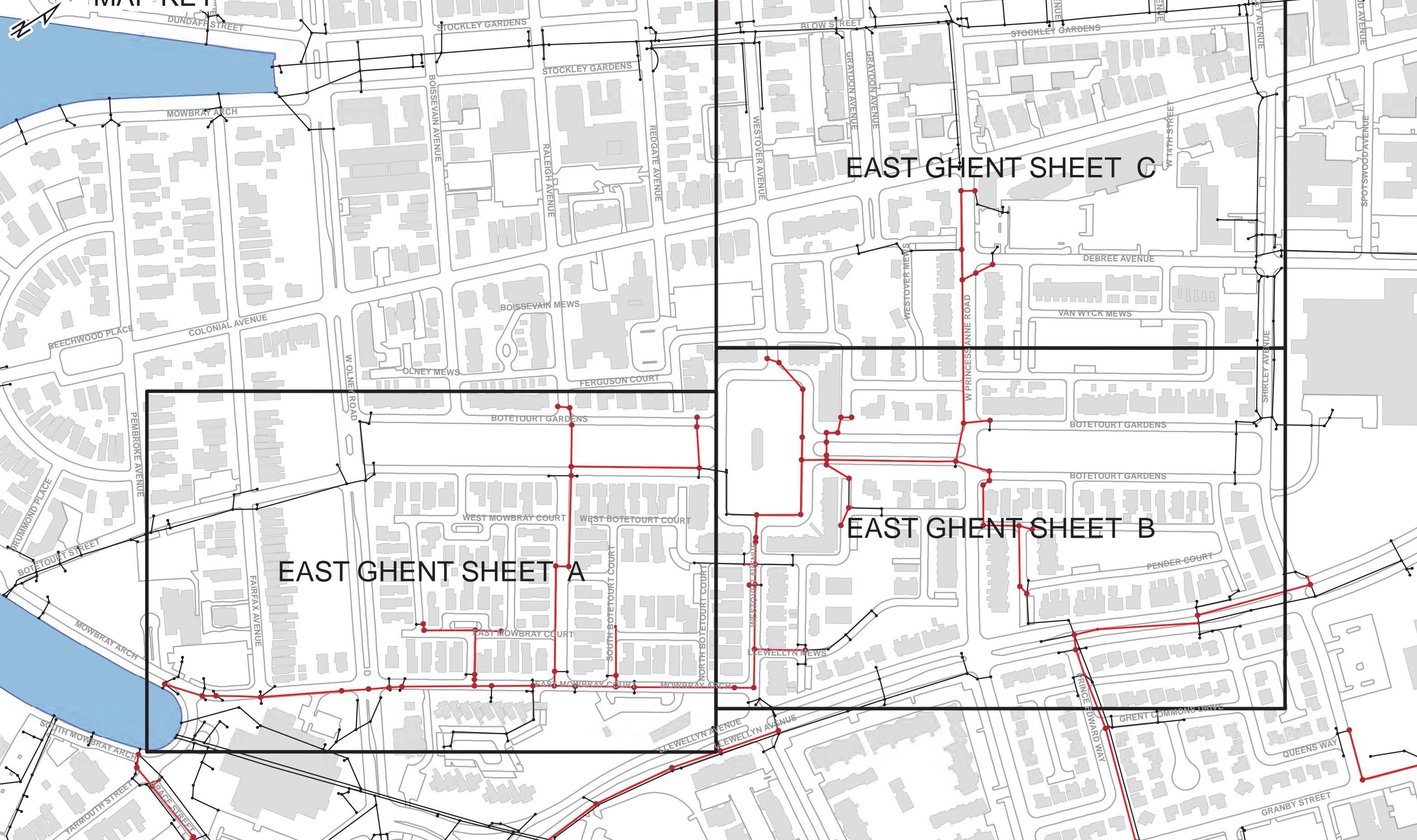
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# **APPENDIX A**

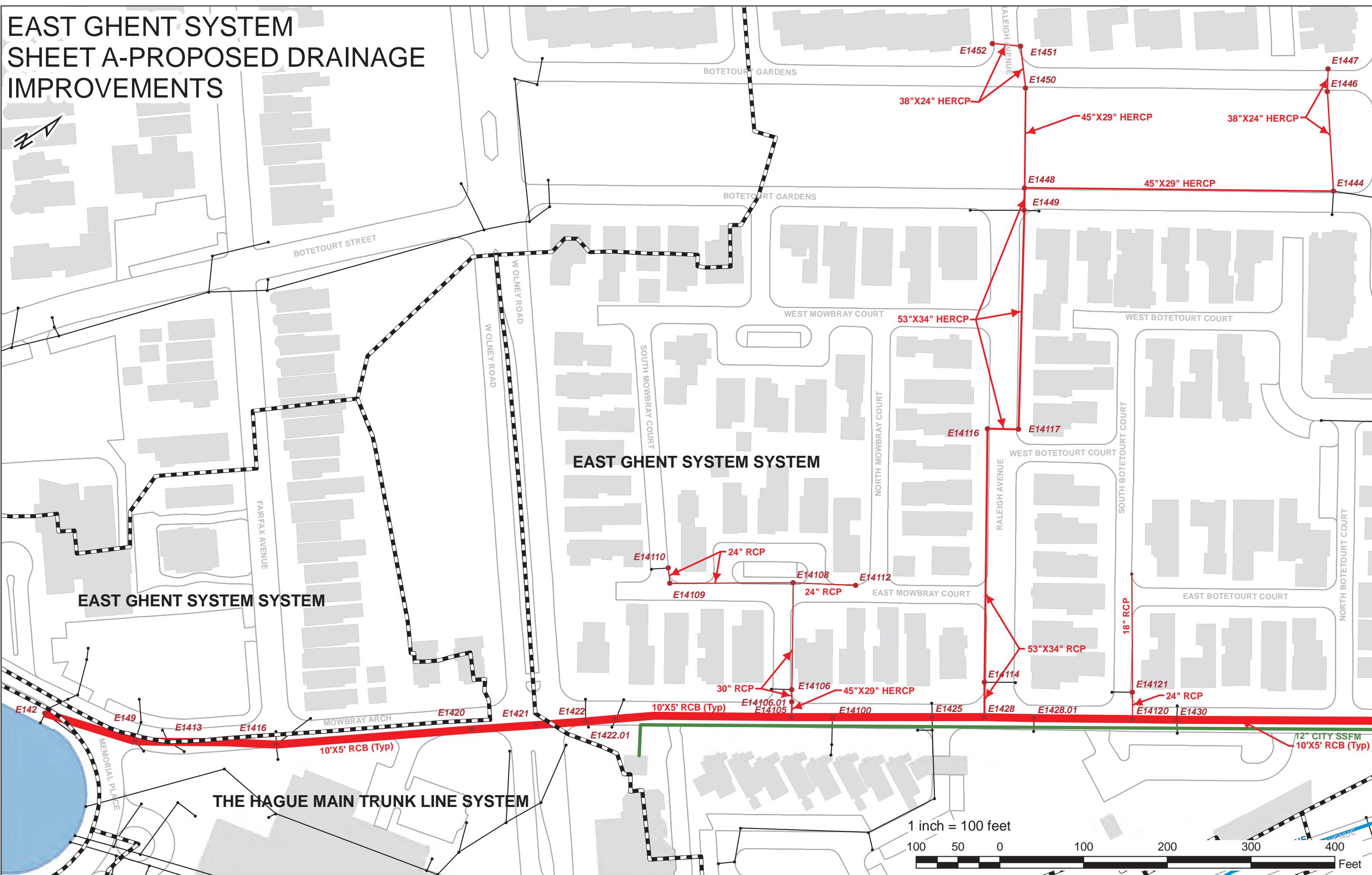
## **PROPOSED IMPROVEMENT MAPS**



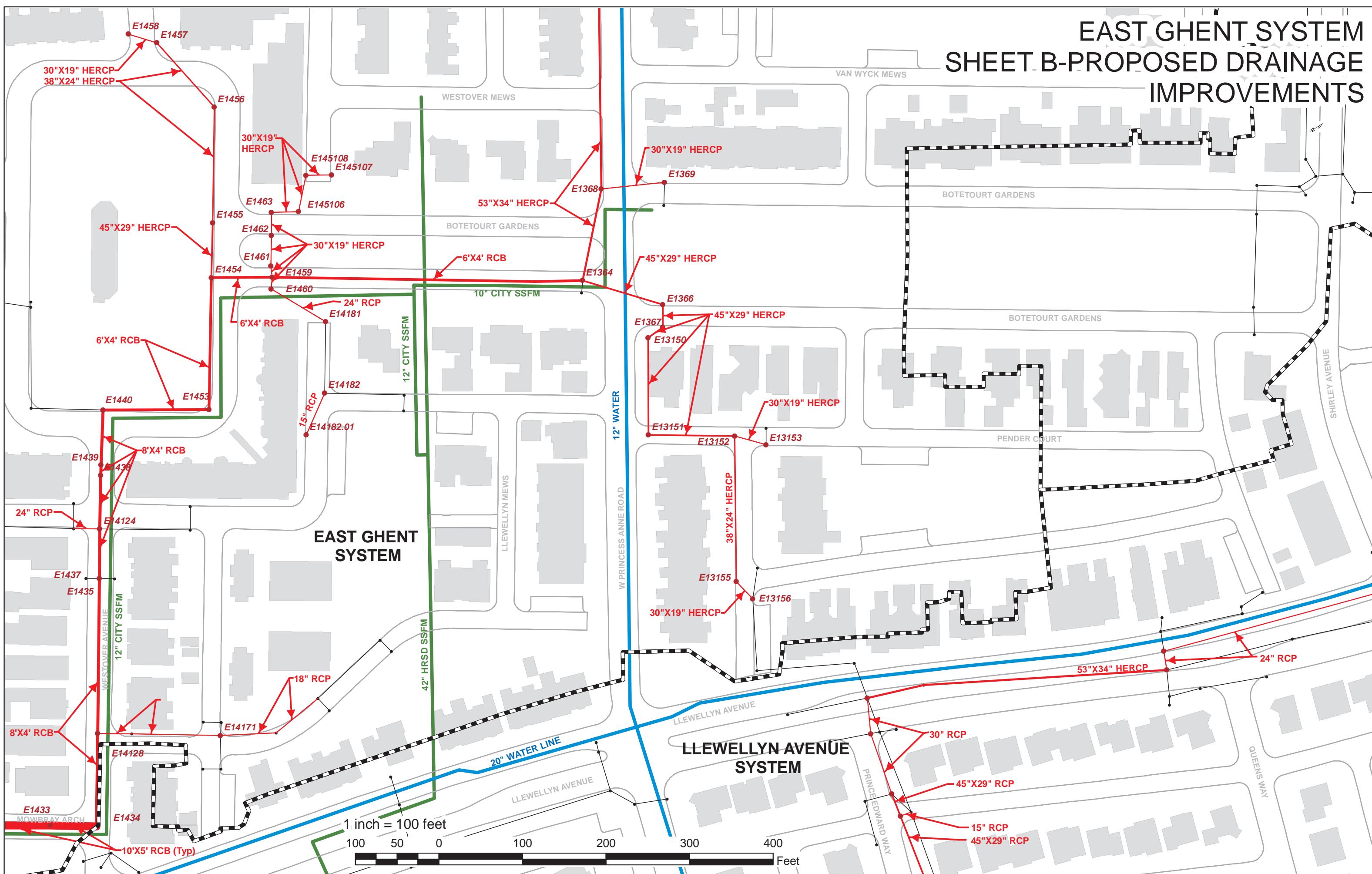
# EAST GHENT SYSTEM MAP KEY



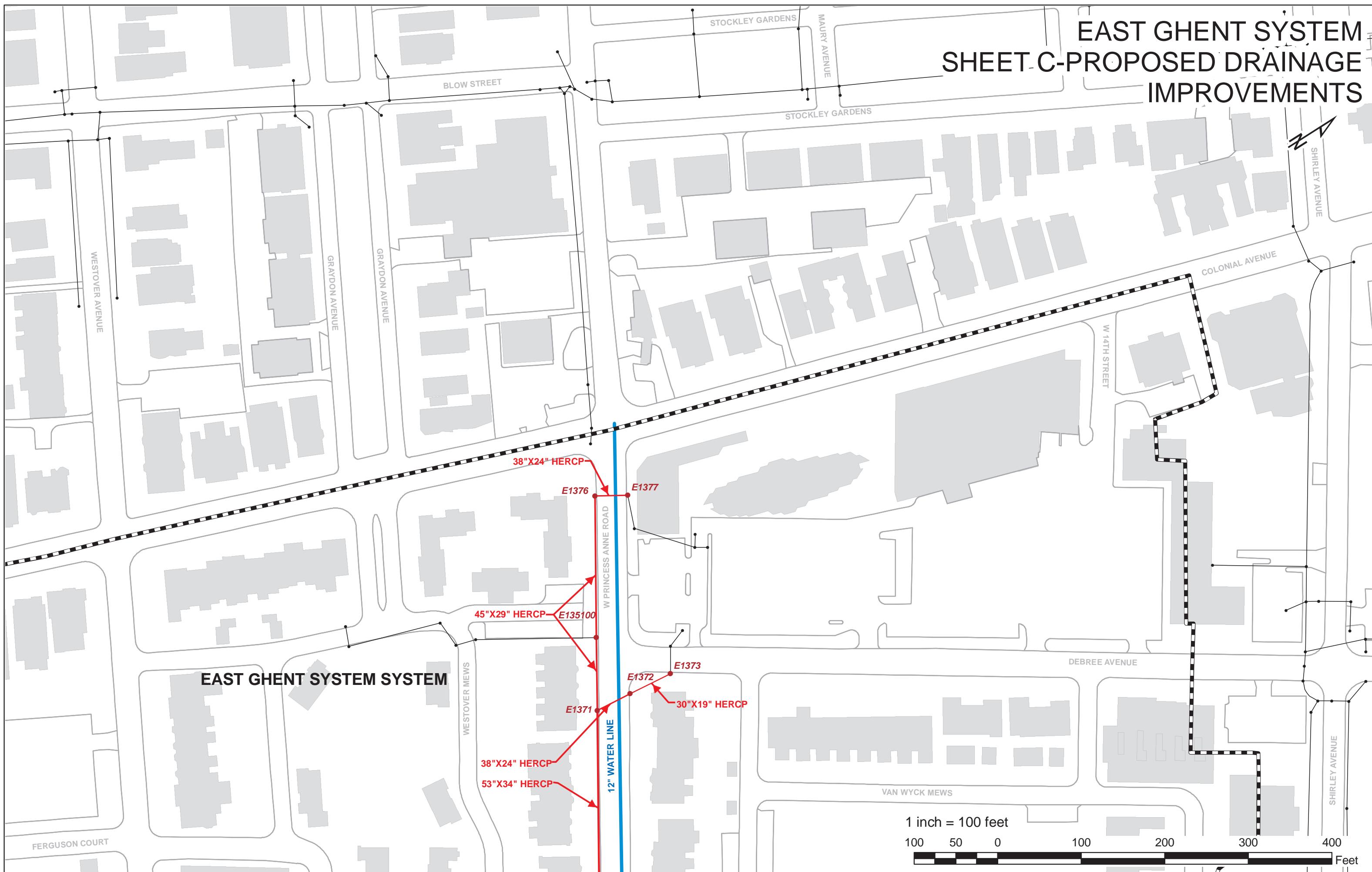
# EAST GHENT SYSTEM SHEET A-PROPOSED DRAINAGE IMPROVEMENTS



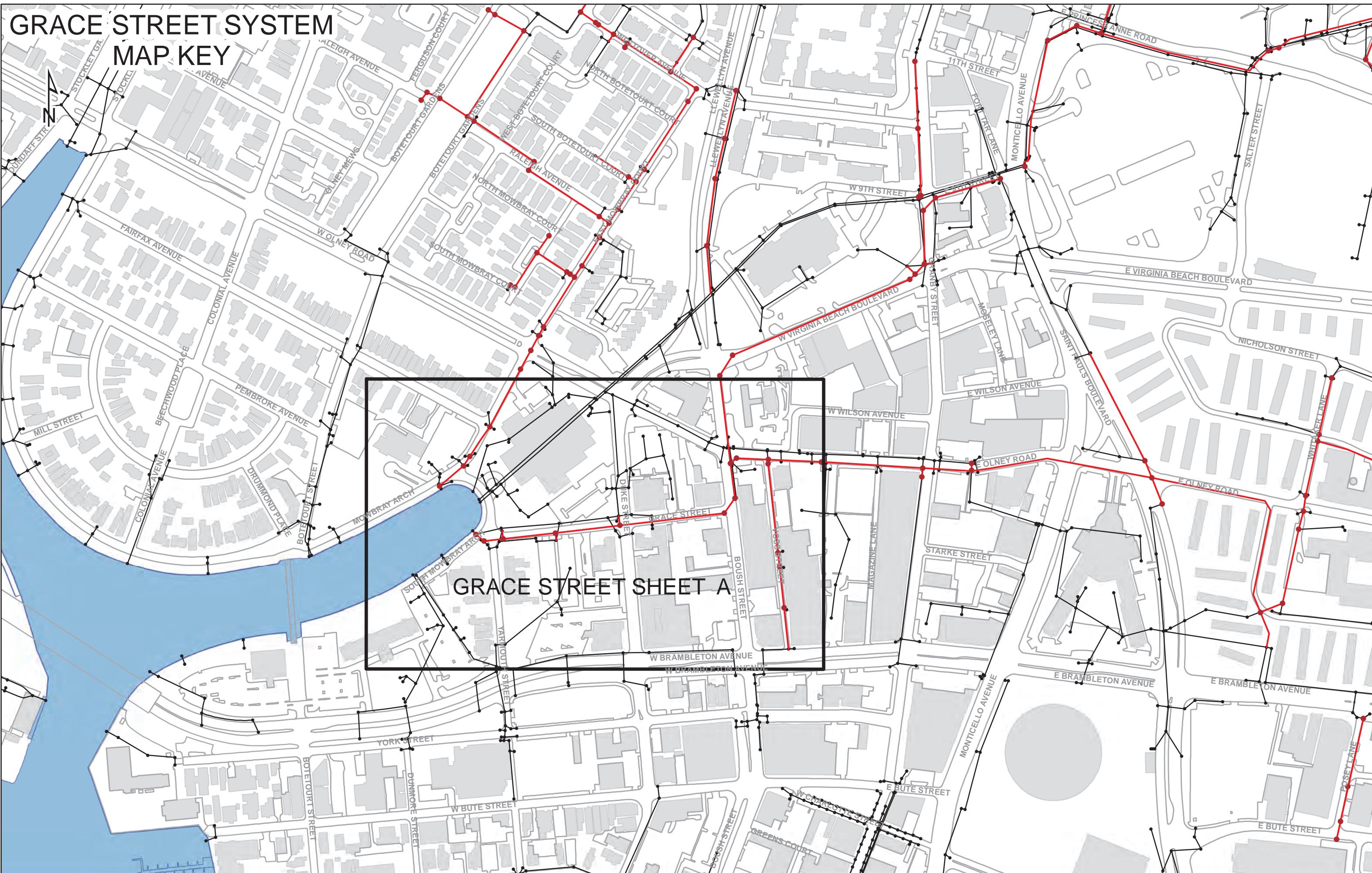
# EAST GHENT SYSTEM SHEET B-PROPOSED DRAINAGE IMPROVEMENTS

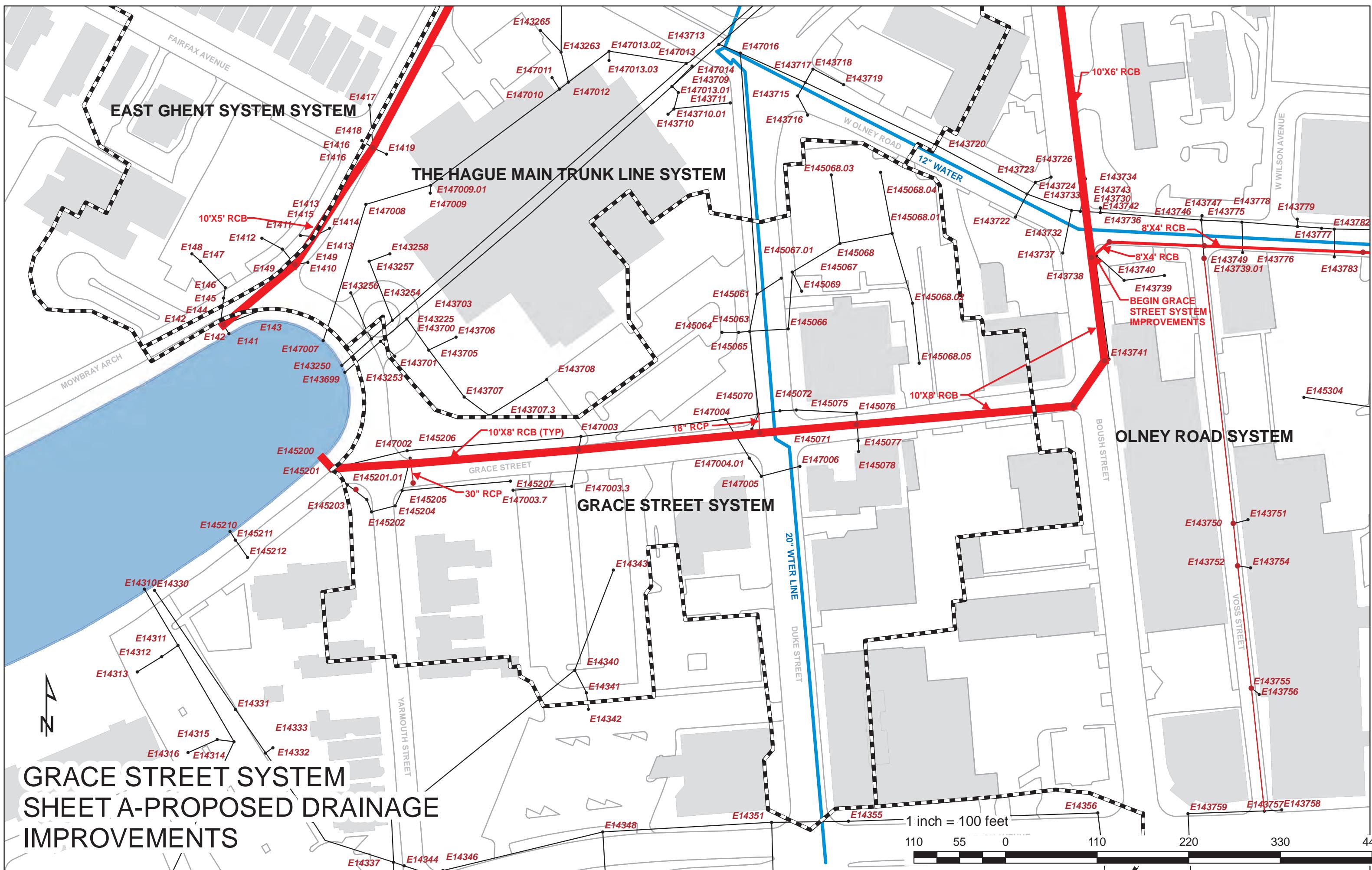


# EAST GHENT SYSTEM SHEET C-PROPOSED DRAINAGE IMPROVEMENTS



# GRACE STREET SYSTEM MAP KEY





# HAGUE MAIN TRUNK SYSTEM MAP KEY

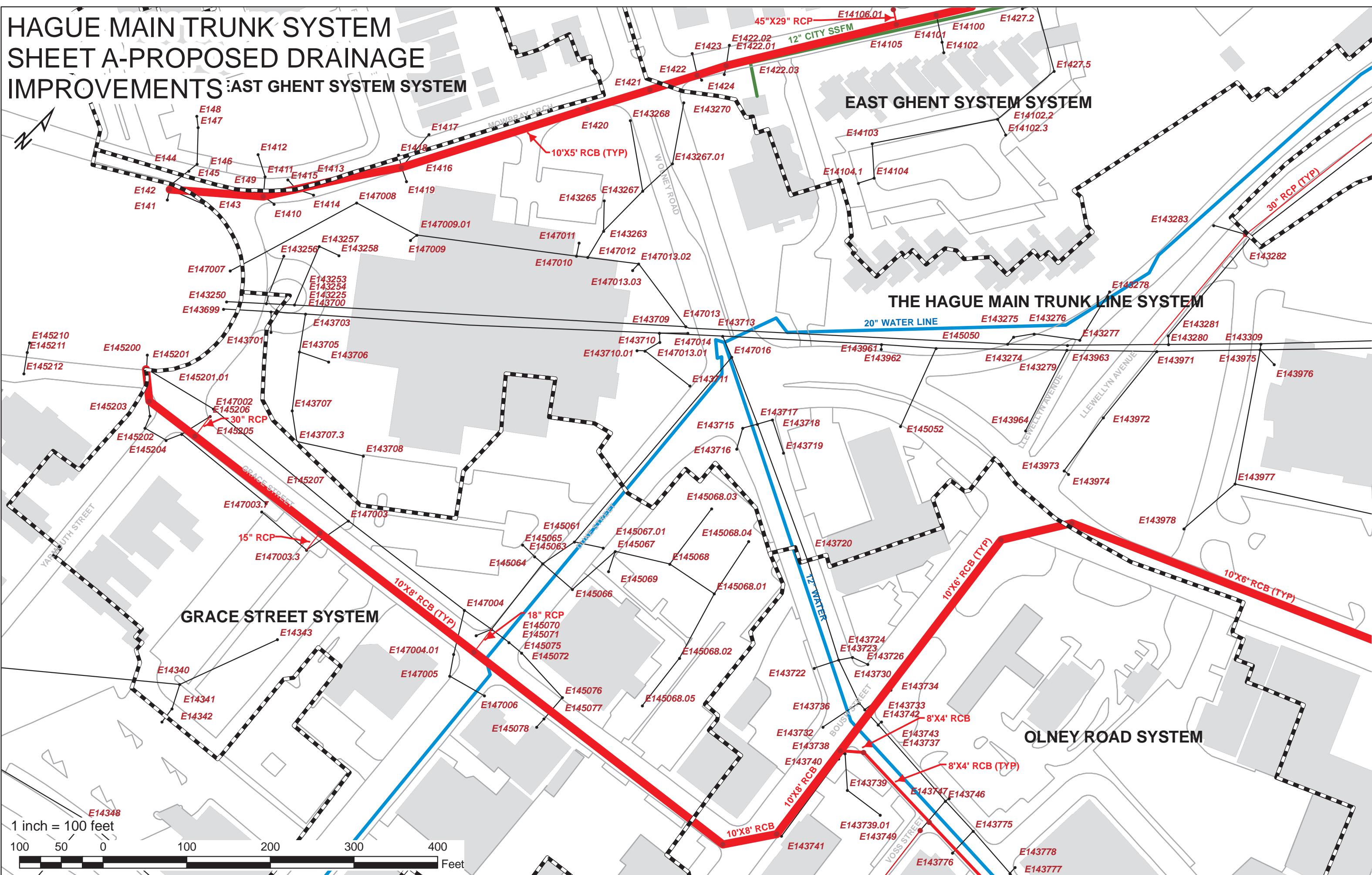
## MAP KEY

**HAGUE MAIN TRUNK SHEET A**

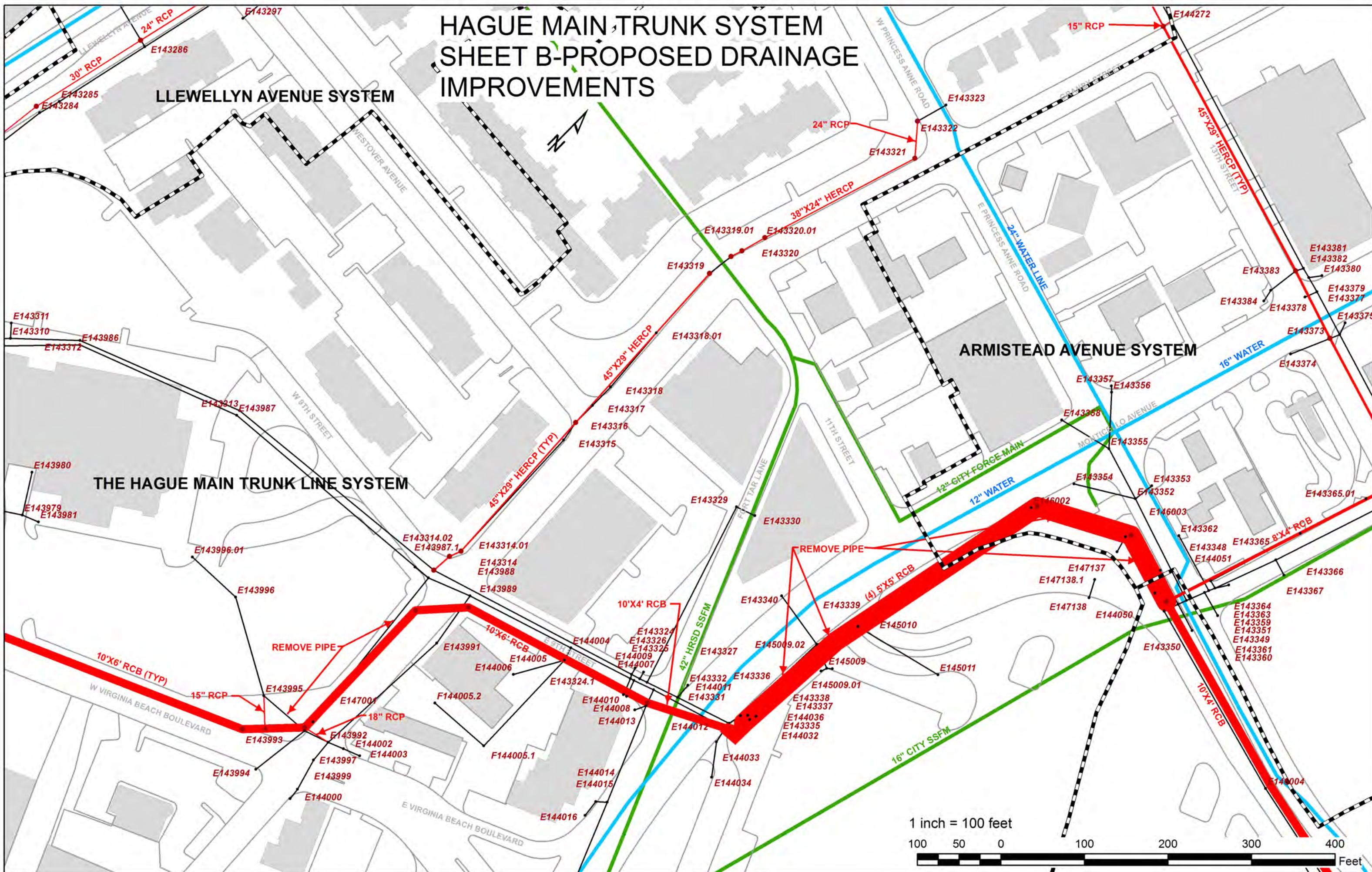
**HAGUE MAIN TRUNK SHEET B**

**HAGUE MAIN TRUNK SHEET C**

# HAGUE MAIN TRUNK SYSTEM SHEET A-PROPOSED DRAINAGE IMPROVEMENTS: EAST GHENT SYSTEM SYSTEM

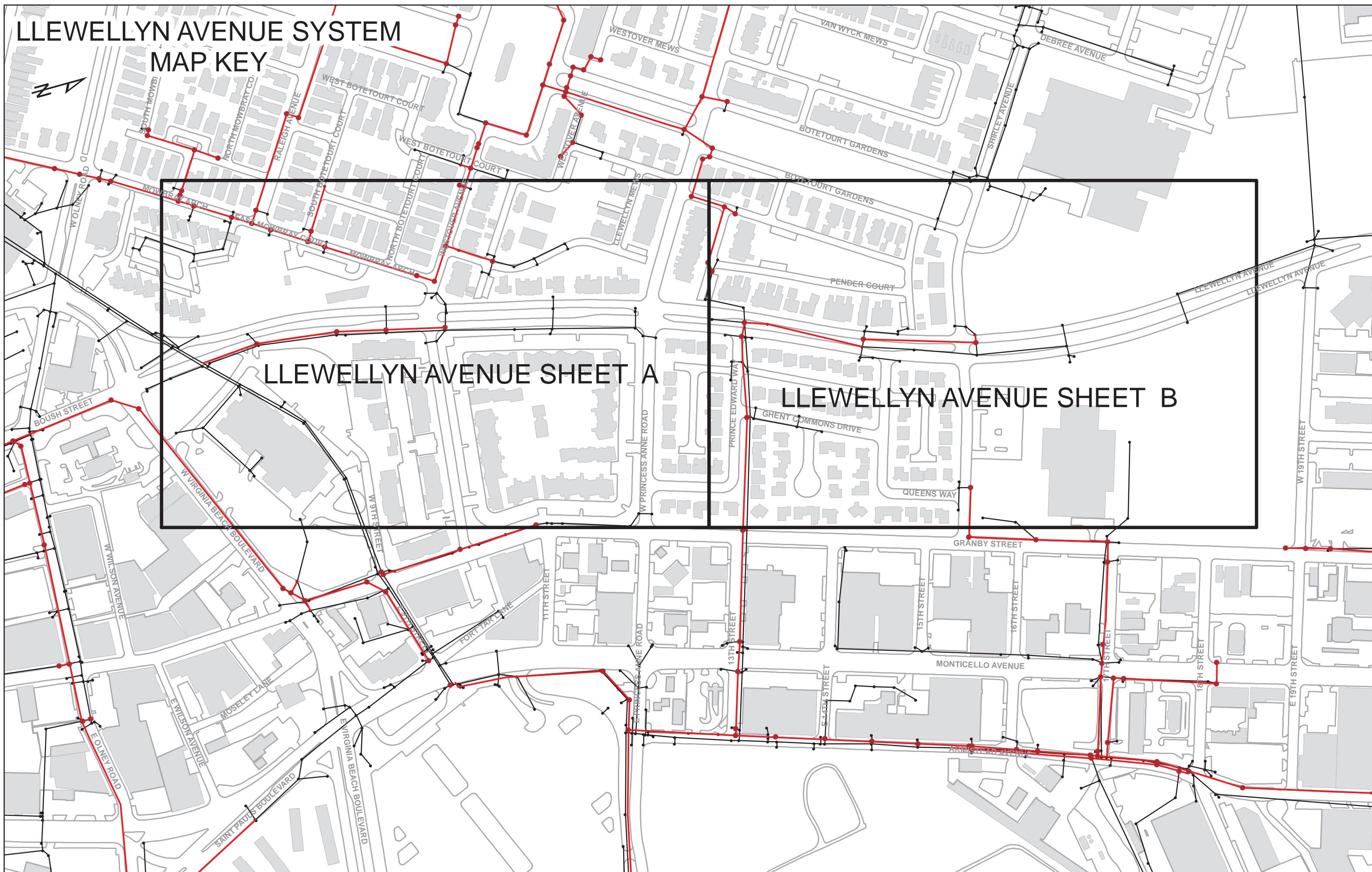


# THE HAGUE MAIN TRUNK SYSTEM SHEET B-PROPOSED DRAINAGE IMPROVEMENTS



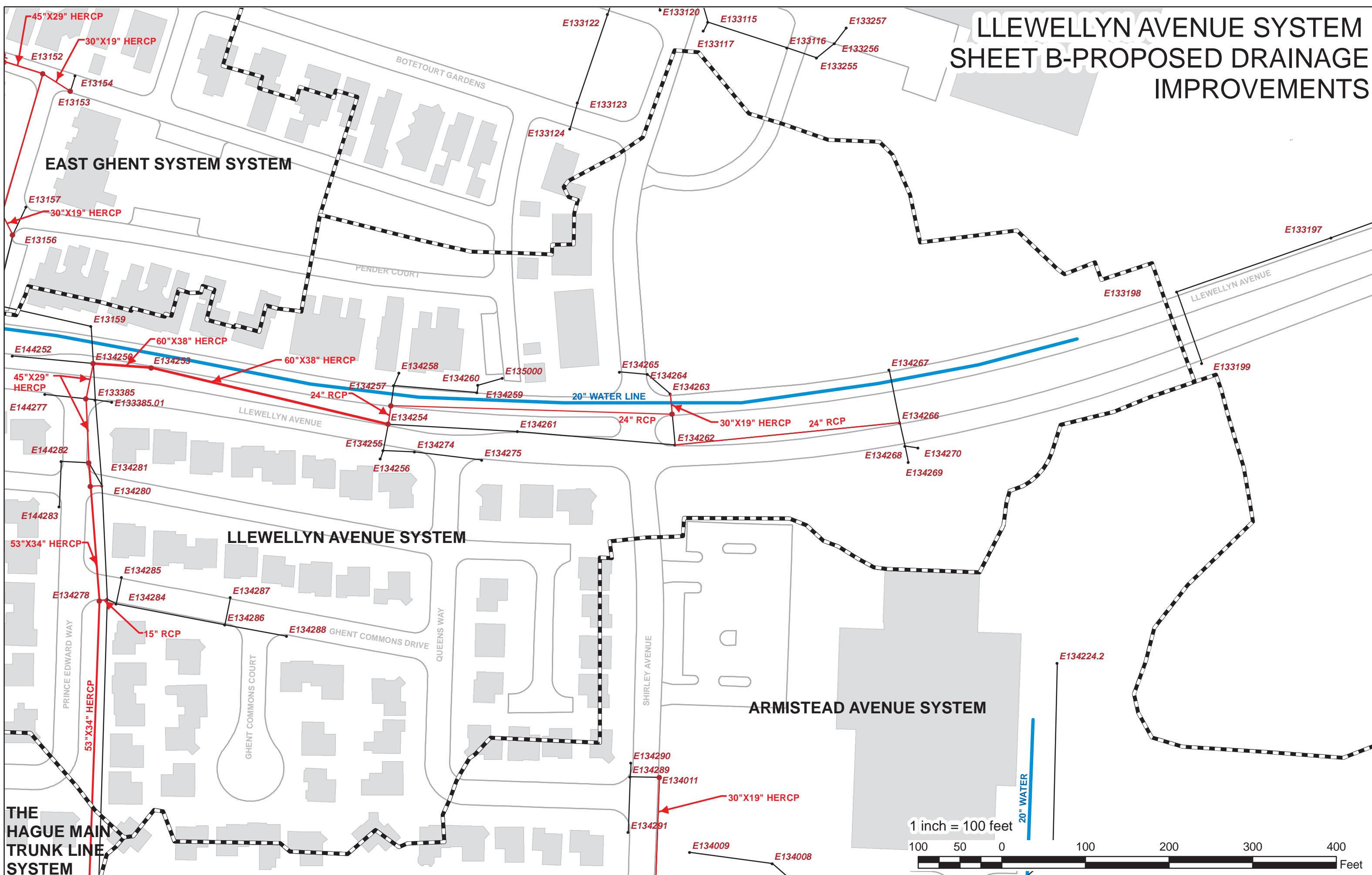


# LLEWELLYN AVENUE SYSTEM MAP KEY





# LLEWELLYN AVENUE SYSTEM SHEET B-PROPOSED DRAINAGE IMPROVEMENTS



# ARMISTEAD AVENUE SYSTEM

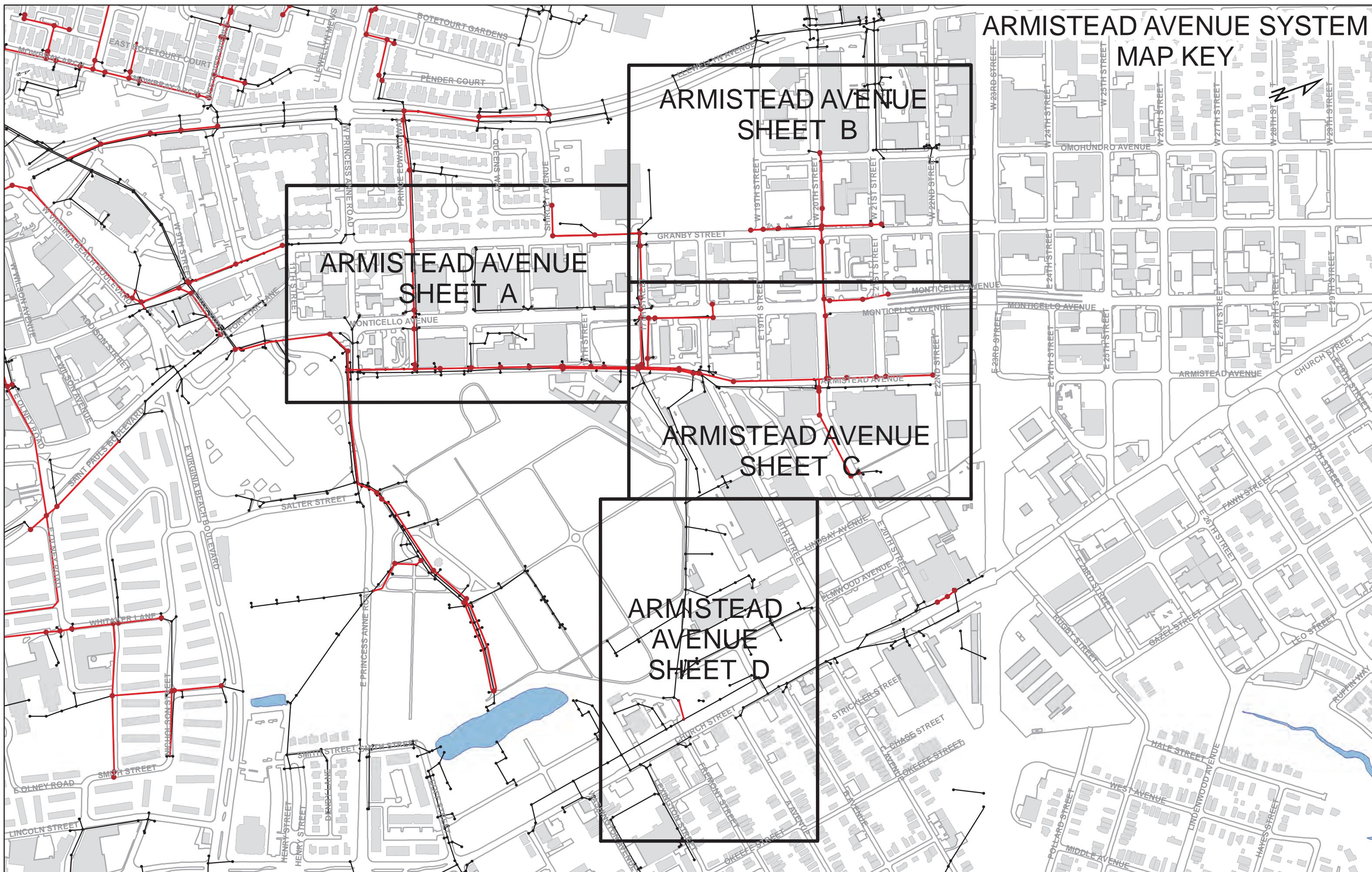
## MAP KEY

ARMISTEAD AVENUE  
SHEET B

ARMISTEAD AVENUE  
SHEET A

ARMISTEAD AVENUE  
SHEET C

ARMISTEAD  
AVENUE  
SHEET D



# ARMISTEAD AVENUE SYSTEM SHEET A-PROPOSED DRAINAGE IMPROVEMENTS

## THE HAGUE MAIN TRUNK LINE SYSTEM

E143320

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E143321

12" WATER

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E146016

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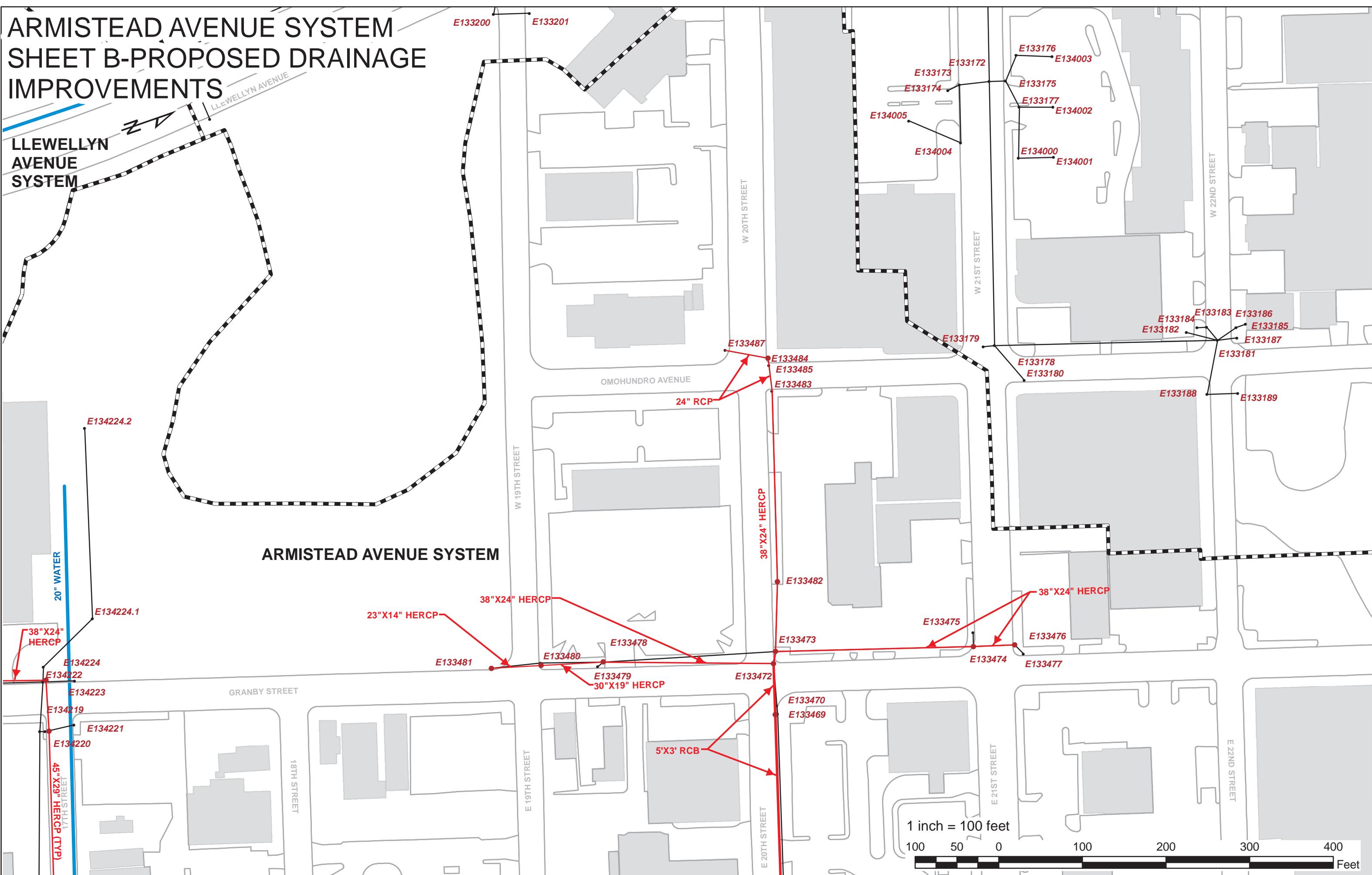
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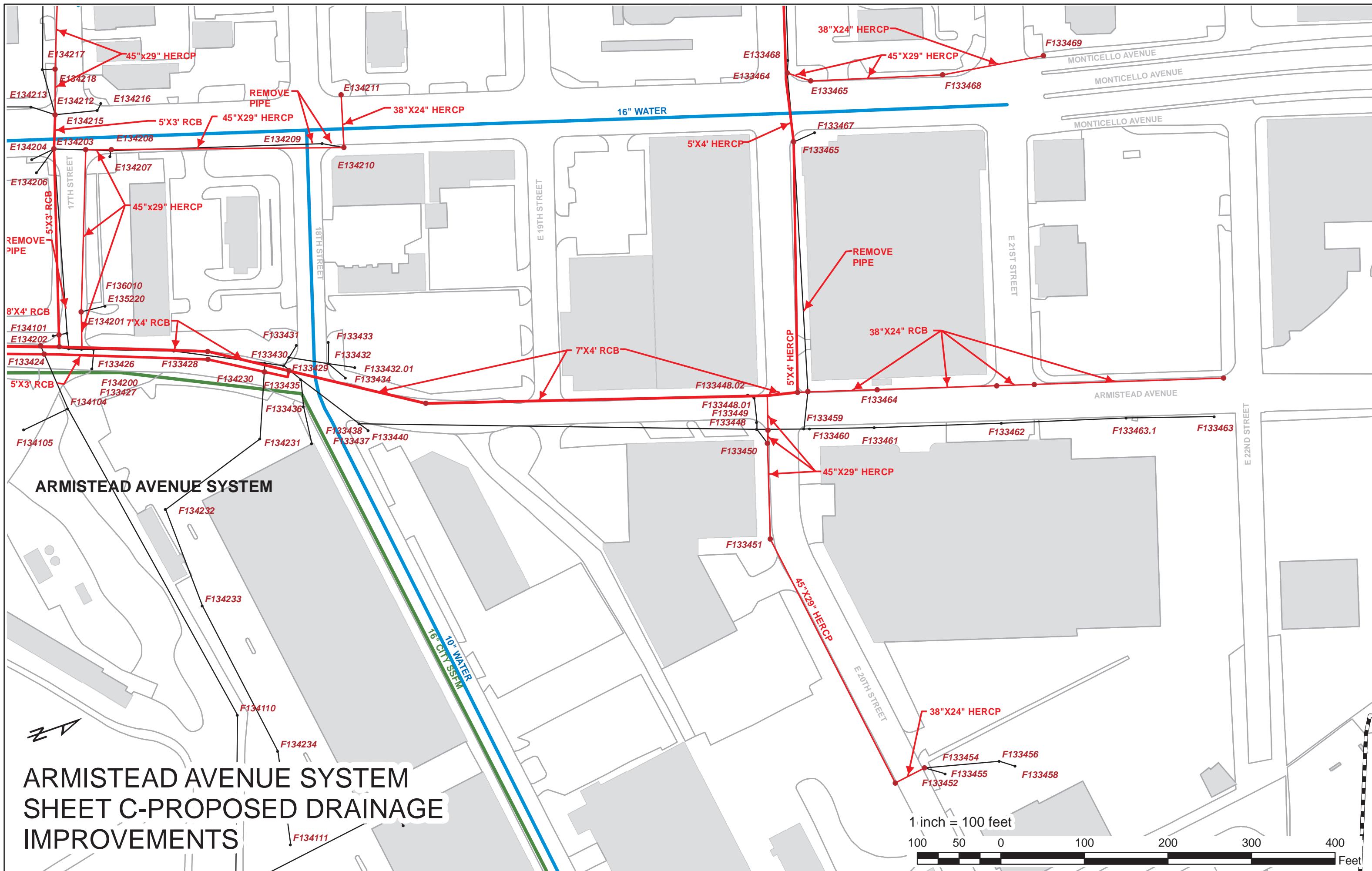
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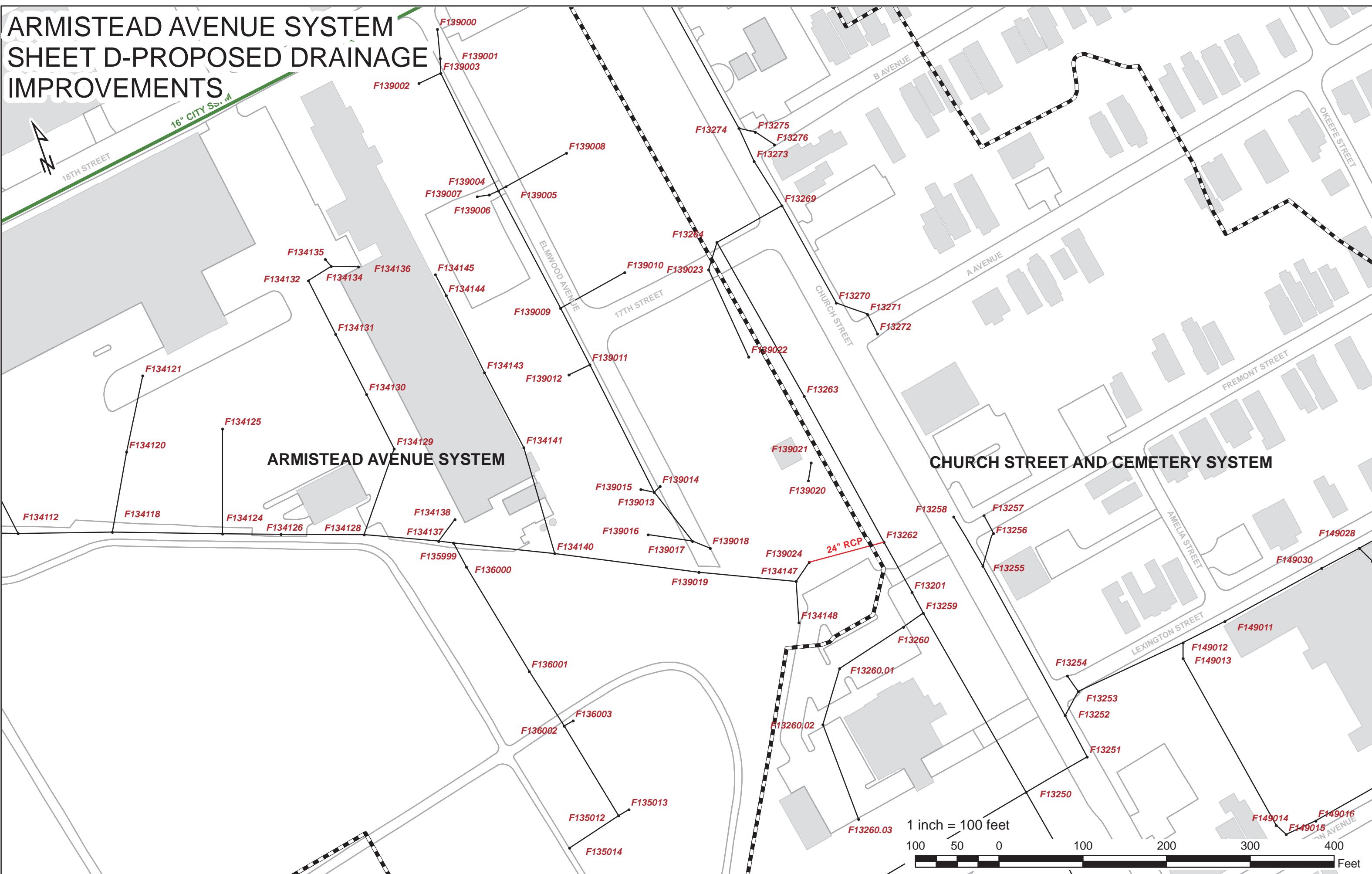
# ARMISTEAD AVENUE SYSTEM SHEET B-PROPOSED DRAINAGE IMPROVEMENTS

LLEWELLYN  
AVENUE  
SYSTEM



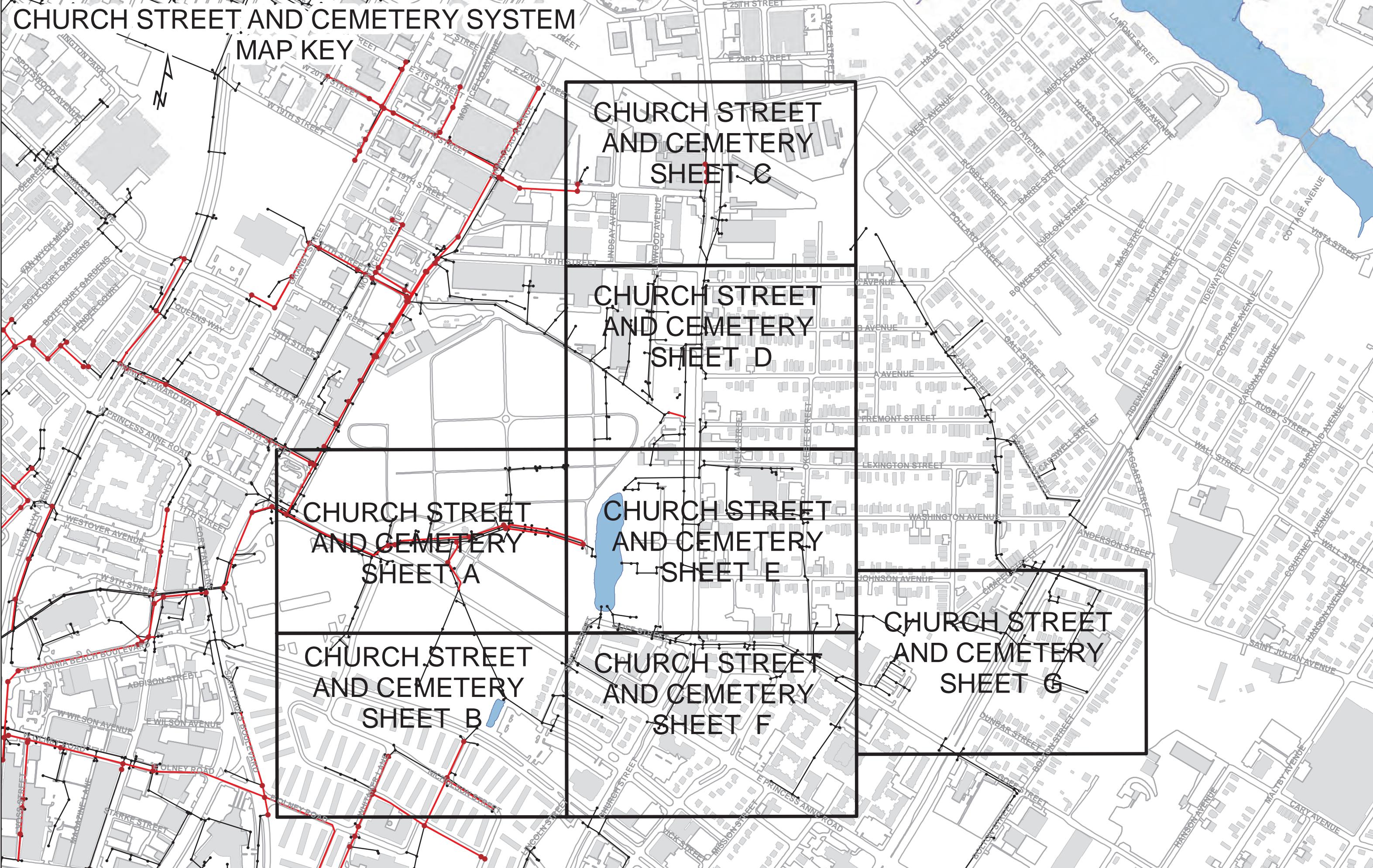


# ARMISTEAD AVENUE SYSTEM SHEET D-PROPOSED DRAINAGE IMPROVEMENTS



# CHURCH STREET AND CEMETERY SYSTEM

## MAP KEY



# CHURCH STREET AND CEMETERY SYSTEM SHEET A-PROPOSED DRAINAGE IMPROVEMENTS

## ARMISTEAD AVENUE SYSTEM

## CHURCH STREET AND CEMETERY SYSTEM

1 inch = 100 feet

100 50 0 100 200 300 400  
Feet



# CHURCH STREET AND CEMETERY SYSTEM SHEET C-PROPOSED DRAINAGE IMPROVEMENTS

11

E 22ND STREET

**ARMISTEAD AVENUE SYSTEM**

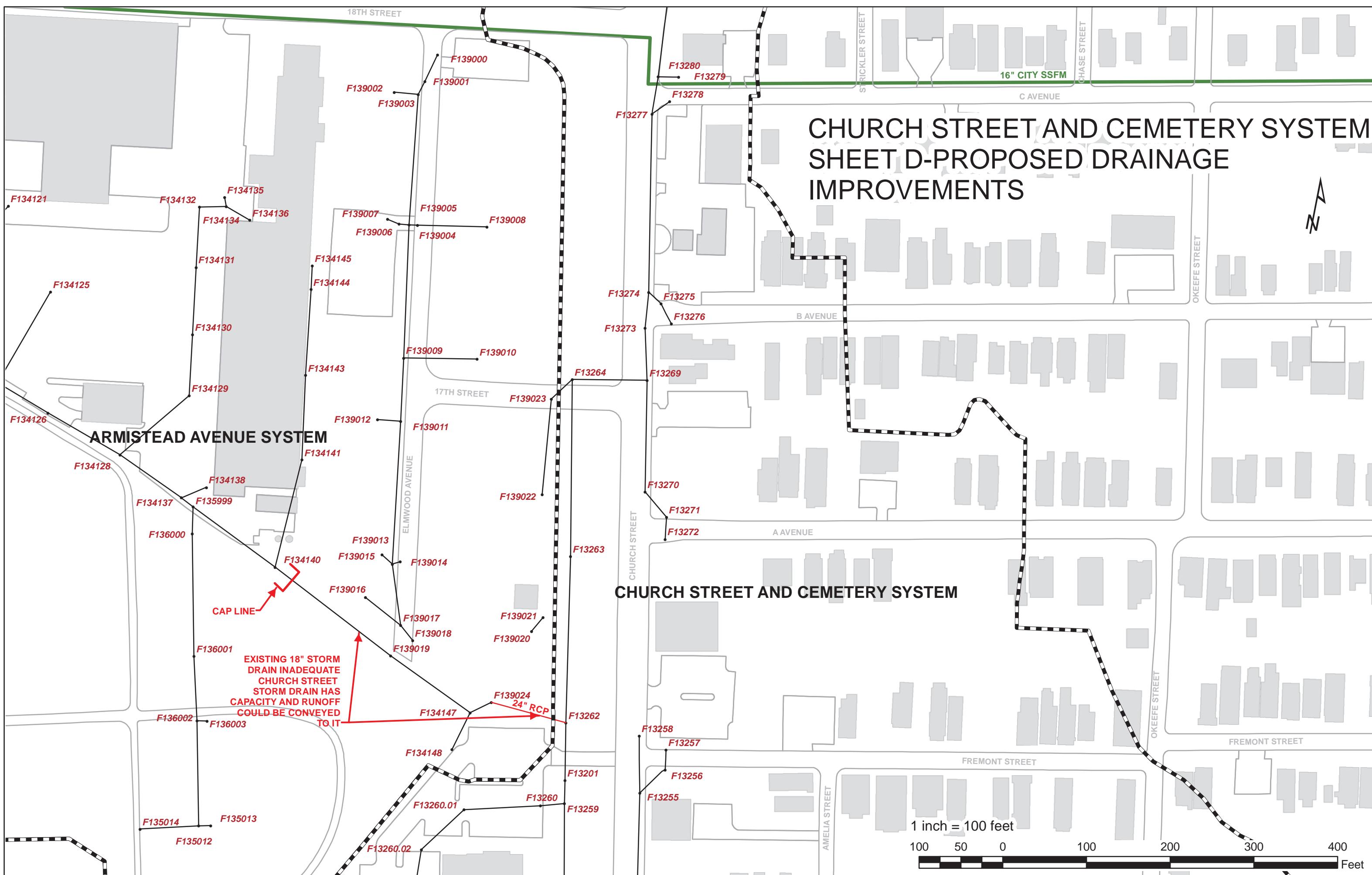
**CHURCH STREET AND CEMETERY SYSTEM**

16" CITY SSFM

18" STREET

1 inch = 100 feet

0 50 100 200 300 400 Feet

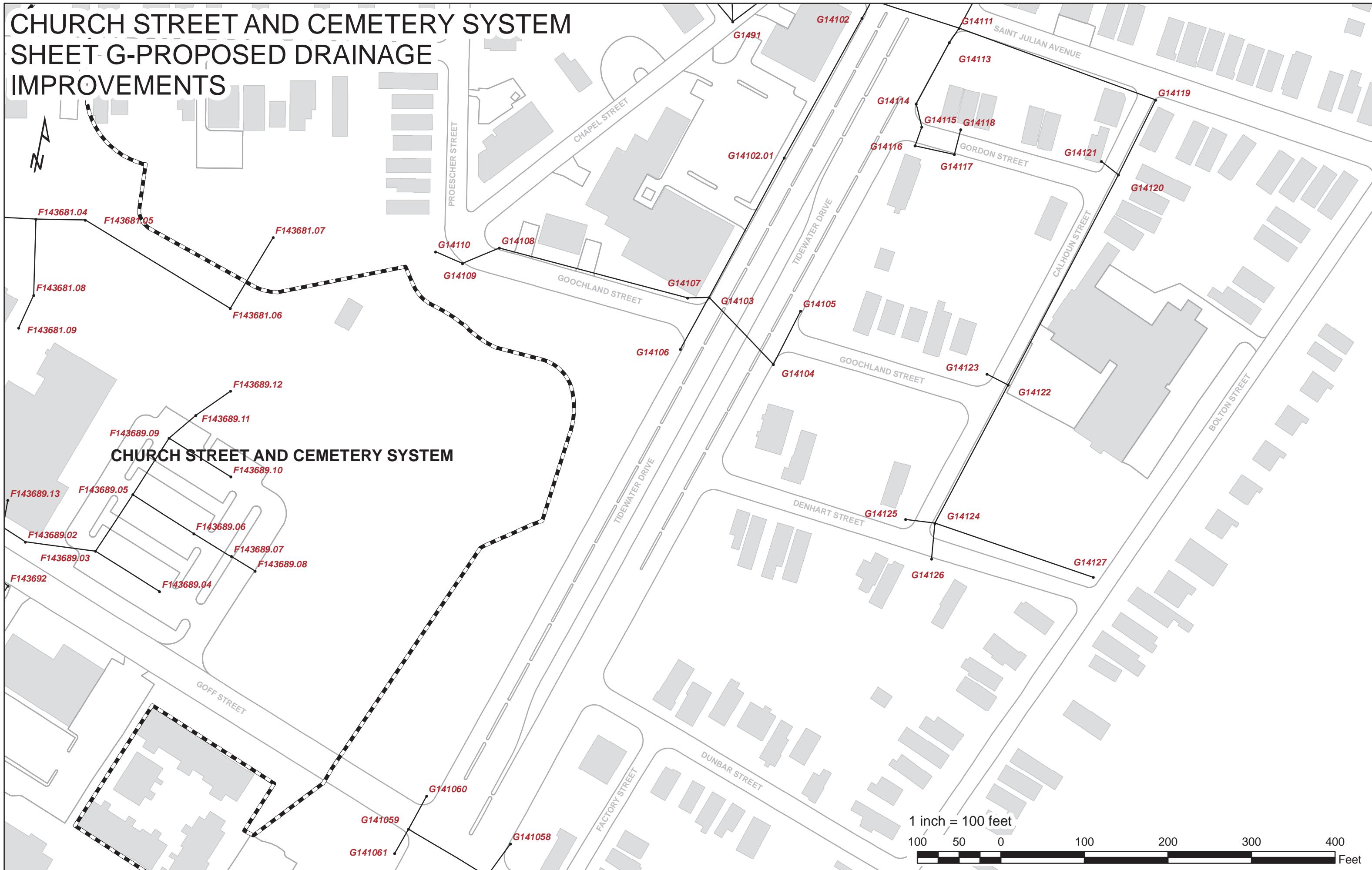




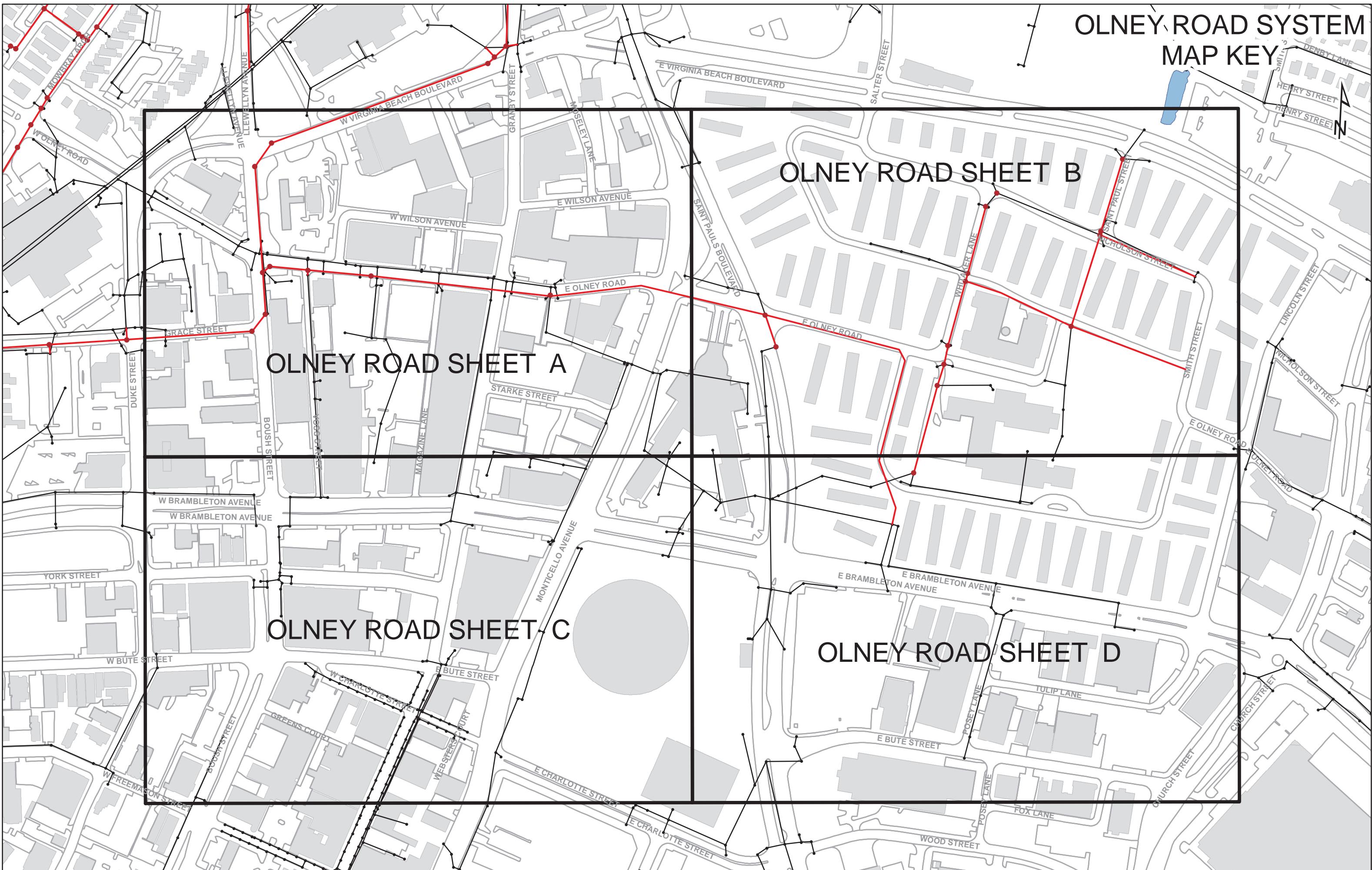


# CHURCH STREET AND CEMETERY SYSTEM SHEET G-PROPOSED DRAINAGE IMPROVEMENTS

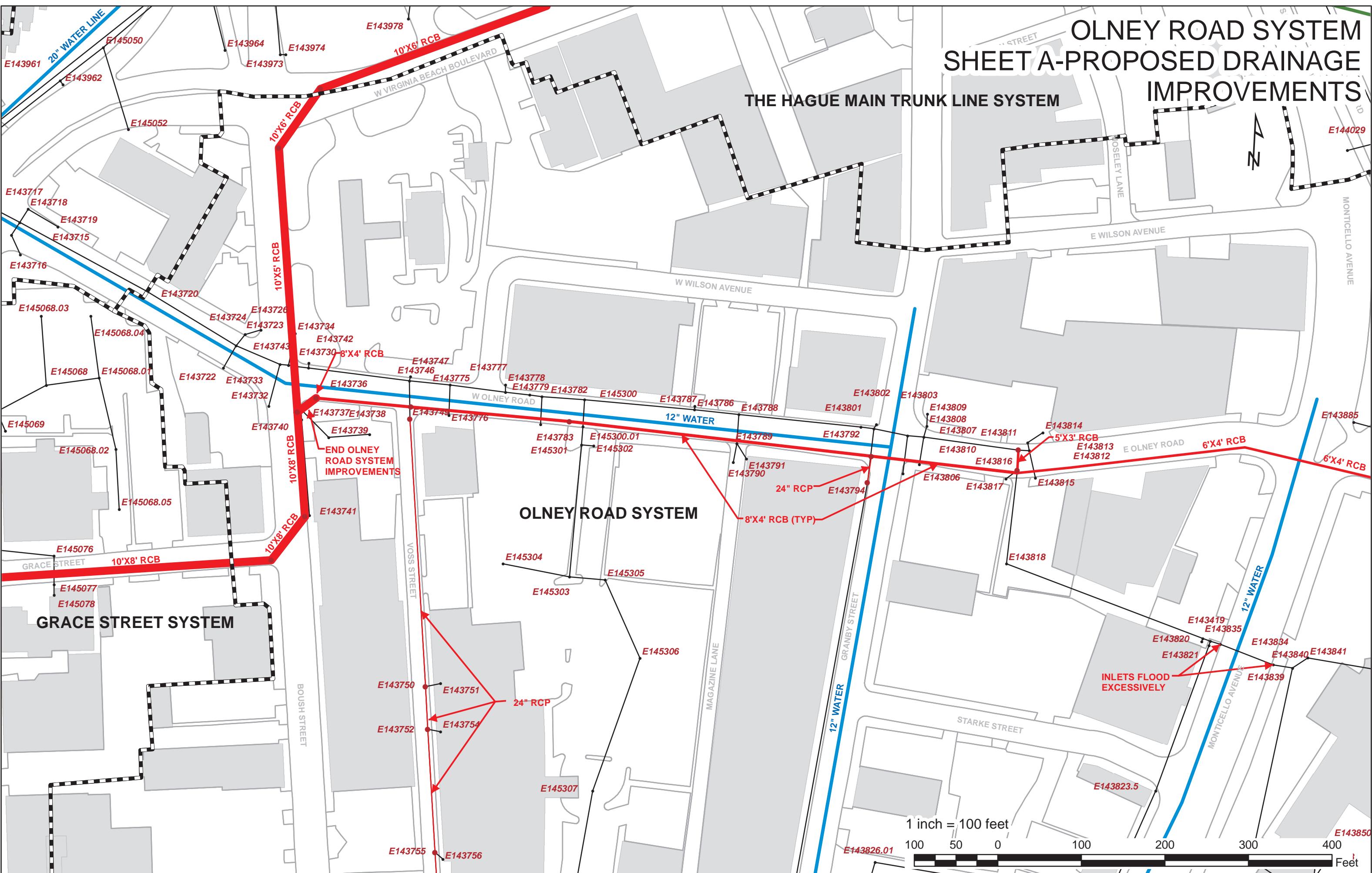
N



# OLNEY ROAD SYSTEM MAP KEY



# OLNEY ROAD SYSTEM SHEET A-PROPOSED DRAINAGE IMPROVEMENTS



# OLNEY ROAD SYSTEM SHEET B-PROPOSED DRAINAGE IMPROVEMENTS

E VIRGINIA BEACH BOULEVARD

# THE HAGUE MAIN TRUNK LINE SYSTEM

SALTER STREET

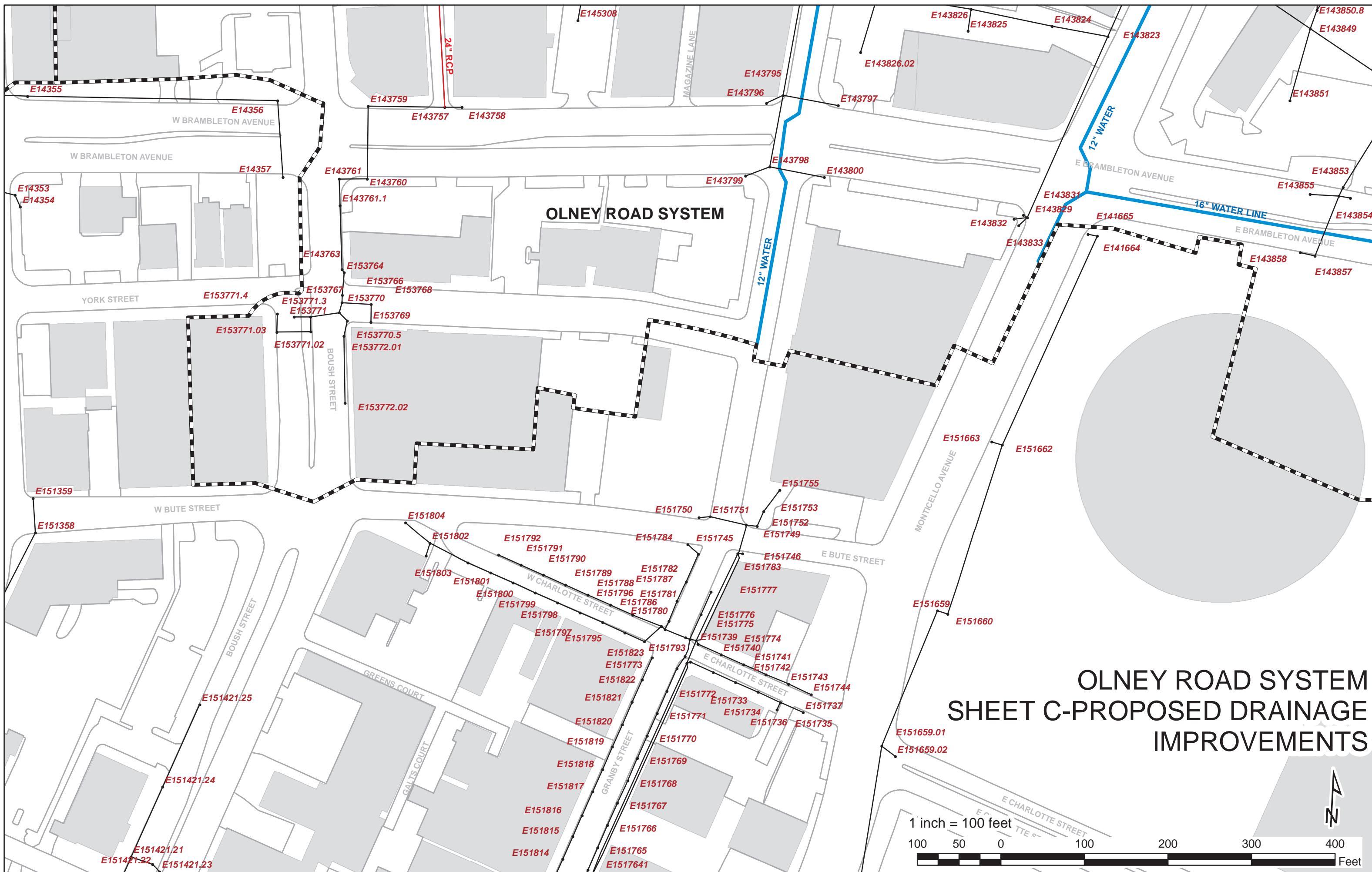
42" HRSD SSET

42" HRSD

**OLNEY ROAD SYSTEM SHEET B-PROPOSED DRAINAGE IMPROVEMENTS**

The map illustrates the Olney Road System and The Hague Main Trunk Line System, showing proposed drainage improvements. Key features include:

- Streets:** E. Virginia Beach Boulevard, Salter Street, Saint Paul Street, Nicholson Street, Smith Street, Olney Road.
- Pipes:**
  - Red Pipes:** 24" RCP, 30"X19" HERCP, 42" HRSD SSFM, 60"X38" HERCP (TYP), 38"X24" HERCP, 38"X24" HERCP, 30"X19" HERCP.
  - Blue Pipe:** 20" WATER LINE.
  - Green Pipe:** 36" HRSD SSFM.
- Labels:** E144027, E144028, E143884.01, E143884, E143882, E143883, E143881, E143842, E143880.01, E145400, E143861, F143901, F143902, F143903, F143904, F143905, F143906, F143907, F143908, F143909, F143910, F143911, F143912, F143913, F143914, F143915, F143916, F143917, F143918, F143919, F143920, F143921, F143922, F143923, F143924, F143925, F143926, F143927, F143928, F143929, F143930.
- Scale:** 1 inch = 100 feet.
- North Arrow:** Located in the top right corner.





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# **APPENDIX B**

## **DETAILED ESTIMATES OF CONSTRUCTION COSTS**

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**EAST GHENT - MOWBRAY ARCH**  
**FROM**  
**WESTOVER AVENUE TO THE OUTFALL**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement		SY	\$50.00	\$0
◆ Subdivision Road Pavement	4,355	SY	\$41.00	\$178,535
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement	206	SY	\$85.00	\$17,468
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	1,955	LF	\$20.00	\$39,100
◆ Curb		LF	\$10.00	\$0
◆ Private Entrances	2	EA	\$1,500.00	\$3,000
◆ Sidewalk		LF	\$12.00	\$0
◆ ADA Ramp		EA	\$2,500.00	\$0
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<i>Subtotal Paving and Earthwork</i>				<b>\$238,102</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	4,355	SY	\$8.00	\$34,836
◆ Remove Concrete Pavement	206	SY	\$10.00	\$2,055
◆ Remove Curb and Gutter	1,955	LF	\$7.00	\$13,685
◆ Remove Entrance	2	EA	\$450.00	\$900
◆ Remove Sidewalk		LF	\$7.00	\$0
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"	1,334	LF	\$20.00	\$26,680
◆ Remove Pipe 21"-30"	369	LF	\$35.00	\$12,915
◆ Remove Pipe 36"-42"		LF	\$60.00	\$0
◆ Remove Pipe 48"-54"	1,702	LF	\$90.00	\$153,180
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)	36	EA	\$750.00	\$27,000
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$271,251</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**EAST GHENT - MOWBRAY ARCH**  
**FROM**  
**WESTOVER AVENUE TO THE OUTFALL**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP		LF	\$65.00	\$0
◆ 18" RCP	141	LF	\$75.00	\$10,575
◆ 24" RCP	273	LF	\$105.00	\$28,665
◆ 30" RCP	142	LF	\$125.00	\$17,750
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP		LF	\$130.00	\$0
◆ 24"x38" HERCP	231	LF	\$165.00	\$38,115
◆ 29"x45" HERCP	506	LF	\$190.00	\$96,140
◆ 34"x53" HERCP	670	LF	\$235.00	\$157,450
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB		LF	\$675.00	\$0
◆ 5'x4'RCB		LF	\$725.00	\$0
◆ Double 5'x5' RCB	1,702	LF	\$1,450.00	\$2,467,900
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 8'x4' RCB		LF	\$1,000.00	\$0
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts	10,758	CY	\$40.00	\$430,333
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material	5,337	CY	\$30.00	\$160,114
◆ Bedding (Box Culverts Only)	987	TONS	\$40.00	\$39,486
◆ Curb Inlet	14	EA	\$4,500.00	\$63,000
◆ Drop Inlet	4	EA	\$3,000.00	\$12,000
◆ Riser and Top affixed to Box Culvert	16	EA	\$1,200.00	\$19,200
◆ 4' Manhole (including frame and cover)	1	EA	\$6,000.00	\$6,000
◆ 5' Manhole (including frame and cover)		EA	\$8,500.00	\$0
◆ 6' Manhole (including frame and cover)	1	EA	\$10,000.00	\$10,000
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes		EA	\$20,000.00	\$0
◆ Pipe Connections (Proposed to Existing)		EA	\$750.00	\$0
<b><i>Subtotal Storm Drainage</i></b>				<b>\$3,556,728</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**EAST GHENT - MOWBRAY ARCH**  
**FROM**  
**WESTOVER AVENUE TO THE OUTFALL**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset	3	LS	\$6,000.00	\$18,000
◆ 6" Waterline Offset	8	LS	\$8,000.00	\$64,000
◆ 8" Waterline Offset	4	LS	\$12,000.00	\$48,000
◆ 10" Waterline Offset		LS	\$45,000.00	\$0
◆ 12" Waterline Offset		LS	\$50,000.00	\$0
◆ 16" Waterline Offset		LS	\$65,000.00	\$0
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$130,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	5.00%	1	LS	\$209,804.07
◆ Topographic Survey	0.50%	1	LS	\$20,980.41
◆ Geotechnical (Borings)	0.25%	1	LS	\$10,490.20
◆ Utility Designation and Test Holes	1.00%	1	LS	\$41,960.81
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	1.50%	1	LS	\$62,941.22
◆ Traffic Control	2.00%	1	LS	\$83,921.63
◆ Construction Surveying	0.50%	1	LS	\$20,980.41
◆ Mobilization/Demobilization	4.00%	1	LS	\$167,843.25
◆ Miscellaneous Utility Adjustments <sup>1</sup>	1.00%	1	LS	\$41,960.81
◆ Miscellaneous Streetscaping <sup>2</sup>	0.50%	1	LS	\$20,980.41
<i>Subtotal Mark-ups</i>				<b>\$681,863</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$466,231.26
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$5,344,176</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**EAST GHENT**  
**PRINCESS ANNE ROAD TO WESTOVER AVENUE AT MOWBRAY ARCH**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement	874	SY	\$50.00	\$43,700
◆ Subdivision Road Pavement	2,185	SY	\$41.00	\$89,565
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement	443	SY	\$85.00	\$37,613
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	1,825	LF	\$20.00	\$36,500
◆ Curb		LF	\$10.00	\$0
◆ Private Entrances		EA	\$1,500.00	\$0
◆ Sidewalk		LF	\$12.00	\$0
◆ ADA Ramp	2	EA	\$2,500.00	\$5,000
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<i>Subtotal Paving and Earthwork</i>				<b>\$212,377</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	3,059	SY	\$8.00	\$24,468
◆ Remove Concrete Pavement	443	SY	\$10.00	\$4,425
◆ Remove Curb and Gutter	1,825	LF	\$7.00	\$12,775
◆ Remove Entrance		EA	\$450.00	\$0
◆ Remove Sidewalk		LF	\$7.00	\$0
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"	2,064	LF	\$20.00	\$41,280
◆ Remove Pipe 21"-30"	524	LF	\$35.00	\$18,340
◆ Remove Pipe 36"-42"	931	LF	\$60.00	\$55,860
◆ Remove Pipe 48"-54"	297	LF	\$90.00	\$26,730
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)	44	EA	\$750.00	\$33,000
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$216,878</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**EAST GHENT**  
**PRINCESS ANNE ROAD TO WESTOVER AVENUE AT MOWBRAY ARCH**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP	55	LF	\$65.00	\$3,575
◆ 18" RCP	132	LF	\$75.00	\$9,900
◆ 24" RCP	254	LF	\$105.00	\$26,670
◆ 30" RCP		LF	\$125.00	\$0
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP	433	LF	\$130.00	\$56,290
◆ 24"x38" HERCP	499	LF	\$165.00	\$82,335
◆ 29"x45" HERCP	692	LF	\$190.00	\$131,480
◆ 34"x53" HERCP	524	LF	\$235.00	\$123,140
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB		LF	\$675.00	\$0
◆ 5'x4'RCB		LF	\$725.00	\$0
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB	729	LF	\$800.00	\$583,200
◆ 8'x4' RCB	498	LF	\$1,000.00	\$498,000
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts		CY	\$40.00	\$0
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material		CY	\$30.00	\$0
◆ Bedding (Box Culverts Only)		TONS	\$40.00	\$0
◆ Curb Inlet	22	EA	\$4,500.00	\$99,000
◆ Drop Inlet	2	EA	\$3,000.00	\$6,000
◆ Riser and Top affixed to Box Culvert	7	EA	\$1,200.00	\$8,400
◆ 4' Manhole (including frame and cover)	6	EA	\$6,000.00	\$36,000
◆ 5' Manhole (including frame and cover)	2	EA	\$8,500.00	\$17,000
◆ 6' Manhole (including frame and cover)	4	EA	\$10,000.00	\$40,000
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes	3	EA	\$20,000.00	\$60,000
◆ Pipe Connections (Proposed to Existing)		EA	\$750.00	\$0
<b><i>Subtotal Storm Drainage</i></b>				<b>\$1,780,990</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**EAST GHENT**  
**PRINCESS ANNE ROAD TO WESTOVER AVENUE AT MOWBRAY ARCH**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset	6	LS	\$6,000.00	\$36,000
◆ 6" Waterline Offset	4	LS	\$8,000.00	\$32,000
◆ 8" Waterline Offset	6	LS	\$12,000.00	\$72,000
◆ 10" Waterline Offset		LS	\$45,000.00	\$0
◆ 12" Waterline Offset	4	LS	\$50,000.00	\$200,000
◆ 16" Waterline Offset		LS	\$65,000.00	\$0
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main	1	LS	\$60,000.00	\$60,000
◆ 12" Sanitary Force Main	1	LS	\$75,000.00	\$75,000
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main	1	LS	\$250,000.00	\$250,000
<i>Subtotal Municipal Utilities</i>				<b>\$725,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	5.00%	1	LS	\$146,762.25
◆ Topographic Survey	0.75%	1	LS	\$22,014.34
◆ Geotechnical (Borings)	0.25%	1	LS	\$7,338.11
◆ Utility Designation and Test Holes	1.75%	1	LS	\$51,366.79
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	1.50%	1	LS	\$44,028.68
◆ Traffic Control	2.50%	1	LS	\$73,381.13
◆ Construction Surveying	0.75%	1	LS	\$22,014.34
◆ Mobilization/Demobilization	5.00%	1	LS	\$146,762.25
◆ Miscellaneous Utility Adjustments <sup>1</sup>	1.00%	1	LS	\$29,352.45
◆ Miscellaneous Streetscaping <sup>2</sup>	0.50%	1	LS	\$14,676.23
<i>Subtotal Mark-ups</i>				<b>\$557,697</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$326,138.33
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$3,819,080</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
 THE HAGUE MAIN TRUNK LINE - GRACE STREET SYSTEM  
 NEW OUTFALL FROM OLNEY ROAD AT BOUSH STREET

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement	405	SY	\$50.00	\$20,250
◆ Subdivision Road Pavement	1,284	SY	\$41.00	\$52,644
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement		SY	\$85.00	\$0
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	290	LF	\$20.00	\$5,800
◆ Curb	160	LF	\$10.00	\$1,600
◆ Private Entrances	4	EA	\$1,500.00	\$6,000
◆ Sidewalk	403	LF	\$12.00	\$4,836
◆ ADA Ramp	5	EA	\$2,500.00	\$12,500
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<i>Subtotal Paving and Earthwork</i>				<b>\$103,630</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	1,689	SY	\$8.00	\$13,512
◆ Remove Concrete Pavement		SY	\$10.00	\$0
◆ Remove Curb and Gutter	450	LF	\$7.00	\$3,150
◆ Remove Entrance	4	EA	\$450.00	\$1,800
◆ Remove Sidewalk	403	LF	\$7.00	\$2,821
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"	204	LF	\$20.00	\$4,080
◆ Remove Pipe 21"-30"	35	LF	\$35.00	\$1,225
◆ Remove Pipe 36"-42"		LF	\$60.00	\$0
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)	4	EA	\$750.00	\$3,000
◆ Remove Bulkhead	1	LS	\$15,000.00	\$15,000
<i>Subtotal Demolition</i>				<b>\$44,588</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
 THE HAGUE MAIN TRUNK LINE - GRACE STREET SYSTEM  
 NEW OUTFALL FROM OLNEY ROAD AT BOUSH STREET

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP		LF	\$65.00	\$0
◆ 18" RCP	15	LF	\$75.00	\$1,125
◆ 24" RCP		LF	\$105.00	\$0
◆ 30" RCP	15	LF	\$125.00	\$1,875
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP		LF	\$130.00	\$0
◆ 24"x38" HERCP		LF	\$165.00	\$0
◆ 29"x45" HERCP		LF	\$190.00	\$0
◆ 34"x53" HERCP		LF	\$235.00	\$0
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB		LF	\$675.00	\$0
◆ 5'x4'RCB		LF	\$725.00	\$0
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 8'x4' RCB		LF	\$1,000.00	\$0
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB	1,145	LF	\$1,650.00	\$1,889,250
◆ Minor Structural Excavation for Box Culverts	7,424	CY	\$40.00	\$296,946
◆ Bulkhead Replacement	1	LS	\$65,000.00	\$65,000
◆ Select Material	2,377	CY	\$30.00	\$71,315
◆ Bedding (Box Culverts Only)	1,061	TONS	\$40.00	\$42,429
◆ Curb Inlet	4	EA	\$4,500.00	\$18,000
◆ Drop Inlet		EA	\$3,000.00	\$0
◆ Riser and Top affixed to Box Culvert	8	EA	\$1,200.00	\$9,600
◆ 4' Manhole (including frame and cover)	1	EA	\$6,000.00	\$6,000
◆ 5' Manhole (including frame and cover)		EA	\$8,500.00	\$0
◆ 6' Manhole (including frame and cover)		EA	\$10,000.00	\$0
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes		EA	\$20,000.00	\$0
◆ Pipe Connections (Proposed to Existing)		EA	\$750.00	\$0
<b><i>Subtotal Storm Drainage</i></b>				<b>\$2,401,540</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
 THE HAGUE MAIN TRUNK LINE - GRACE STREET SYSTEM  
 NEW OUTFALL FROM OLNEY ROAD AT BOUSH STREET

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset		LS	\$6,000.00	\$0
◆ 6" Waterline Offset		LS	\$8,000.00	\$0
◆ 8" Waterline Offset		LS	\$12,000.00	\$0
◆ 10" Waterline Offset		LS	\$45,000.00	\$0
◆ 12" Waterline Offset		LS	\$50,000.00	\$0
◆ 16" Waterline Offset		LS	\$65,000.00	\$0
◆ 20" Waterline Offset	1	LS	\$85,000.00	\$85,000
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$85,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	5.00%	1	LS	\$131,737.89
◆ Topographic Survey	1.50%	1	LS	\$39,521.37
◆ Geotechnical (Borings)	0.75%	1	LS	\$19,760.68
◆ Utility Designation and Test Holes	1.50%	1	LS	\$39,521.37
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	2.00%	1	LS	\$52,695.16
◆ Traffic Control	2.50%	1	LS	\$65,868.95
◆ Construction Surveying	1.00%	1	LS	\$26,347.58
◆ Mobilization/Demobilization	3.50%	1	LS	\$92,216.52
◆ Miscellaneous Utility Adjustments <sup>1</sup>	2.00%	1	LS	\$52,695.16
◆ Miscellaneous Streetscaping <sup>2</sup>	0.50%	1	LS	\$13,173.79
<i>Subtotal Mark-ups</i>				<b>\$533,538</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$292,750.87
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$3,461,047</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**THE HAGUE MAIN TRUNK LINE**  
**ARMISTEAD AVENUE AND PRINCESS ANNE ROAD TO OLNEY ROAD**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement	2,615	SY	\$50.00	\$130,725
◆ Subdivision Road Pavement		SY	\$41.00	\$0
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement		SY	\$85.00	\$0
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter		LF	\$20.00	\$0
◆ Curb		LF	\$10.00	\$0
◆ Private Entrances		EA	\$1,500.00	\$0
◆ Sidewalk		LF	\$12.00	\$0
◆ ADA Ramp		EA	\$2,500.00	\$0
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<b><i>Subtotal Paving and Earthwork</i></b>				<b>\$130,725</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	2,615	SY	\$8.00	\$20,916
◆ Remove Concrete Pavement		SY	\$10.00	\$0
◆ Remove Curb and Gutter		LF	\$7.00	\$0
◆ Remove Entrance		EA	\$450.00	\$0
◆ Remove Sidewalk		LF	\$7.00	\$0
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"	952	LF	\$20.00	\$19,040
◆ Remove Pipe 21"-30"	15	LF	\$35.00	\$525
◆ Remove Pipe 36"-42"	190	LF	\$60.00	\$11,400
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box	705	LF	\$125.00	\$88,125
◆ Remove Structure (CB, DI, MH)	26	EA	\$750.00	\$19,500
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<b><i>Subtotal Demolition</i></b>				<b>\$159,506</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**THE HAGUE MAIN TRUNK LINE**  
**ARMISTEAD AVENUE AND PRINCESS ANNE ROAD TO OLNEY ROAD**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP		LF	\$65.00	\$0
◆ 18" RCP		LF	\$75.00	\$0
◆ 24" RCP	45	LF	\$105.00	\$4,725
◆ 30" RCP		LF	\$125.00	\$0
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP		LF	\$130.00	\$0
◆ 24"x38" HERCP	250	LF	\$165.00	\$41,250
◆ 29"x45" HERCP	487	LF	\$190.00	\$92,435
◆ 34"x53" HERCP		LF	\$235.00	\$0
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB		LF	\$675.00	\$0
◆ 5'x4'RCB		LF	\$725.00	\$0
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB	645	LF	\$2,800.00	\$1,806,000
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 8'x4' RCB		LF	\$1,000.00	\$0
◆ 10'x4'RCB	102	LF	\$1,250.00	\$127,500
◆ 10'x6' RCB	1,661	LF	\$1,375.00	\$2,283,875
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts	16,876	CY	\$40.00	\$675,028
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material	6,807	CY	\$30.00	\$204,205
◆ Bedding (Box Culverts Only)	1,927	TONS	\$40.00	\$77,071
◆ Curb Inlet	15	EA	\$4,500.00	\$67,500
◆ Drop Inlet	2	EA	\$3,000.00	\$6,000
◆ Riser and Top affixed to Box Culvert	11	EA	\$1,200.00	\$13,200
◆ 4' Manhole (including frame and cover)		EA	\$6,000.00	\$0
◆ 5' Manhole (including frame and cover)	3	EA	\$8,500.00	\$25,500
◆ 6' Manhole (including frame and cover)		EA	\$10,000.00	\$0
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes		EA	\$20,000.00	\$0
◆ Pipe Connections (Proposed to Existing)		EA	\$750.00	\$0
<b><i>Subtotal Storm Drainage</i></b>				<b>\$5,424,289</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**THE HAGUE MAIN TRUNK LINE**  
**ARMISTEAD AVENUE AND PRINCESS ANNE ROAD TO OLNEY ROAD**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset		LS	\$6,000.00	\$0
◆ 6" Waterline Offset	1	LS	\$8,000.00	\$8,000
◆ 8" Waterline Offset	1	LS	\$12,000.00	\$12,000
◆ 10" Waterline Offset	1	LS	\$45,000.00	\$45,000
◆ 12" Waterline Offset	1	LS	\$50,000.00	\$50,000
◆ 16" Waterline Offset		LS	\$65,000.00	\$0
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main	1	LS	\$250,000.00	\$250,000
<i>Subtotal Municipal Utilities</i>				<b>\$365,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	4.00%	1	LS	\$243,180.78
◆ Topographic Survey	1.50%	1	LS	\$91,192.79
◆ Geotechnical (Borings)	0.50%	1	LS	\$30,397.60
◆ Utility Designation and Test Holes	1.20%	1	LS	\$72,954.24
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	2.00%	1	LS	\$121,590.39
◆ Traffic Control	2.50%	1	LS	\$151,987.99
◆ Construction Surveying	1.00%	1	LS	\$60,795.20
◆ Mobilization/Demobilization	2.50%	1	LS	\$151,987.99
◆ Miscellaneous Utility Adjustments <sup>1</sup>	1.00%	1	LS	\$60,795.20
◆ Miscellaneous Streetscaping <sup>2</sup>	0.75%	1	LS	\$45,596.40
<i>Subtotal Mark-ups</i>				<b>\$1,030,479</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$675,502.18
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$7,785,500</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**LLEWELLYN AVENUE**  
**FROM**  
**PRINCESS ANNE ROAD TO**  
**THE HAGUE MAIN TRUNK LINE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement	448	SY	\$50.00	\$22,400
◆ Subdivision Road Pavement		SY	\$41.00	\$0
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement		SY	\$85.00	\$0
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	340	LF	\$20.00	\$6,800
◆ Curb		LF	\$10.00	\$0
◆ Private Entrances	2	EA	\$1,500.00	\$3,000
◆ Sidewalk		LF	\$12.00	\$0
◆ ADA Ramp		EA	\$2,500.00	\$0
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<i>Subtotal Paving and Earthwork</i>				<b>\$32,200</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	448	SY	\$8.00	\$3,584
◆ Remove Concrete Pavement		SY	\$10.00	\$0
◆ Remove Curb and Gutter	340	LF	\$7.00	\$2,380
◆ Remove Entrance	2	EA	\$450.00	\$900
◆ Remove Sidewalk		LF	\$7.00	\$0
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"		LF	\$20.00	\$0
◆ Remove Pipe 21"-30"		LF	\$35.00	\$0
◆ Remove Pipe 36"-42"		LF	\$60.00	\$0
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)		EA	\$750.00	\$0
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$6,864</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**LLEWELLYN AVENUE**  
**FROM**  
**PRINCESS ANNE ROAD TO**  
**THE HAGUE MAIN TRUNK LINE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP		LF	\$65.00	\$0
◆ 18" RCP		LF	\$75.00	\$0
◆ 24" RCP	176	LF	\$105.00	\$18,480
◆ 30" RCP	540	LF	\$125.00	\$67,500
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP		LF	\$130.00	\$0
◆ 24"x38" HERCP		LF	\$165.00	\$0
◆ 29"x45" HERCP		LF	\$190.00	\$0
◆ 34"x53" HERCP		LF	\$235.00	\$0
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB		LF	\$675.00	\$0
◆ 5'x4'RCB		LF	\$725.00	\$0
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 8'x4' RCB		LF	\$1,000.00	\$0
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts		CY	\$40.00	\$0
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material		CY	\$30.00	\$0
◆ Bedding (Box Culverts Only)		TONS	\$40.00	\$0
◆ Curb Inlet		EA	\$4,500.00	\$0
◆ Drop Inlet		EA	\$3,000.00	\$0
◆ Riser and Top affixed to Box Culvert		EA	\$1,200.00	\$0
◆ 4' Manhole (including frame and cover)	4	EA	\$6,000.00	\$24,000
◆ 5' Manhole (including frame and cover)		EA	\$8,500.00	\$0
◆ 6' Manhole (including frame and cover)		EA	\$10,000.00	\$0
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes		EA	\$20,000.00	\$0
◆ Pipe Connections (Proposed to Existing)		EA	\$750.00	\$0
<i>Subtotal Storm Drainage</i>				<b>\$109,980</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
 LLEWELLYN AVENUE  
 FROM  
 PRINCESS ANNE ROAD TO  
 THE HAGUE MAIN TRUNK LINE

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset		LS	\$6,000.00	\$0
◆ 6" Waterline Offset		LS	\$8,000.00	\$0
◆ 8" Waterline Offset	1	LS	\$12,000.00	\$12,000
◆ 10" Waterline Offset		LS	\$45,000.00	\$0
◆ 12" Waterline Offset		LS	\$50,000.00	\$0
◆ 16" Waterline Offset		LS	\$65,000.00	\$0
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$12,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	8.00%	1	LS	\$12,883.52
◆ Topographic Survey	2.50%	1	LS	\$4,026.10
◆ Geotechnical (Borings)	0.00%	1	LS	\$0.00
◆ Utility Designation and Test Holes	1.50%	1	LS	\$2,415.66
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	1.00%	1	LS	\$1,610.44
◆ Traffic Control	6.00%	1	LS	\$9,662.64
◆ Construction Surveying	2.00%	1	LS	\$3,220.88
◆ Mobilization/Demobilization	10.00%	1	LS	\$16,104.40
◆ Miscellaneous Utility Adjustments <sup>1</sup>	2.00%	1	LS	\$3,220.88
◆ Miscellaneous Streetscaping <sup>2</sup>	1.00%	1	LS	\$1,610.44
<i>Subtotal Mark-ups</i>				<b>\$54,755</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$17,893.78
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$233,693</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**LEWELLYN AVENUE**  
**FROM**  
**NORTH OF SHIRLEY AVENUE TO GRANBY STREET**  
**COMBINED WITH 13TH STREET IMPROVEMENTS**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement	212	SY	\$50.00	\$10,600
◆ Subdivision Road Pavement	139	SY	\$41.00	\$5,699
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement		SY	\$85.00	\$0
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	384	LF	\$20.00	\$7,680
◆ Curb	96	LF	\$10.00	\$960
◆ Private Entrances	2	EA	\$1,500.00	\$3,000
◆ Sidewalk		LF	\$12.00	\$0
◆ ADA Ramp	2	EA	\$2,500.00	\$5,000
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed	478	SY	\$4.00	\$1,912
<i>Subtotal Paving and Earthwork</i>				<b>\$34,851</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	351	SY	\$8.00	\$2,808
◆ Remove Concrete Pavement		SY	\$10.00	\$0
◆ Remove Curb and Gutter	480	LF	\$7.00	\$3,360
◆ Remove Entrance	2	EA	\$450.00	\$900
◆ Remove Sidewalk		LF	\$7.00	\$0
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"	115	LF	\$20.00	\$2,300
◆ Remove Pipe 21"-30"	516	LF	\$35.00	\$18,060
◆ Remove Pipe 36"-42"		LF	\$60.00	\$0
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)	4	EA	\$750.00	\$3,000
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$30,428</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**LEWELLYN AVENUE**  
**FROM**  
**NORTH OF SHIRLEY AVENUE TO GRANBY STREET**  
**COMBINED WITH 13TH STREET IMPROVEMENTS**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP	30	LF	\$65.00	\$1,950
◆ 18" RCP		LF	\$75.00	\$0
◆ 24" RCP	359	LF	\$105.00	\$37,695
◆ 30" RCP	119	LF	\$125.00	\$14,875
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP	24	LF	\$130.00	\$3,120
◆ 24"x38" HERCP		LF	\$165.00	\$0
◆ 29"x45" HERCP	504	LF	\$190.00	\$95,760
◆ 34"x53" HERCP	361	LF	\$235.00	\$84,835
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB		LF	\$675.00	\$0
◆ 5'x4'RCB		LF	\$725.00	\$0
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 8'x4' RCB		LF	\$1,000.00	\$0
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts		CY	\$40.00	\$0
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material		CY	\$30.00	\$0
◆ Bedding (Box Culverts Only)		TONS	\$40.00	\$0
◆ Curb Inlet	5	EA	\$4,500.00	\$22,500
◆ Drop Inlet		EA	\$3,000.00	\$0
◆ Riser and Top affixed to Box Culvert		EA	\$1,200.00	\$0
◆ 4' Manhole (including frame and cover)	2	EA	\$6,000.00	\$12,000
◆ 5' Manhole (including frame and cover)	3	EA	\$8,500.00	\$25,500
◆ 6' Manhole (including frame and cover)		EA	\$10,000.00	\$0
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes	1	EA	\$20,000.00	\$20,000
◆ Pipe Connections (Proposed to Existing)		EA	\$750.00	\$0
<i>Subtotal Storm Drainage</i>				<b>\$318,235</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
 LEWELLYN AVENUE  
 FROM  
 NORTH OF SHIRLEY AVENUE TO GRANBY STREET  
 COMBINED WITH 13TH STREET IMPROVEMENTS

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset		LS	\$6,000.00	\$0
◆ 6" Waterline Offset		LS	\$8,000.00	\$0
◆ 8" Waterline Offset		LS	\$12,000.00	\$0
◆ 10" Waterline Offset		LS	\$45,000.00	\$0
◆ 12" Waterline Offset		LS	\$50,000.00	\$0
◆ 16" Waterline Offset		LS	\$65,000.00	\$0
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$0</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	8.00%	1	LS	\$30,681.12
◆ Topographic Survey	2.25%	1	LS	\$8,629.07
◆ Geotechnical (Borings)	0.00%	1	LS	\$0.00
◆ Utility Designation and Test Holes	1.75%	1	LS	\$6,711.50
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	1.00%	1	LS	\$3,835.14
◆ Traffic Control	7.00%	1	LS	\$26,845.98
◆ Construction Surveying	2.00%	1	LS	\$7,670.28
◆ Mobilization/Demobilization	12.00%	1	LS	\$46,021.68
◆ Miscellaneous Utility Adjustments <sup>1</sup>	3.00%	1	LS	\$11,505.42
◆ Miscellaneous Streetscaping <sup>2</sup>	1.00%	1	LS	\$3,835.14
<i>Subtotal Mark-ups</i>				<b>\$145,735</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$42,612.67
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$571,862</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**ARMISTEAD AVENUE TRUNK LINE**  
**FROM**  
**22ND STREET TO PRINCESS ANNE ROAD**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement	3,051	SY	\$50.00	\$152,550
◆ Subdivision Road Pavement		SY	\$41.00	\$0
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)	8,422	SY	\$21.00	\$176,862
◆ Concrete Pavement	220	SY	\$85.00	\$18,700
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	601	LF	\$20.00	\$12,020
◆ Curb		LF	\$10.00	\$0
◆ Private Entrances	5	EA	\$1,500.00	\$7,500
◆ Sidewalk		LF	\$12.00	\$0
◆ ADA Ramp		EA	\$2,500.00	\$0
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<i>Subtotal Paving and Earthwork</i>				<b>\$367,632</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	3,051	SY	\$8.00	\$24,408
◆ Remove Concrete Pavement	220	SY	\$10.00	\$2,200
◆ Remove Curb and Gutter	601	LF	\$7.00	\$4,207
◆ Remove Entrance	5	EA	\$450.00	\$2,250
◆ Remove Sidewalk		LF	\$7.00	\$0
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"	260	LF	\$20.00	\$5,200
◆ Remove Pipe 21"-30"	81	LF	\$35.00	\$2,835
◆ Remove Pipe 36"-42"	15	LF	\$60.00	\$900
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box	713	LF	\$125.00	\$89,125
◆ Remove Structure (CB, DI, MH)	10	EA	\$750.00	\$7,500
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$138,625</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**ARMISTEAD AVENUE TRUNK LINE**  
**FROM**  
**22ND STREET TO PRINCESS ANNE ROAD**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP		LF	\$65.00	\$0
◆ 18" RCP		LF	\$75.00	\$0
◆ 24" RCP		LF	\$105.00	\$0
◆ 30" RCP		LF	\$125.00	\$0
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP	105	LF	\$130.00	\$13,650
◆ 24"x38" HERCP	386	LF	\$165.00	\$63,690
◆ 29"x45" HERCP		LF	\$190.00	\$0
◆ 34"x53" HERCP		LF	\$235.00	\$0
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB	713	LF	\$675.00	\$481,275
◆ 5'x4'RCB		LF	\$725.00	\$0
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 7'x4'RCB	615	LF	\$900.00	\$553,500
◆ 8'x4' RCB	1,679	LF	\$1,000.00	\$1,679,000
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts	11,713	CY	\$40.00	\$468,504
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material	6,099	CY	\$30.00	\$182,966
◆ Bedding (Box Culverts Only)	1,354	TONS	\$40.00	\$54,142
◆ Curb Inlet	2	EA	\$4,500.00	\$9,000
◆ Drop Inlet	8	EA	\$3,000.00	\$24,000
◆ Riser and Top affixed to Box Culvert	1	EA	\$1,200.00	\$1,200
◆ 4' Manhole (including frame and cover)		EA	\$6,000.00	\$0
◆ 5' Manhole (including frame and cover)		EA	\$8,500.00	\$0
◆ 6' Manhole (including frame and cover)		EA	\$10,000.00	\$0
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes		EA	\$20,000.00	\$0
◆ Pipe Connections (Proposed to Existing)		EA	\$750.00	\$0
<b><i>Subtotal Storm Drainage</i></b>				<b>\$3,530,926</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**ARMISTEAD AVENUE TRUNK LINE**  
**FROM**  
**22ND STREET TO PRINCESS ANNE ROAD**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset		LS	\$6,000.00	\$0
◆ 6" Waterline Offset		LS	\$8,000.00	\$0
◆ 8" Waterline Offset		LS	\$12,000.00	\$0
◆ 10" Waterline Offset		LS	\$45,000.00	\$0
◆ 12" Waterline Offset		LS	\$50,000.00	\$0
◆ 16" Waterline Offset		LS	\$65,000.00	\$0
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset	1	LS	\$105,000.00	\$105,000
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$105,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	5.00%	1	LS	\$181,796.31
◆ Topographic Survey	1.50%	1	LS	\$54,538.89
◆ Geotechnical (Borings)	0.50%	1	LS	\$18,179.63
◆ Utility Designation and Test Holes	1.25%	1	LS	\$45,449.08
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	2.00%	1	LS	\$72,718.52
◆ Traffic Control	1.75%	1	LS	\$63,628.71
◆ Construction Surveying	0.75%	1	LS	\$27,269.45
◆ Mobilization/Demobilization	4.00%	1	LS	\$145,437.05
◆ Miscellaneous Utility Adjustments <sup>1</sup>	1.00%	1	LS	\$36,359.26
◆ Miscellaneous Streetscaping <sup>2</sup>	0.005	1	LS	\$18,179.63
<i>Subtotal Mark-ups</i>				<b>\$663,557</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$403,991.79
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$4,703,474</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
13TH STREET TO ARMISTEAD AVENUE TRUNK LINE

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement		SY	\$50.00	\$0
◆ Subdivision Road Pavement		SY	\$41.00	\$0
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement		SY	\$85.00	\$0
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	265	LF	\$20.00	\$5,300
◆ Curb		LF	\$10.00	\$0
◆ Private Entrances	5	EA	\$1,500.00	\$7,500
◆ Sidewalk		LF	\$12.00	\$0
◆ ADA Ramp		EA	\$2,500.00	\$0
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<i>Subtotal Paving and Earthwork</i>				<b>\$12,800</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement		SY	\$8.00	\$0
◆ Remove Concrete Pavement		SY	\$10.00	\$0
◆ Remove Curb and Gutter	265	LF	\$7.00	\$1,855
◆ Remove Entrance	5	EA	\$450.00	\$2,250
◆ Remove Sidewalk		LF	\$7.00	\$0
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"	48	LF	\$20.00	\$960
◆ Remove Pipe 21"-30"		LF	\$35.00	\$0
◆ Remove Pipe 36"-42"		LF	\$60.00	\$0
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)	2	EA	\$750.00	\$1,500
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$6,565</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
13TH STREET TO ARMISTEAD AVENUE TRUNK LINE

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP		LF	\$65.00	\$0
◆ 18" RCP		LF	\$75.00	\$0
◆ 24" RCP		LF	\$105.00	\$0
◆ 30" RCP		LF	\$125.00	\$0
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP		LF	\$130.00	\$0
◆ 24"x38" HERCP		LF	\$165.00	\$0
◆ 29"x45" HERCP		LF	\$190.00	\$0
◆ 34"x53" HERCP		LF	\$235.00	\$0
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB		LF	\$675.00	\$0
◆ 5'x4'RCB	614	LF	\$725.00	\$445,150
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 7'x4'RCB		LF	\$900.00	\$0
◆ 8'x4' RCB		LF	\$1,000.00	\$0
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts	2,037	CY	\$40.00	\$81,462
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material	1,148	CY	\$30.00	\$34,452
◆ Bedding (Box Culverts Only)	230	TONS	\$40.00	\$9,200
◆ Curb Inlet	2	EA	\$4,500.00	\$9,000
◆ Drop Inlet		EA	\$3,000.00	\$0
◆ Riser and Top affixed to Box Culvert	2	EA	\$1,200.00	\$2,400
◆ 4' Manhole (including frame and cover)		EA	\$6,000.00	\$0
◆ 5' Manhole (including frame and cover)		EA	\$8,500.00	\$0
◆ 6' Manhole (including frame and cover)		EA	\$10,000.00	\$0
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes		EA	\$20,000.00	\$0
◆ Pipe Connections (Proposed to Existing)		EA	\$750.00	\$0
<b>Subtotal Storm Drainage</b>				<b>\$581,664</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
13TH STREET TO ARMISTEAD AVENUE TRUNK LINE

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset		LS	\$6,000.00	\$0
◆ 6" Waterline Offset	2	LS	\$8,000.00	\$16,000
◆ 8" Waterline Offset		LS	\$12,000.00	\$0
◆ 10" Waterline Offset		LS	\$45,000.00	\$0
◆ 12" Waterline Offset		LS	\$50,000.00	\$0
◆ 16" Waterline Offset	1	LS	\$65,000.00	\$65,000
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$81,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	5.00%	1	LS	\$33,133.22
◆ Topographic Survey	1.50%	1	LS	\$9,939.97
◆ Geotechnical (Borings)	0.75%	1	LS	\$4,969.98
◆ Utility Designation and Test Holes	1.20%	1	LS	\$7,951.97
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	1.00%	1	LS	\$6,626.64
◆ Traffic Control	2.00%	1	LS	\$13,253.29
◆ Construction Surveying	1.25%	1	LS	\$8,283.30
◆ Mobilization/Demobilization	3.50%	1	LS	\$23,193.25
◆ Miscellaneous Utility Adjustments <sup>1</sup>	2.00%	1	LS	\$13,253.29
◆ Miscellaneous Streetscaping <sup>2</sup>	0.01	1	LS	\$6,626.64
<i>Subtotal Mark-ups</i>				<b>\$127,232</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$73,629.38
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$863,525</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**17TH STREET TO ARMISTEAD AVENUE TRUNK LINE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement	1,162	SY	\$50.00	\$58,100
◆ Subdivision Road Pavement		SY	\$41.00	\$0
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement		SY	\$85.00	\$0
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	903	LF	\$20.00	\$18,060
◆ Curb		LF	\$10.00	\$0
◆ Private Entrances	3	EA	\$1,500.00	\$4,500
◆ Sidewalk	562	LF	\$12.00	\$6,744
◆ ADA Ramp	3	EA	\$2,500.00	\$7,500
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<i>Subtotal Paving and Earthwork</i>				<b>\$94,904</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	1,162	SY	\$8.00	\$9,296
◆ Remove Concrete Pavement		SY	\$10.00	\$0
◆ Remove Curb and Gutter	903	LF	\$7.00	\$6,321
◆ Remove Entrance	3	EA	\$450.00	\$1,350
◆ Remove Sidewalk	562	LF	\$7.00	\$3,934
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"	1,023	LF	\$20.00	\$20,460
◆ Remove Pipe 21"-30"	341	LF	\$35.00	\$11,935
◆ Remove Pipe 36"-42"		LF	\$60.00	\$0
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)	13	EA	\$750.00	\$9,750
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$63,046</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**17TH STREET TO ARMISTEAD AVENUE TRUNK LINE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP		LF	\$65.00	\$0
◆ 18" RCP		LF	\$75.00	\$0
◆ 24" RCP		LF	\$105.00	\$0
◆ 30" RCP		LF	\$125.00	\$0
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP	349	LF	\$130.00	\$45,370
◆ 24"x38" HERCP	274	LF	\$165.00	\$45,210
◆ 29"x45" HERCP	906	LF	\$190.00	\$172,140
◆ 34"x53" HERCP		LF	\$235.00	\$0
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB		LF	\$675.00	\$0
◆ 5'x4'RCB	280	LF	\$725.00	\$203,000
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 7'x4'RCB		LF	\$900.00	\$0
◆ 8'x4' RCB		LF	\$1,000.00	\$0
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts	929	CY	\$40.00	\$37,149
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material	524	CY	\$30.00	\$15,711
◆ Bedding (Box Culverts Only)	105	TONS	\$40.00	\$4,195
◆ Curb Inlet	6	EA	\$4,500.00	\$27,000
◆ Drop Inlet		EA	\$3,000.00	\$0
◆ Riser and Top affixed to Box Culvert	3	EA	\$1,200.00	\$3,600
◆ 4' Manhole (including frame and cover)		EA	\$6,000.00	\$0
◆ 5' Manhole (including frame and cover)	1	EA	\$8,500.00	\$8,500
◆ 6' Manhole (including frame and cover)	3	EA	\$10,000.00	\$30,000
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes		EA	\$20,000.00	\$0
◆ Pipe Connections (Proposed to Existing)		EA	\$750.00	\$0
<b><i>Subtotal Storm Drainage</i></b>				<b>\$591,875</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**17TH STREET TO ARMISTEAD AVENUE TRUNK LINE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset		LS	\$6,000.00	\$0
◆ 6" Waterline Offset	4	LS	\$8,000.00	\$32,000
◆ 8" Waterline Offset		LS	\$12,000.00	\$0
◆ 10" Waterline Offset	1	LS	\$45,000.00	\$45,000
◆ 12" Waterline Offset		LS	\$50,000.00	\$0
◆ 16" Waterline Offset	2	LS	\$65,000.00	\$130,000
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$207,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	8.00%	1	LS	\$63,910.03
◆ Topographic Survey	2.25%	1	LS	\$17,974.70
◆ Geotechnical (Borings)	0.75%	1	LS	\$5,991.57
◆ Utility Designation and Test Holes	1.75%	1	LS	\$13,980.32
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	2.25%	1	LS	\$17,974.70
◆ Traffic Control	8.00%	1	LS	\$63,910.03
◆ Construction Surveying	2.00%	1	LS	\$15,977.51
◆ Mobilization/Demobilization	10.00%	1	LS	\$79,887.54
◆ Miscellaneous Utility Adjustments <sup>1</sup>	5.00%	1	LS	\$39,943.77
◆ Miscellaneous Streetscaping <sup>2</sup>	0.03	1	LS	\$23,966.26
<i>Subtotal Mark-ups</i>				<b>\$343,516</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$88,763.94
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$1,231,156</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**20TH STREET TO ARMISTEAD AVENUE TRUNK LINE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement	1,635	SY	\$50.00	\$81,750
◆ Subdivision Road Pavement		SY	\$41.00	\$0
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement		SY	\$85.00	\$0
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	1,079	LF	\$20.00	\$21,580
◆ Curb	304	LF	\$10.00	\$3,040
◆ Private Entrances	12	EA	\$1,500.00	\$18,000
◆ Sidewalk		LF	\$12.00	\$0
◆ ADA Ramp	6	EA	\$2,500.00	\$15,000
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<i>Subtotal Paving and Earthwork</i>				<b>\$139,370</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	1,635	SY	\$8.00	\$13,080
◆ Remove Concrete Pavement		SY	\$10.00	\$0
◆ Remove Curb and Gutter	1,383	LF	\$7.00	\$9,681
◆ Remove Entrance	12	EA	\$450.00	\$5,400
◆ Remove Sidewalk		LF	\$7.00	\$0
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"	2,553	LF	\$20.00	\$51,060
◆ Remove Pipe 21"-30"		LF	\$35.00	\$0
◆ Remove Pipe 36"-42"		LF	\$60.00	\$0
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)	26	EA	\$750.00	\$19,500
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$98,721</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**20TH STREET TO ARMISTEAD AVENUE TRUNK LINE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP		LF	\$65.00	\$0
◆ 18" RCP		LF	\$75.00	\$0
◆ 24" RCP	92	LF	\$105.00	\$9,660
◆ 30" RCP		LF	\$125.00	\$0
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP	60	LF	\$115.00	\$6,843
◆ 19"x30" HERCP	74	LF	\$130.00	\$9,672
◆ 24"x38" HERCP	1,172	LF	\$165.00	\$193,380
◆ 29"x45" HERCP	685	LF	\$190.00	\$130,150
◆ 34"x53" HERCP		LF	\$235.00	\$0
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB	348	LF	\$675.00	\$234,900
◆ 5'x4'RCB	384	LF	\$725.00	\$278,400
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 7'x4'RCB		LF	\$900.00	\$0
◆ 8'x4' RCB		LF	\$1,000.00	\$0
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts	2,295	CY	\$40.00	\$91,791
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material	1,318	CY	\$30.00	\$39,527
◆ Bedding (Box Culverts Only)	274	TONS	\$40.00	\$10,968
◆ Curb Inlet		EA	\$4,500.00	\$0
◆ Drop Inlet		EA	\$3,000.00	\$0
◆ Riser and Top affixed to Box Culvert		EA	\$1,200.00	\$0
◆ 4' Manhole (including frame and cover)		EA	\$6,000.00	\$0
◆ 5' Manhole (including frame and cover)		EA	\$8,500.00	\$0
◆ 6' Manhole (including frame and cover)		EA	\$10,000.00	\$0
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes		EA	\$20,000.00	\$0
◆ Pipe Connections (Proposed to Existing)		EA	\$750.00	\$0
<b><i>Subtotal Storm Drainage</i></b>				<b>\$1,005,290</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**20TH STREET TO ARMISTEAD AVENUE TRUNK LINE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset	1	LS	\$6,000.00	\$6,000
◆ 6" Waterline Offset	6	LS	\$8,000.00	\$48,000
◆ 8" Waterline Offset	2	LS	\$12,000.00	\$24,000
◆ 10" Waterline Offset		LS	\$45,000.00	\$0
◆ 12" Waterline Offset		LS	\$50,000.00	\$0
◆ 16" Waterline Offset	1	LS	\$65,000.00	\$65,000
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$143,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	7.00%	1	LS	\$80,380.27
◆ Topographic Survey	2.25%	1	LS	\$25,836.52
◆ Geotechnical (Borings)	0.50%	1	LS	\$5,741.45
◆ Utility Designation and Test Holes	2.00%	1	LS	\$22,965.79
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	1.50%	1	LS	\$17,224.34
◆ Traffic Control	8.00%	1	LS	\$91,863.17
◆ Construction Surveying	2.00%	1	LS	\$22,965.79
◆ Mobilization/Demobilization	10.00%	1	LS	\$114,828.96
◆ Miscellaneous Utility Adjustments <sup>1</sup>	5.00%	1	LS	\$57,414.48
◆ Miscellaneous Streetscaping <sup>2</sup>	0.015	1	LS	\$17,224.34
<i>Subtotal Mark-ups</i>				<b>\$456,445</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$127,587.73
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$1,732,322</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
 CHURCH STREET AND HUNTERSVILLE THROUGH ELMWOOD CEMETERY  
 TO  
 PRINCESS ANNE ROAD AT ARMINSTEAD AVENUE

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement	264	SY	\$50.00	\$13,200
◆ Subdivision Road Pavement		SY	\$41.00	\$0
◆ Cemetery Pavement	1,992	SY	\$19.00	\$37,848
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement		SY	\$85.00	\$0
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	92	LF	\$20.00	\$1,840
◆ Curb		LF	\$10.00	\$0
◆ Private Entrances		EA	\$1,500.00	\$0
◆ Sidewalk		LF	\$12.00	\$0
◆ ADA Ramp	1	EA	\$2,500.00	\$2,500
◆ Clearing and Grubbing	994	AC	\$1.00	\$994
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed	994	SY	\$4.00	\$3,976
<i>Subtotal Paving and Earthwork</i>				<b>\$60,358</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	2,317	SY	\$8.00	\$18,536
◆ Remove Concrete Pavement		SY	\$10.00	\$0
◆ Remove Curb and Gutter	92	LF	\$7.00	\$644
◆ Remove Entrance		EA	\$450.00	\$0
◆ Remove Sidewalk		LF	\$7.00	\$0
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"		LF	\$20.00	\$0
◆ Remove Pipe 21"-30"		LF	\$35.00	\$0
◆ Remove Pipe 36"-42"		LF	\$60.00	\$0
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)	7	EA	\$750.00	\$5,250
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$24,430</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
 CHURCH STREET AND HUNTERSVILLE THROUGH ELMWOOD CEMETERY  
 TO  
 PRINCESS ANNE ROAD AT ARMINSTEAD AVENUE

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP	55	LF	\$65.00	\$3,575
◆ 18" RCP	100	LF	\$75.00	\$7,500
◆ 24" RCP	93	LF	\$105.00	\$9,765
◆ 30" RCP		LF	\$125.00	\$0
◆ 36" RCP	325	LF	\$145.00	\$47,125
◆ 42" RCP	1,500	LF	\$175.00	\$262,500
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP		LF	\$130.00	\$0
◆ 24"x38" HERCP		LF	\$165.00	\$0
◆ 29"x45" HERCP		LF	\$190.00	\$0
◆ 34"x53" HERCP		LF	\$235.00	\$0
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB		LF	\$675.00	\$0
◆ 5'x4'RCB	140	LF	\$725.00	\$101,500
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 8'x4' RCB		LF	\$1,000.00	\$0
◆ 10'x4'RCB	550	LF	\$1,250.00	\$687,500
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts	3,171	CY	\$40.00	\$126,854
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material	1,545	CY	\$30.00	\$46,356
◆ Bedding (Box Culverts Only)	358	TONS	\$40.00	\$14,326
◆ Curb Inlet	2	EA	\$4,500.00	\$9,000
◆ Drop Inlet	2	EA	\$3,000.00	\$6,000
◆ Riser and Top affixed to Box Culvert		EA	\$1,200.00	\$0
◆ 4' Manhole (including frame and cover)		EA	\$6,000.00	\$0
◆ 5' Manhole (including frame and cover)		EA	\$8,500.00	\$0
◆ 6' Manhole (including frame and cover)		EA	\$10,000.00	\$0
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes	3	EA	\$20,000.00	\$60,000
◆ Pipe Connections (Proposed to Existing)	19	EA	\$750.00	\$14,250
<b><i>Subtotal Storm Drainage</i></b>				<b>\$1,396,251</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
 CHURCH STREET AND HUNTERSVILLE THROUGH ELMWOOD CEMETERY  
 TO  
 PRINCESS ANNE ROAD AT ARMINSTEAD AVENUE

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset		LS	\$6,000.00	\$0
◆ 6" Waterline Offset		LS	\$8,000.00	\$0
◆ 8" Waterline Offset		LS	\$12,000.00	\$0
◆ 10" Waterline Offset		LS	\$45,000.00	\$0
◆ 12" Waterline Offset		LS	\$50,000.00	\$0
◆ 16" Waterline Offset		LS	\$65,000.00	\$0
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset	1	LS	\$105,000.00	\$105,000
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$105,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	5.00%	1	LS	\$79,301.94
◆ Topographic Survey	1.75%	1	LS	\$27,755.68
◆ Geotechnical (Borings)	0.75%	1	LS	\$11,895.29
◆ Utility Designation and Test Holes	0.75%	1	LS	\$11,895.29
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	1.00%	1	LS	\$15,860.39
◆ Traffic Control <sup>a</sup>	2.00%	1	LS	\$31,720.78
◆ Construction Surveying	1.25%	1	LS	\$19,825.49
◆ Mobilization/Demobilization	3.50%	1	LS	\$55,511.36
◆ Miscellaneous Utility Adjustments <sup>1</sup>	1.00%	1	LS	\$15,860.39
◆ Miscellaneous Streetscaping <sup>2</sup>	1.00%	1	LS	\$15,860.39
<i>Subtotal Mark-ups</i>				<b>\$285,487</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$158,603.89
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$1,871,526</b>

<sup>a</sup>Traffic Control assumes construction equipment can use the Cedar Grove Parking Lot for access when installing the 10'x4' RCB thereby mitigating impacts on Princess Anne Road.

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**OLNEY ROAD TRUNK LINE**  
**FROM**  
**YOUNG TERRACE TO BOUSH STREET**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement	1,394	SY	\$50.00	\$69,700
◆ Subdivision Road Pavement	1,202	SY	\$41.00	\$49,282
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement		SY	\$85.00	\$0
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter	582	LF	\$20.00	\$11,640
◆ Curb	1,963	LF	\$10.00	\$19,630
◆ Private Entrances	7	EA	\$1,500.00	\$10,500
◆ Sidewalk		LF	\$12.00	\$0
◆ ADA Ramp	6	EA	\$2,500.00	\$15,000
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<i>Subtotal Paving and Earthwork</i>				<b>\$175,752</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	3,011	SY	\$8.00	\$24,088
◆ Remove Concrete Pavement		SY	\$10.00	\$0
◆ Remove Curb and Gutter	2,545	LF	\$7.00	\$17,815
◆ Remove Entrance	7	EA	\$450.00	\$3,150
◆ Remove Sidewalk		LF	\$7.00	\$0
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"		LF	\$20.00	\$0
◆ Remove Pipe 21"-30"		LF	\$35.00	\$0
◆ Remove Pipe 36"-42"		LF	\$60.00	\$0
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)		EA	\$750.00	\$0
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$45,053</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**OLNEY ROAD TRUNK LINE**  
**FROM**  
**YOUNG TERRACE TO BOUSH STREET**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP		LF	\$65.00	\$0
◆ 18" RCP	533	LF	\$75.00	\$39,975
◆ 24" RCP	414	LF	\$105.00	\$43,470
◆ 30" RCP		LF	\$125.00	\$0
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP	66	LF	\$130.00	\$8,580
◆ 24"x38" HERCP		LF	\$165.00	\$0
◆ 29"x45" HERCP		LF	\$190.00	\$0
◆ 34"x53" HERCP		LF	\$235.00	\$0
◆ 38"x60" HERCP		LF	\$270.00	\$0
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB		LF	\$675.00	\$0
◆ 5'x4'RCB		LF	\$725.00	\$0
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB	1,615	LF	\$800.00	\$1,292,000
◆ 8'x4' RCB	867	LF	\$1,000.00	\$867,000
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts	8,480	CY	\$40.00	\$339,188
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material	3,927	CY	\$30.00	\$117,797
◆ Bedding (Box Culverts Only)	1,083	TONS	\$40.00	\$43,302
◆ Curb Inlet	7	EA	\$4,500.00	\$31,500
◆ Drop Inlet	3	EA	\$3,000.00	\$9,000
◆ Riser and Top affixed to Box Culvert	10	EA	\$1,200.00	\$12,000
◆ 4' Manhole (including frame and cover)	5	EA	\$6,000.00	\$30,000
◆ 5' Manhole (including frame and cover)		EA	\$8,500.00	\$0
◆ 6' Manhole (including frame and cover)		EA	\$10,000.00	\$0
◆ 8' Manhole (including frame and cover)		EA	\$12,500.00	\$0
◆ Junction Boxes		EA	\$20,000.00	\$0
◆ Pipe Connections (Proposed to Existing)	2	EA	\$750.00	\$1,500
<b><i>Subtotal Storm Drainage</i></b>				<b>\$2,835,313</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**OLNEY ROAD TRUNK LINE**  
**FROM**  
**YOUNG TERRACE TO BOUSH STREET**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset		LS	\$6,000.00	\$0
◆ 6" Waterline Offset	9	LS	\$8,000.00	\$72,000
◆ 8" Waterline Offset		LS	\$12,000.00	\$0
◆ 10" Waterline Offset		LS	\$45,000.00	\$0
◆ 12" Waterline Offset	2	LS	\$50,000.00	\$100,000
◆ 16" Waterline Offset		LS	\$65,000.00	\$0
◆ 20" Waterline Offset	1	LS	\$85,000.00	\$85,000
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main		LS	\$190,000.00	\$0
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$257,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	6.00%	1	LS	\$198,787.06
◆ Topographic Survey	1.25%	1	LS	\$41,413.97
◆ Geotechnical (Borings)	0.75%	1	LS	\$24,848.38
◆ Utility Designation and Test Holes	1.50%	1	LS	\$49,696.77
◆ Environmental Permitting		LS	\$0.00	\$0
◆ Erosion and Sediment Control	1.50%	1	LS	\$49,696.77
◆ Traffic Control	2.50%	1	LS	\$82,827.94
◆ Construction Surveying	1.00%	1	LS	\$33,131.18
◆ Mobilization/Demobilization	5.00%	1	LS	\$165,655.89
◆ Miscellaneous Utility Adjustments <sup>1</sup>	2.00%	1	LS	\$66,262.35
◆ Miscellaneous Streetscaping <sup>2</sup>	1.25%	1	LS	\$41,413.97
<i>Subtotal Mark-ups</i>				<b>\$753,734</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$368,124.19
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$4,434,976</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**OLNEY ROAD AT YOUNG TERRACE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>I. PAVING AND EARTHWORK</b>				
◆ Roadway Pavement		SY	\$50.00	\$0
◆ Subdivision Road Pavement	1,323	SY	\$41.00	\$54,243
◆ Cemetery Pavement		SY	\$19.00	\$0
◆ Asphalt Resurfacing (includes Milling)		SY	\$21.00	\$0
◆ Concrete Pavement		SY	\$85.00	\$0
◆ Geotextile Fabric		SY	\$2.50	\$0
◆ Curb & Gutter		LF	\$20.00	\$0
◆ Curb		LF	\$10.00	\$0
◆ Private Entrances	5	EA	\$1,500.00	\$7,500
◆ Sidewalk	540	LF	\$12.00	\$6,480
◆ ADA Ramp		EA	\$2,500.00	\$0
◆ Clearing and Grubbing		AC	\$1.00	\$0
◆ Regular Excavation		CY	\$12.00	\$0
◆ Ditch Excavation		LF	\$15.00	\$0
◆ Topsoil and Seed		SY	\$4.00	\$0
<i>Subtotal Paving and Earthwork</i>				<b>\$68,223</b>
<b>II. DEMOLITION</b>				
◆ Remove Asphalt Pavement	1,323	SY	\$8.00	\$10,584
◆ Remove Concrete Pavement		SY	\$10.00	\$0
◆ Remove Curb and Gutter		LF	\$7.00	\$0
◆ Remove Entrance	5	EA	\$450.00	\$2,250
◆ Remove Sidewalk	540	LF	\$7.00	\$3,780
◆ Remove Trees		EA	\$650.00	\$0
◆ Remove Pipe 12"-18"	1,616	LF	\$20.00	\$32,320
◆ Remove Pipe 21"-30"	839	LF	\$35.00	\$29,365
◆ Remove Pipe 36"-42"	77	LF	\$60.00	\$4,620
◆ Remove Pipe 48"-54"		LF	\$90.00	\$0
◆ Remove 5'x3.5' Box		LF	\$125.00	\$0
◆ Remove Structure (CB, DI, MH)	13	EA	\$750.00	\$9,750
◆ Remove Bulkhead		LS	\$15,000.00	\$0
<i>Subtotal Demolition</i>				<b>\$92,669</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**OLNEY ROAD AT YOUNG TERRACE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>III. STORM DRAINAGE</b>				
◆ 15" RCP		LF	\$65.00	\$0
◆ 18" RCP		LF	\$75.00	\$0
◆ 24" RCP		LF	\$105.00	\$0
◆ 30" RCP		LF	\$125.00	\$0
◆ 36" RCP		LF	\$145.00	\$0
◆ 42" RCP		LF	\$175.00	\$0
◆ 48" RCP		LF	\$200.00	\$0
◆ 54" RCP		LF	\$225.00	\$0
◆ 60" RCP		LF	\$270.00	\$0
◆ 72" RCP		LF	\$325.00	\$0
◆ 14"x23" HERCP		LF	\$115.00	\$0
◆ 19"x30" HERCP	236	LF	\$130.00	\$30,680
◆ 24"x38" HERCP	551	LF	\$165.00	\$90,915
◆ 29"x45" HERCP	208	LF	\$190.00	\$39,520
◆ 34"x53" HERCP		LF	\$235.00	\$0
◆ 38"x60" HERCP	963	LF	\$270.00	\$260,010
◆ 4'x3' RCB		LF	\$600.00	\$0
◆ 5'x3' RCB	87	LF	\$675.00	\$58,725
◆ 5'x4'RCB		LF	\$725.00	\$0
◆ Double 5'x5' RCB		LF	\$1,450.00	\$0
◆ Quad 5'x5'RCB		LF	\$2,800.00	\$0
◆ 6'x4'RCB		LF	\$800.00	\$0
◆ 8'x4' RCB		LF	\$1,000.00	\$0
◆ 10'x4'RCB		LF	\$1,250.00	\$0
◆ 10'x6' RCB		LF	\$1,375.00	\$0
◆ 10'x8' RCB		LF	\$1,650.00	\$0
◆ Minor Structural Excavation for Box Culverts		CY	\$40.00	\$0
◆ Bulkhead Replacement		LS	\$65,000.00	\$0
◆ Select Material		CY	\$30.00	\$0
◆ Bedding (Box Culverts Only)		TONS	\$40.00	\$0
◆ Curb Inlet	4	EA	\$4,500.00	\$18,000
◆ Drop Inlet	3	EA	\$3,000.00	\$9,000
◆ Riser and Top affixed to Box Culvert		EA	\$1,200.00	\$0
◆ 4' Manhole (including frame and cover)		EA	\$6,000.00	\$0
◆ 5' Manhole (including frame and cover)		EA	\$8,500.00	\$0
◆ 6' Manhole (including frame and cover)	6	EA	\$10,000.00	\$60,000
◆ 8' Manhole (including frame and cover)	1	EA	\$12,500.00	\$12,500
◆ Junction Boxes		EA	\$20,000.00	\$0
◆ Pipe Connections (Proposed to Existing)	1	EA	\$750.00	\$750
<b><i>Subtotal Storm Drainage</i></b>				<b>\$580,100</b>

**CITY OF NORFOLK**  
**STORM WATER MASTER PLAN FOR THE HAGUE**  
**ESTIMATE OF CONSTRUCTION COSTS**  
**OLNEY ROAD AT YOUNG TERRACE**

DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
<b>IV. MUNICIPAL UTILITIES</b>				
◆ 4" Waterline Offset		LS	\$6,000.00	\$0
◆ 6" Waterline Offset		LS	\$8,000.00	\$0
◆ 8" Waterline Offset		LS	\$12,000.00	\$0
◆ 10" Waterline Offset	2	LS	\$45,000.00	\$90,000
◆ 12" Waterline Offset		LS	\$50,000.00	\$0
◆ 16" Waterline Offset		LS	\$65,000.00	\$0
◆ 20" Waterline Offset		LS	\$85,000.00	\$0
◆ 24" Waterline Offset		LS	\$105,000.00	\$0
◆ 10" Sanitary Force Main		LS	\$60,000.00	\$0
◆ 12" Sanitary Force Main		LS	\$75,000.00	\$0
◆ 16" Sanitary Force Main		LS	\$85,000.00	\$0
◆ 24" HRSD Force Main		LS	\$125,000.00	\$0
◆ 36" HRSD Force Main	1	LS	\$190,000.00	\$190,000
◆ 42" HRSD Force Main		LS	\$250,000.00	\$0
<i>Subtotal Municipal Utilities</i>				<b>\$280,000</b>
<b>V. MARK-UPS</b>				
◆ Engineering Design	6.00%	1	LS	\$61,259.52
◆ Topographic Survey	2.50%	1	LS	\$25,524.80
◆ Geotechnical (Borings)	1.00%		LS	\$10,209.92
◆ Utility Designation and Test Holes	2.25%	1	LS	\$22,972.32
◆ Environmental Permitting			LS	\$0.00
◆ Erosion and Sediment Control	1.00%	1	LS	\$10,209.92
◆ Traffic Control	5.00%	1	LS	\$51,049.60
◆ Construction Surveying	1.50%	1	LS	\$15,314.88
◆ Mobilization/Demobilization	8.00%	1	LS	\$81,679.36
◆ Miscellaneous Utility Adjustments <sup>1</sup>	2.00%	1	LS	\$20,419.84
◆ Miscellaneous Streetscaping <sup>2</sup>	1.50%	1	LS	\$15,314.88
<i>Subtotal Mark-ups</i>				<b>\$303,745</b>
<b>VI. CONTINGENCY</b>				
◆ Contingency	10.00%	1	LS	\$113,443.56
<b>GRAND TOTAL - ITEMS I-VI</b>				<b>\$1,438,181</b>

<sup>1</sup>Miscellaneous Utility Adjustments in Traffic Signals, Waterline, Sewer, Hydrants, Service Connections, etc. not specified.

<sup>2</sup>Miscellaneous Streetscaping includes, pavers, benches, fencing, trees, street lights/lamps, ADA ramps, etc.