FLOOD RISK MANAGEMENT PLAN FOR THE TOWN OF PORT DEPOSIT CECIL COUNTY, MARYLAND

Prepared for:
Town of Port Deposit
64 South Main Street
Port Deposit, Maryland 21901

Prepared by:
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SEPTEMBER 2015

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1. Town of Port Deposit, Maryland, Comprehensive Plan, located at http://www.portdeposit.org/comprehensive-plan

2. Kilar, Steve, Baltimore Sun, History of Port Deposit has been defined by high water, October 1, 2011.

3. Federal Emergency Management Agency, Flood Insurance Study for Cecil County and Incorporated Areas, *May 4, 2015.*

4. U.S. Army Corps of Engineers, Hydrologic Engineering Center, River Analysis System HEC-RAS, User's Manual, Version 4.1, November 2006.

5. XP Software, XPStorm Getting Started Manual, undated.

1 INTRODUCTION

1.1 PURPOSE

This study was completed by the Planning Division of the U.S. Army Corps of Engineers (USACE), Baltimore District. The purpose of this study was to (1) identify the flood risk in the Town of Port Deposit, Maryland from riverine flooding from the Susquehanna River and (2) develop a plan that would mitigate the risk of damages to the Town from this flooding. Because there are limited cost-effective, technically feasible options for flood risk management in the town, the focus of this investigation was structural measures to prevent floodwaters from reaching at risk buildings.

1.2 STUDY AUTHORITY

This study was completed under the Floodplain Management Services (FPMS) Program. The FPMS Program is authorized by Section 206 of the Flood Control Act of 1960, as amended. Under this program USACE is authorized to provide a full range of technical services and planning guidance on floods and floodplain issues to other Federal, non-Federal, local or individual entities.

1.3 STUDY AREA

The study area is the Town of Port Deposit, located in Cecil County, Maryland. The 2.3 square mile Town, having an estimated population of 656 people in 2012, is on the left bank of the Susquehanna River, a few miles downstream of the Conowingo Dam, owned and operated by Exelon Corporation (Figure 1.1). According to the Town of Port Deposit comprehensive plan, Port Deposit is a predominantly residential community and maintains significant resources composed of historic achievements and personages, historic structures, and natural scenic aspects of granite cliffs and terraces (Reference 1).

1.4 FLOOD HISTORY

Many of the historic structures in Port Deposit are at risk of flooding from both coastal storm systems causing storm surge and high tides and riverine flooding from the Susquehanna River, with the riverine flooding being the major flooding source in Port Deposit. The history of flooding in Port Deposit has been well documented and dates back to the Town's establishment. Below is a brief summary of the flooding issues in Port Deposit, from an article published in the Baltimore Sun on October 1, 2011 (Reference 2):

- Until the Conowingo Dam was completed in 1928, Port Deposit suffered flooding nearly every spring. The townspeople called it a "freshet," when the river thawed and pushed water and ice chunks above the banks. There were at least five major floods in the second half of the 19th Century.
- The first major flood following the dam's completion was in 1936 when several homes were under water to the second floor.

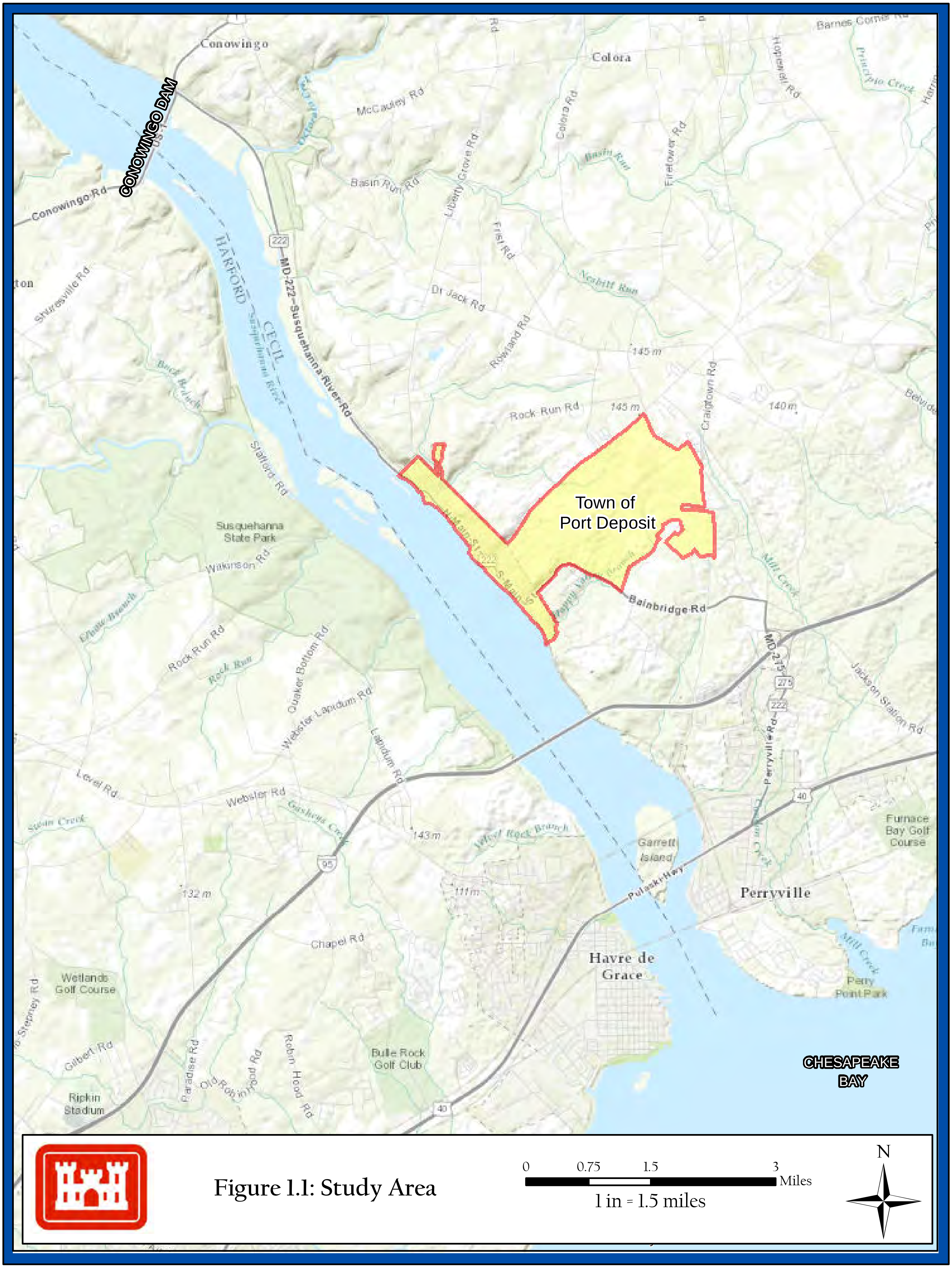


Figure 1.1: Study Area

- A substantial flood was reported in 1946 that drove "rats from the city dump and from the cellars. They were hunted down by small boys with clubs and air rifles during the day."

- In 1972, Tropical Storm Agnes brought the highest waters recorded in Port Deposit's history. Silt in the river became thick layers of mud inside homes. A captain in USACE told The Baltimore Sun "The mud in this town was worse than some of the stuff I've seen in Vietnam. But we've managed to get most of it out of the way."

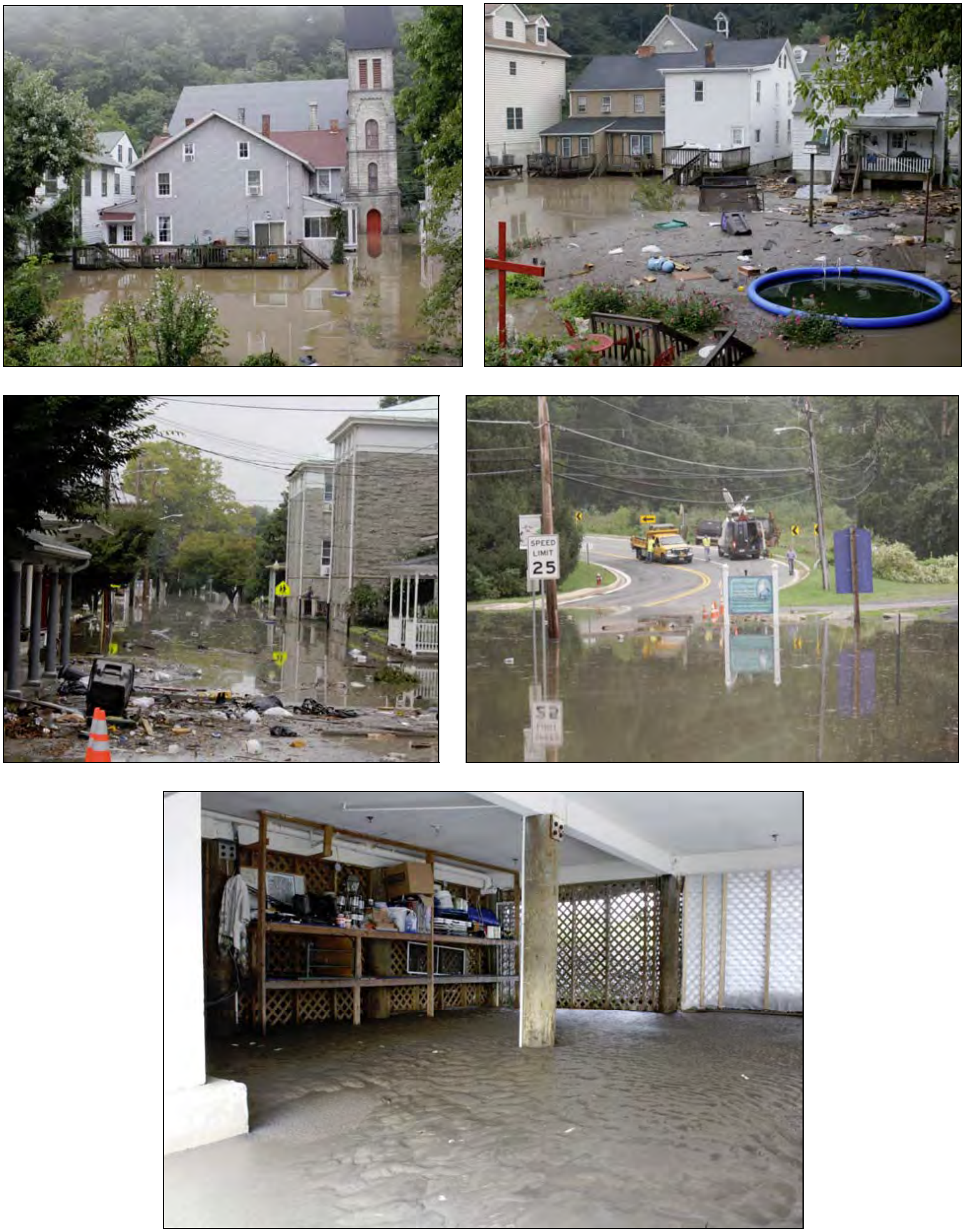
Based upon surveyed high water marks, Tropical Storm Agnes (Figure 1.2) produced flood elevations ranging from 14.2 ft. (North American Vertical Datum of 1988, NAVD88) at U.S. Route 95 (Millard E. Tydings Memorial Bridge) to as high as 15.2 ft NAVD88 within the Town of Port Deposit near the intersection of Vannort Drive and Main Street (Maryland Route 222).

Figure 1.2: Flooding in Port Deposit from Agnes *(courtesy of cecildaily.com)*

The most recent flooding occurred in September 2011 as a result of flooding from the remnants of Tropical Storm Lee (Figure 1.3). The majority of the Town flooded with flood elevations (based upon surveyed high water marks) reaching 9.3 ft. at Marina Park in the lower end of town to 14.5 ft. near the upper end of town at Granite Avenue. At the same location as the 15.2 ft. high water mark produced from Agnes, Lee produced an elevation of 12.9 ft., 2.3 ft. lower. After the floods, the removal of mud and debris becomes a challenging issue. Mud and debris several feet high can accumulate along the streets and in basement level garages at the riverside community of Tomes Landing.

The majority of the flooding enters the Town of Port Deposit through two existing openings on the Norfolk Southern railroad embankment that runs parallel to the Susquehanna River. These openings are at Vannort Drive and Netters Alley. Additional flooding enters the Town through the existing stormwater system. While the town floods through these openings, the railroad itself remains high and dry for most storms (portions did overtop during Agnes and Lee).

Figure 1.3: Images of Lee Flooding in Port Deposit ***(courtesy of Cecil County Emergency Management)***



Riverine flooding from the Susquehanna River in Port Deposit can be predicted days ahead of time due to a river gage system operated by the United States Geological Survey (USGS) and the presence of the Conowingo Dam; and although the operation of the Conowingo Dam has little impact on downstream flooding (Reference Exelon report), the amount of gates open at the dam correlates to a specific flooding condition that can be expected within the Town. Port Deposit and the dam jointly use dam notification levels to plan for emergency action during a predicted flood. These levels range from Level 1, notifying appropriate agencies, to Level 9, where no persons are permitted in the Town (Table 1.1).

Table 1.1: Notification Levels for Flood Emergency Action

Level	Conowingo Dam Gate Openings	Action
1	10-11	* High river flow * No effect to residents in Town or Rt. 222N * Appropriate agencies notified
2	12-15	* Appropriate notification and warning signage posted. * State Highway Administration places signage * Town personnel prepares flyers for distribution (dependent on projected flood level)
3	16-17	* Rt. 222 (Susquehanna River Road) to the Conowingo Dam closed to through traffic. * Rock Run Landing & Tome's Landing notified of potential flooding. * Marina Park closed to public access
4	18-20	* Residents on the West Side of North Main Street and Tome's Landing urged to move items from basements or low lying areas. * Residents of Ratledge Lane and those occupying businesses along Rt. 222 (Susquehanna River Road) informed by emergency personnel of high water. * Port Deposit Area Wide Command Center is established in the Port Deposit Town Hall. Center will be coordinated by officials of the Town, Water Witch Fire Company, and Cecil County Dept. of Emergency Services.
5	21-25	* Water in backyards and basements West side of Main Street and Northern end of Tome's Landing. Voluntary evacuation of residents of Ratledge Lane, Rt.222 corridor and, depending on conditions, residents of the Northern end of Tome's Landing.
6	26-32	* An emergency evacuation siren will be activated to indicate the start of a voluntary evacuation. * The evacuation will begin on N. Main Street and proceed south, as necessary, through Town. * Emergency personnel will do door-to-door search and notification. * Water will enter the Town at railroad overpasses and through storm drains. * Evacuation Center will be established. * Those without transportation are to report to Town Hall for shuttle to evacuation center. * Town closed to incoming traffic. Evacuation by boat necessary in low-lying levels of Town.
7	33-35	* Considerable flooding in the North end of Town, and parts of S. Main Street affected.
8	36-42	* Town is impassable from Center Street North. Residents who chose to initially remain in Town are urged to evacuate.
9	43-50	* The Port Deposit Area Wide Command Center moves to Water Witch Fire Company /Woodlawn Station. Mandatory evacuation initiated by emergency personnel. * Town secured by emergency personnel and no one allowed in Town until deemed safe by the appropriate agencies

**Source: Port Deposit Website http://www.portdeposit.org/dam-notification-levels*

2 IDENTIFICATION OF FLOOD RISK

Flooding occurs in Port Deposit in two distinct areas, which are separated by a Norfolk Southern railroad embankment (Figure 2.1). The area to the west or "riverside" of the railroad embankment includes the residential developments of Tomes Landing, Newport Landing, Tomes Landing Marina, Marina Park, and two residential buildings on Vannort Drive. This area floods directly from floodwaters overflowing the banks of the Susquehanna River from either coastal or riverine flood events.

The area to the east or "landside" of the railroad embankment includes a northern area, which includes residential buildings along North Main Street (MD Route 222), and the southern area, which includes some residential buildings and the majority of the businesses, churches, and historic buildings in the Town. Flooding in the landside area is controlled by floodwater entry points, which includes two above ground openings (Vannort Drive and Netters Alley) in the railroad embankment and numerous underground stormwater outfalls. Some of the existing stormwater outfalls, but not all, have duckbill valves which prevent floodwaters from entering the pipes, while allowing localized stormwater to flow out of them.

Although Port Deposit is susceptible to floods from coastal storm-surge related storms, historically the primary cause of flooding is riverine flows from the Susquehanna River. In the effective Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for Cecil County and Incorporated Areas, dated May 4, 2015 (Reference 3), the 1-percent annual chance flood elevation in the Town of Port Deposit from a coastal storm surge is 7.3 feet NAVD88. The 1-percent annual chance flood is a flood having a 1-percent chance of occurring in any given year, and is often referred to as the 100-year flood.

The average flood elevation for Lee (September 2011) in Port Deposit was 12.9 ft., with Agnes being even higher, around 15.9 ft. These numbers indicate that riverine flooding from high flows from the Susquehanna River are much more of a flood threat to Port Deposit than a coastal storm surge. Therefore, for this investigation, the focus was to identify the risk of flooding to Port Deposit from a riverine flood. Any flood risk management plan that addresses riverine flood will also be sufficient to address coastal flooding, since a riverine flood causes much higher flood elevations.

Hydraulic modeling was completed in order to identify the estimated water surface elevations in the Town of Port Deposit during various flow releases from the Conowingo Dam and tidal conditions on the Chesapeake Bay. The USACE HEC-RAS (River Analysis System), version 4.1, was used to develop a geo-referenced hydraulic model of the Susquehanna River from the Conowingo Dam downstream to the Chesapeake Bay. HEC-RAS is software that performs one-dimensional steady and unsteady state river flow hydraulic calculations. It is an integrated system of software designed for interactive use for a multi-tasking environment. The system is comprised of a graphical user interface, separate analysis components, data storage and management capabilities, graphics and reporting facilities (Reference 4). The HEC-GeoRAS pre- and post-processor utilities were used to assist in the development of cross-sections and the mapping of the floodplain.

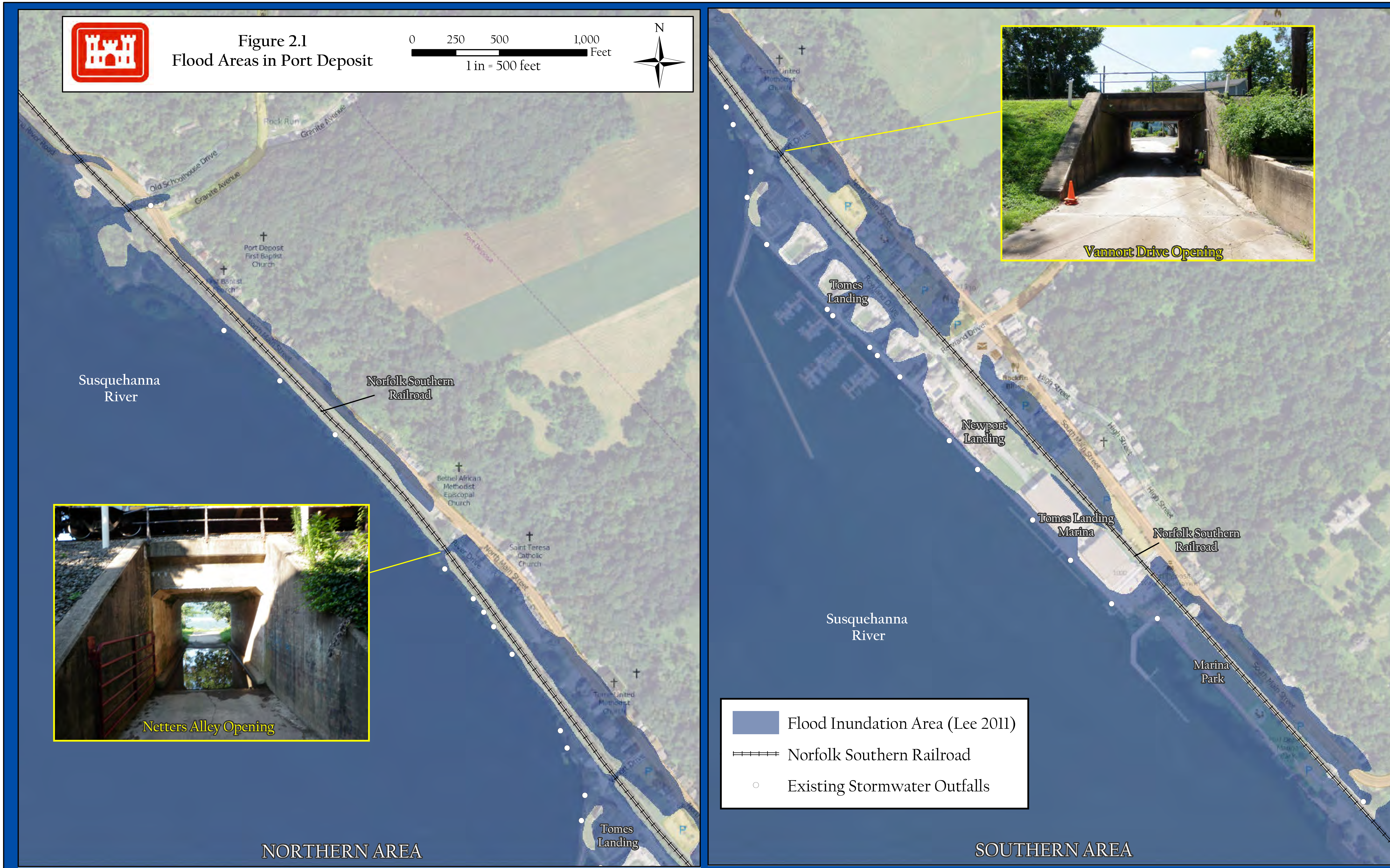


Figure 2.1
Flood Areas in Port Deposit
0 250 500 1,000
Feet
1 in = 500 feet
N
Susquehanna River
Norfolk Southern Railroad
Netters Alley Opening
Tomes Landing
NORTHERN AREA
Vannort Drive Opening
Tomes Landing
Newport Landing
Tomes Landing Marina
Norfolk Southern Railroad
Susquehanna River
Marina Park
Flood Inundation Area (Lee 2011)
Norfolk Southern Railroad
Existing Stormwater Outfalls
SOUTHERN AREA

A detailed summary of the HEC-RAS model developed for this investigation is located in Appendix A of this report. USACE is in the process of developing a flood inundation mapping and interactive Geographic Information System (GIS) application for the Susquehanna River as a byproduct of this investigation and HEC-RAS modeling. It is anticipated that the application will enhance the Conowingo Dam and Port Deposit's emergency action flood plan by allowing the user to review the inundation areas and associated flood depths for user-defined conditions. The user-defined conditions include a downstream tide elevation (ranging from Mean Lower Low Tide, MLLW to a tide elevation of 5.0 ft.) and the number of open gates at Conowingo Dam. This application, which will likely be completed within one year of the date of this report, will reflect existing-conditions flood scenarios and may be revised at a later date if any actions recommended in this plan are implemented.

The results of the HEC-RAS model, which was calibrated to Lee and Agnes, show there is a high risk of flooding in Port Deposit from riverine flows from the Susquehanna River. During normal tide conditions, flooding in Port Deposit starts with a peak flow of 250,000 cfs leaving the Conowingo Dam, which is a scenario of 16 gates open with no power generation or 11 gates open with power generation. The flooding with these scenarios is limited to Marina Park. At 30 gates open during normal tidal conditions (465,000 cfs flow), floodwaters enter the Vannort Drive opening, flooding areas behind the railroad embankment. Marina Park is completely underwater and other areas of the town flood from water entering the stormwater system. With 43 gates open, which was equivalent to Lee in September 2011, there is widespread flooding throughout the Town.

The tide level has an impact on the flood elevations in Port Deposit during a riverine event, with the impact being less the higher the flows exiting the dam. Table 2.1 shows that during a lower flow flood, with 25 gates open, the difference in flood elevations if the flood were to occur during a MLLW tide or a Mean Higher High Water (MHHW) tide is 1.0 ft. For a higher flow event, such as 50-gates open, this range is reduced to 0.3 ft.

Table 2.1: Tidal Impacts on Flood Elevations in Port Deposit

Scenario	Flow (cubic feet per second)	Flood Elevation (feet NAVD 88) at HEC-RAS XS 26914			Range (ft.)
		MLLW (-1.33 ft.)	Mean Tide Level (-0.18 ft.)	MHHW (+1.11 ft.)	
25 Gates	390,000	6.5	6.9	7.5	1.0
30 Gates	465,000	7.7	8.1	8.6	0.9
43 Gates (Lee)	665,000	10.9	11.1	11.4	0.5
50 Gates	775,000	11.0	11.2	11.3	0.3

Figure 2.2 shows the area that would be inundated by flooding of select gate openings at Conowingo Dam during Mean Tide Level (MTL) on the Chesapeake Bay.

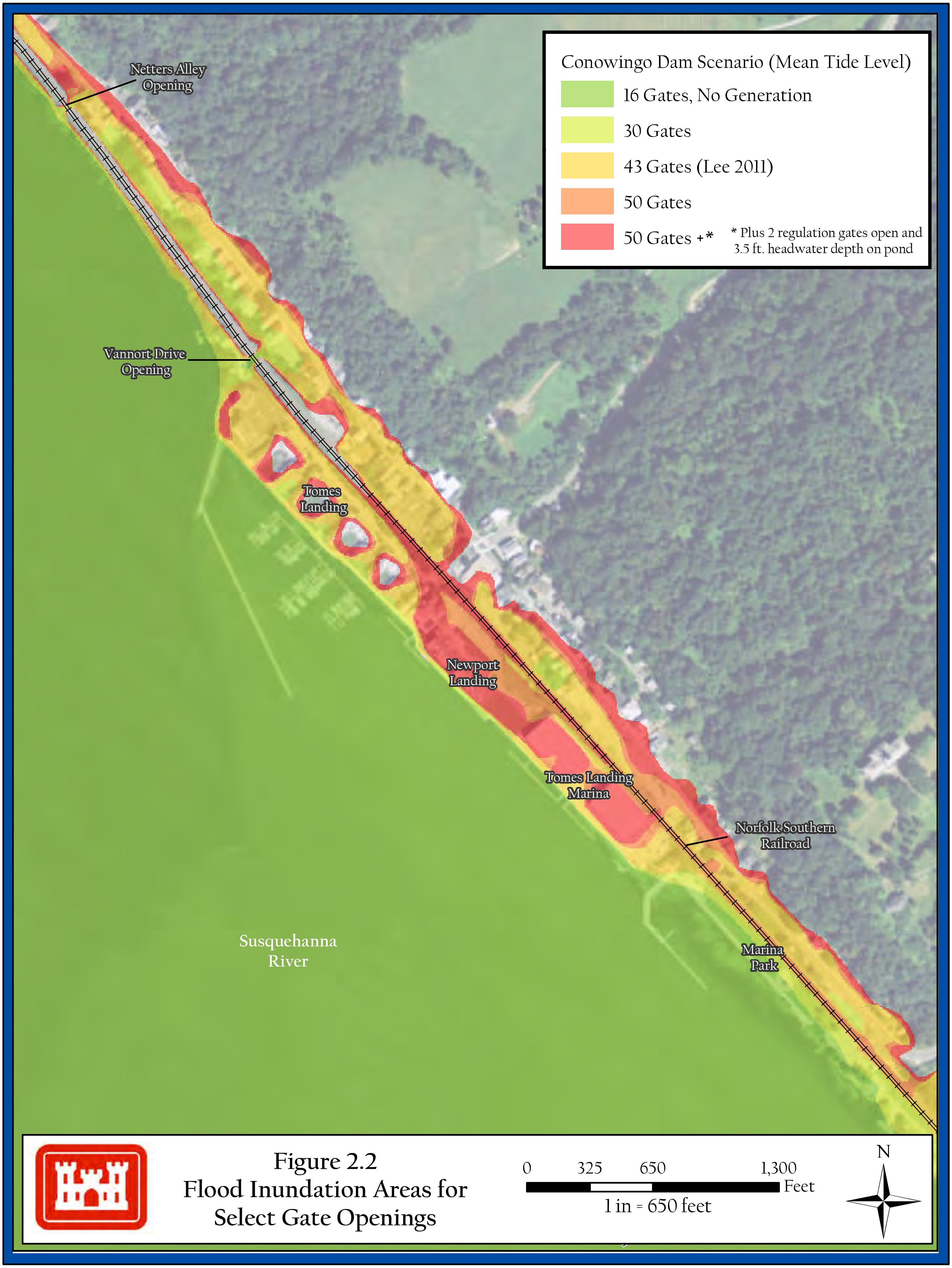


Figure 2.2
Flood Inundation Areas for Select Gate Openings

3 STORMWATER MAPPING AND ANALYSIS

Mapping of the stormwater system in the Town of Port Deposit was completed in order to identify all entry points of floodwaters under the Norfolk Southern railroad embankment. The mapping was also used to complete an analysis of the capacity of the stormwater system to convey localized heavy rainfalls and for further analysis outlined in the flood risk management plan (discussed in Section 4.0).

3.1 STORMWATER MAPPING

EXISTING-CONDITIONS

A survey and assessment of the existing stormwater system in the Town of Port Deposit was completed by USACE in July 2013. The objective was to complete comprehensive mapping layers of the stormwater conveyance system to determine the location of existing stormwater infrastructure and assess the overall condition of the existing stormwater infrastructure (excluding underground pipes).

The study team concluded that using Global Positioning System (GPS) techniques for capturing the location and elevations of stormwater system features was the appropriate method for the survey. The use of GPS allows for the collection of a large amount of data in a short time frame to a high degree of accuracy. The survey utilized relative positioning techniques yielding precision on the order of less than 2 centimeters horizontally and vertically. More specifically, Real-Time Kinematic (RTK) GPS techniques were used. The Trimble R8 GNSS (Global Navigation Satellite System) unit was utilized to perform the field survey.

For stormwater structures (combination inlets, curb inlets, drop inlets, grate inlets, manholes, pipe inlets, pipe outlets, and slotted inlets) the geographic location and invert elevations were determined by taking a survey point at the top of the structure or invert of pipe inlet and outlets. Distance measurements were made from the surface to any inside piping of the curb, combination, or grate inlets using a tape measure and the inverts of the internal pipes were determined by subtraction.

The location and information on the stormwater pipes, such as shape, material, size, elevations, and slope, were derived from data compiled for the stormwater structures. For the stormwater system assessment, stormwater inlets were assessed for both physical condition and conveyance condition. The stormwater inlets were categorized as being in Good, Fair, Poor, or Unknown condition based upon their physical stability and ability to convey stormwater (siltation).

Data collected from the stormwater system survey were used to develop comprehensive mapping of the connectivity of the stormwater system within the Town of Port Deposit. A Geographic Information System (GIS) shapefile was created separately for stormwater structures and stormwater pipes. These layers were provided to the Cecil County Department of Planning and Zoning and the data can be publicly viewed on the County's mapping portal at http://cecilmaps.ccgov.org/planning/. The data layers are also located on the attached project disc.

Prior to the existing-conditions stormwater system survey, a random "Field ID" was assigned to each stormwater system feature in order to assist with the survey. The Field ID was a random number and was developed for the sole purpose to guide the field team throughout the survey process. Once the stormwater system survey was complete, a "Permanent ID" was assigned to each stormwater feature in a logical alphanumerical order. Stormwater pipes were named based upon the stormwater structures in which they are flowing to and from. For example, a stormwater pipe between Structure 7D and Structure 7B has the Permanent ID of 7D-7B. For stormwater pipes that connect to the system directly from a building, the Permanent ID begins with the abbreviation BLDG.

Appendix B of this report contains detailed information on the results of the existing-conditions stormwater survey; however, this data is only valid until the proposed drainage improvement project is complete, as discussed below.

FUTURE-CONDITIONS

At the time of this investigation, the Maryland Department of Transportation, State Highway Administration (SHA) was approximately 90-percent complete with the design of a drainage improvement project along Maryland Route 222 (Main Street) in Port Deposit from Granite Avenue to the southern town limits. This project has significant implications on this flood risk management plan.

The SHA design proposes the replacement of the majority of old stormwater infrastructure within the Town of Port Deposit. USACE worked closely with SHA to obtain the most recent plans that would reflect the "future-conditions" or, the layout of the stormwater system when and if any proposed actions in this flood risk management plan would be constructed. Therefore, for this flood risk management plan, all analyses are being completed using the future-conditions stormwater mapping.

The SHA plans were merged with the existing-conditions stormwater mapping to develop future-conditions mapping layer that incorporates all the improvements proposed by SHA as well as stormwater infrastructure that will remain after the SHA project. The future-conditions stormwater system includes a total of 25 stormwater outfalls, with four of them being new outfalls constructed by SHA. The future-conditions stormwater structures and stormwater pipes were re-named since significant changes occur with the drainage improvements. The outfalls were numbered from 1-25, starting at the first outfall at the downstream end of Port Deposit. From those outfalls, stormwater structures were numbered sequentially with a letter. For instance, the first stormwater structure upstream of Outfall 5 was named 5A, and so forth. Stormwater pipes were again named based upon the stormwater structures in which they are flowing to and from.

Appendix C of this report contains data on the future-conditions stormwater mapping. A map of the future-conditions outfalls and stormwater system is shown in Figure 3.1.

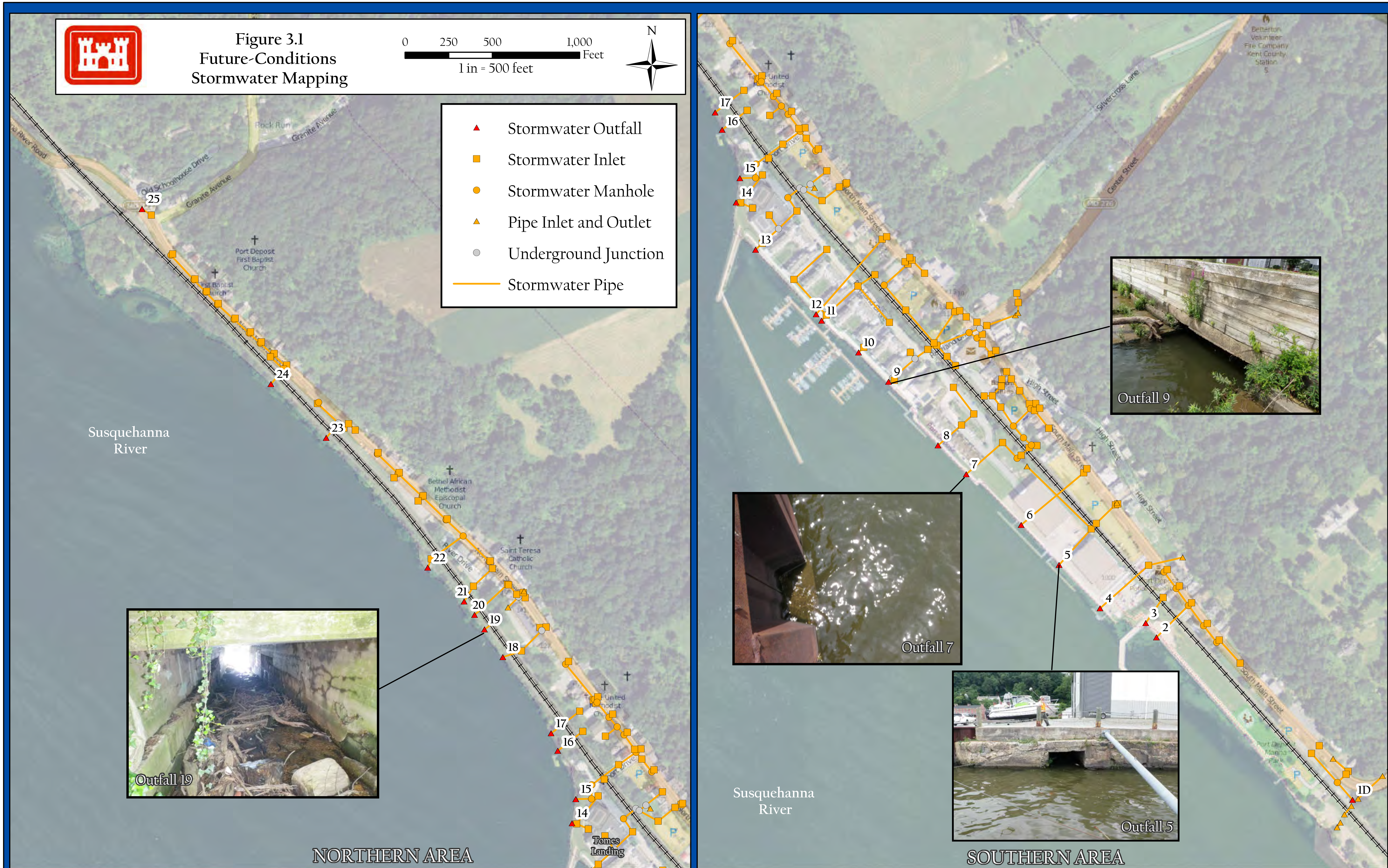


Figure 3.1
Future-Conditions
Stormwater Mapping
0 250 500 1,000
Feet
1 in = 500 feet
N
Stormwater Outfall
Stormwater Inlet
Stormwater Manhole
Pipe Inlet and Outlet
Underground Junction
Stormwater Pipe
Susquehanna River
Outfall 19
NORTHERN AREA
Outfall 9
Outfall 7
Outfall 5
Susquehanna River
SOUTHERN AREA
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1D
Old Schoolhouse Drive
Granite Avenue
Rock Run
Port Deposit First Baptist Church
Bethel African Methodist Episcopal Church
Saint Teresa Catholic Church
Tomes Landing
Silvercross Lane
Center Street
High Street
Betterton Volunteer Fire Company Kent County Station 5

3.2 STORMWATER MODELING

The stormwater mapping was used to complete an analysis of the capacity of both the existing and the future stormwater system to convey localized heavy rainfalls, given normal tidal conditions. The stormwater analysis was completed for both the existing and future conditions using XPStorm 2014 to identify areas in the Town of Port Deposit that are susceptible to stormwater-related flooding. XPStorm is a link-node model that performs hydrologic, hydraulic and quality analysis of stormwater drainage systems. It utilizes sophisticated graphical tools together with associated GIS data, and can be used to model the full hydrologic cycle from stormwater flow to simulation of the hydraulics in any combined system of open and/or closed conduits with any boundary condition. The two-dimensional hydrodynamic engine XP2D was used in addition to XPStorm to enable a complete model of one-dimensional pipe flow and two-dimensional overland flow once the pipe network has reached capacity. This two-dimensional modeling results in more accurate results that are more readily accepted and understood (Reference 5).

EXISTING-CONDITIONS

One of the most widely used and accepted methods of modeling the hydrology of watersheds is using the SCS 24-hour design storm. This method for hydrologic computations was used in this study because it is simple, widely used, and a component of XPStorm. For this method, the development of hydrologic data is required. This data includes drainage area, runoff curve number (CN), percent impervious area, and time of concentration. 24-hour precipitation data and control specifications are also required for a successful event-based simulation. A detailed description of the existing-conditions XPStorm model development for the Town of Port Deposit is included in Appendix D, with a brief summary of the methodology provided below:

- Drainage areas to each stormwater inlet were delineated using the DEM used in the HEC-RAS modeling as described in Appendix A.

- Existing-conditions land use data was determined using recent aerial photography and soil data was obtained directly from the NRCS Soil Data Mart. This data was used to compute a CN for each drainage basin.

- Methods outlined in the Natural Resource Conservation Service Technical Release 55 (TR-55) were used to calculate the time of concentration for each drainage basin and the DEM, field reconnaissance, and stormwater mapping was used to determine the flow paths and hydraulic characteristics of the flow paths.

- For this investigation, precipitation data was taken from NOAA Atlas 14, Volume 2, Version 3, for the location of Port Deposit.

- Pipe and open channel Manning's roughness (n) values were assigned based upon engineering judgment.

- The analysis included model runs for the 2-year, 10-year, and 100-year 24-hour storm events.

- The tailwater boundary condition for the existing-conditions model was set as a free outfall, meaning the Susquehanna River is at a normal tide condition during the event.

The results of the existing-conditions XPStorm model show that portions of the existing stormwater system are undersized, causing nuisance flooding along Main Street (MD Route 222) and in other isolated areas. Figure B.1 in Appendix B shows the areas susceptible to this nuisance flooding and the relative depth of the flooding in those locations for a 10-year, 24-hour rainfall event. GIS shapefiles of the flood areas for a 2-year, 24-hour storm event and a 100-year, 24-hour storm event, as well as the XPStorm modeling files, are located on the attached project disc.

FUTURE-CONDITIONS

Due to the nuisance flooding along Main Street (MD Route 222), as witnessed and confirmed in the existing-conditions XPStorm model, SHA is in the process of completing a drainage improvement project along in Port Deposit from Granite Avenue to the southern town limits. The SHA design proposes the replacement of the majority of old stormwater infrastructure within the Town of Port Deposit. The improvements are reflected in the future-conditions stormwater mapping described above.

The existing-conditions XPStorm model and input data was revised to account for the proposed improvements. The drainage areas, CN values, and times of concentration were recalculated based upon the future-conditions mapping. For the purposes of calculating CN, the existing land use data was used as there are no major developments planned for the project area that would change land use considerably.

The future-conditions mapping and revised data were input into the future-conditions XPStorm model and the same storm events were run. The results showed, as expected, that the nuisance flooding along Main Street (MD Route 222) during a 10-year, 24-hour rainfall would essentially be eliminated as a result of the SHA improvements during a normal tidal tailwater condition. Minor flooding on streets would occur during a 100-year, 24-hour rainfall, as the stormwater system is not designed to convey such a rainfall. The future-conditions XPStorm modeling files are located on the attached project disc.

The future-conditions model was run with a submerged tailwater condition to determine any interior drainage flooding issues with the developed flood risk management plan. The development of this model and the results are discussed in Section 4.1 and Appendix E.

4 FLOOD RISK MANAGEMENT PLAN

Limited cost-effective, technically feasible options exist for flood risk management in the Town of Port Deposit. Due to the age of the buildings and flood depths in the Town, flood-proofing (dry or wet) would be challenging, and could potentially be an option for a limited number of buildings in the Town. There is minimal land available along the Susquehanna River to construct a levee or floodwall to prevent floodwaters from entering the Town. Based upon an August 2012 report produced by Gomez and Sullivan Engineers, P.C. for Exelon, there are no operational changes that the Conowingo Dam can make that would reduce the flooding in the Town of Port Deposit. These operational changes considered included removing the dam completely and several pond management alternatives.

At the request of the Town of Port Deposit, in this investigation, USACE is focused on developing a plan that will utilize the existing Norfolk Southern railroad embankment as a flood risk management feature, by blocking off the openings at Vannort Drive and Netters Avenue and adding backflow prevention to existing stormwater outfalls. This plan was prepared by a multi-disciplinary team (civil, geotechnical, structural engineers, etc…) and identifies the most feasible type of structure for the openings given flood warning times and outlines general costs and pros/cons of the closure structure. The sole purpose of this plan is to reduce the risk of floodwaters from damaging buildings in the landside areas in Port Deposit. Essentially, the actions outlined in this plan will convert the existing railroad embankment into a levee system to provide some protection to the landside flood areas. No consideration was given to meeting requirements for certification of this levee system to eliminate flood insurance requirements under the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP), as outlined in Chapter 44 of the Code of Federal Regulations (44 CFR), Section 65.2. Therefore, if the actions of this plan are implemented, it is likely that the residents of the Town would still require flood insurance if mapped in the FEMA Special Flood Hazard Area (SFHA).

This plan does not propose protection for the area to the west or "riverside" of the railroad embankment. This area includes the residential developments of Tomes Landing and Newport Landing, Tomes Landing Marina, Marina Park, and two residential buildings on Vannort Drive; however, these buildings were constructed in a manner to minimize damages from flooding except for extreme floods such as Agnes. Based upon plans provided by Cecil County, the first floor elevations for the residential buildings at Tomes Landing are at an elevation between 17.9-19.0 ft. NAVD88. This is well above the Agnes flood elevation of 15.0-15.3 ft. These buildings were constructed in a manner where the only areas that flood are the parking garages beneath the living floor, with even utilities being elevated appropriately. The pool building, with a low floor elevation of approximately 13.5 ft., would be flooded during a storm equivalent to Agnes, but would not be flooded during 50-gate open and 3.5 ft. of headwater in the Conowingo Dam (peak flow of 1,000,000 cfs), which would reach an elevation of 13.3 ft. This is based upon the HEC-RAS modeling discussed in Section 2.0 of this report.

At Newport Landing, based upon plans provided by Cecil County, the first floor elevation of these slab on grade units are at an elevation of 13.7 ft. NAVD88. As with the clubhouse at Tomes Landing, these buildings would not be flooded during 50-gates open and 3.5 ft. of headwater in the Conowingo Dam (peak flow of 1,000,000 cfs), which would reach an elevation of 13.3 ft. A storm equivalent to Agnes (15.0 ft.) would inundate the buildings.

The commercial buildings at Tomes Landing Marina are at an approximate elevation of 11.3 ft. Based upon topographic mapping, these buildings begin to flood during 50-gates open and 1.5 ft. of water in the Conowingo Dam (peak flow of 875,000 cfs). The two residential buildings on Vannort Drive are constructed the same as the buildings at Tomes Landing, with the living floors elevated over a garage. Based upon a field survey, the low floor of these buildings is at an elevation of 15.8 ft., which is above a 50-gates open and 3.5 ft. of headwater in the Conowingo Dam (peak flow of 1,000,000 cfs), which would reach an elevation of 14.1 ft. Because the level of protection discussed above is based upon hydraulic modeling, which inherently has a level of uncertainty, the residents of Tomes Landing, Newport Landing, and other entities mentioned should be prepared for flooding well ahead of the noted level of protection. All information contained in this plan is considered concept level and detailed design plans are required prior to implementing the actions identified in this plan. The next steps in the process are discussed in Section 4.9.

4.1 LEVEL OF PROTECTION

Typically, during flood risk management plans, the actions are developed to provide a level of protection to a certain design storm. For example, the 1-percent annual chance flood (100-year flood) plus risk and uncertainty (freeboard) or the flood of record. For this study, the level of protection is solely dependent on the top of the existing railroad embankment. The railroad embankment will not be elevated, and the top elevation of the railroad varies from 27.1 ft. NAVD88 upstream near Granite Avenue to 10.5 ft. downstream of Marina Park.

Based upon the results of the HEC-RAS modeling, the top of the railroad for the entire reach in Port Deposit is above the flood elevation of the 50-gate open flood from the Conowingo Dam (775,000 cfs) during normal tidal conditions (i.e. Mean Tide Level). Therefore, the level of protection for this plan is at least that, which has an annual occurrence probability of 1.35-percent, or, a storm recurrence interval of approximately 80-years. This is based upon a revised hydrologic analysis completed as part of this investigation, and detailed in Appendix A (Figure A.2). Flood elevations for this storm vary from 14.6 feet at Granite Avenue to 10.4 feet at the southern end of Marina Park. The level of protection increases the further north along the railroad. Near Center Street, the level of protection is above the flood elevation of a 50-gate flood plus 3.5 ft. of ponding on the Conowingo Dam, with both regulating gates open (flow of 1,000,000 cfs). This storm has an annual occurrence probability of 0.33-percent, or, a storm recurrence interval of approximately 300-years. This plan will not protect the Town of Port Deposit from a flood equivalent to Agnes (1,300,000 cfs). With this flood level, the railroad will overtop near Center Street causing flooding behind the entire length of the railroad. In addition, floodwaters would overtop the intersection of MD Route 222 and Granite Avenue on the northern end of Town, and run down MD Route 222 into the commercial area.

Thus, in general, the level of protection provided from this plan (Figure 4.1) ranges from a 50-gate open flood at the Conowingo Dam, with a flow of 775,000 cfs and a storm recurrence interval of 80-years, to a 50-gate flood plus 3.5 ft. of ponding on the Conowingo Dam with both

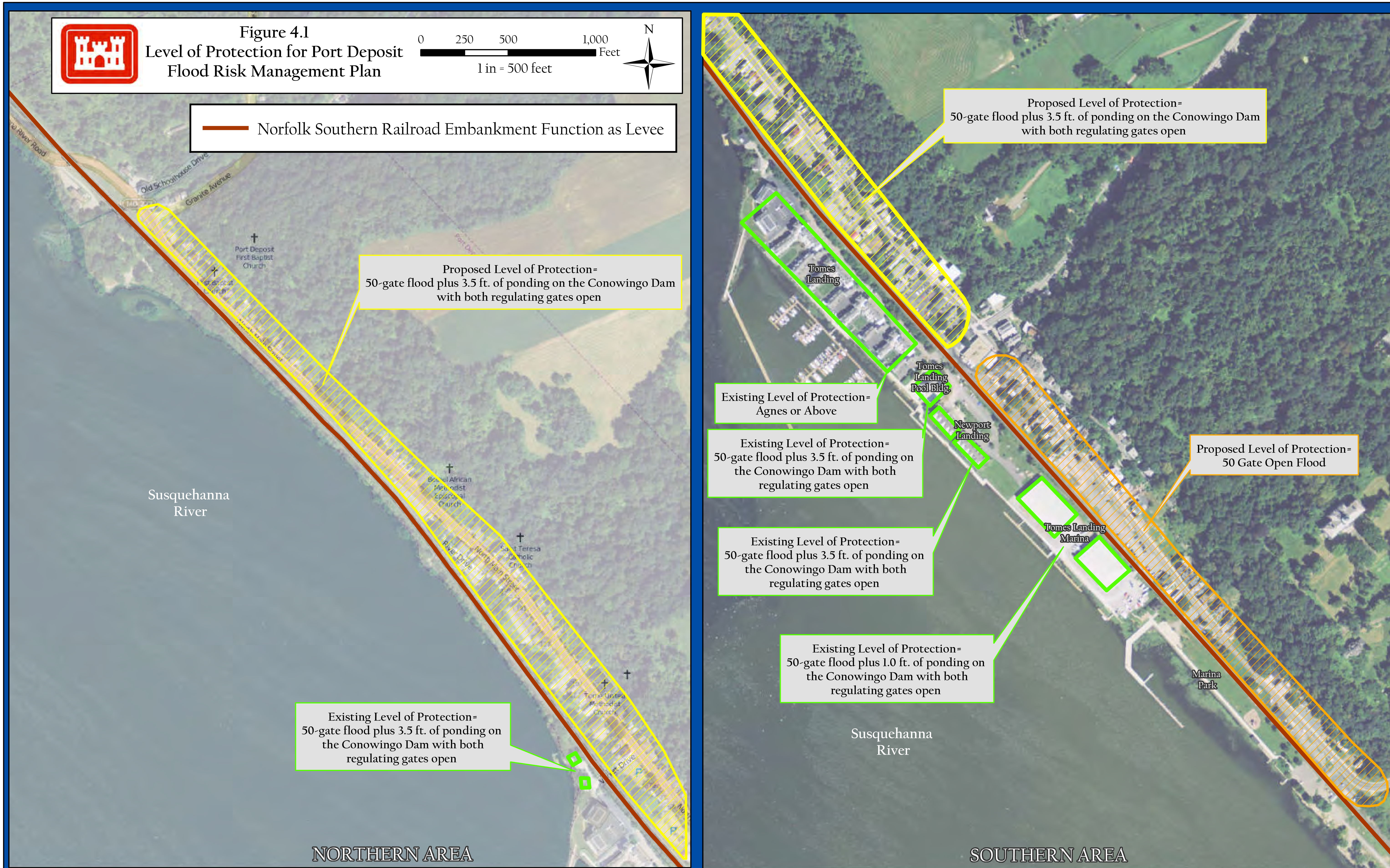


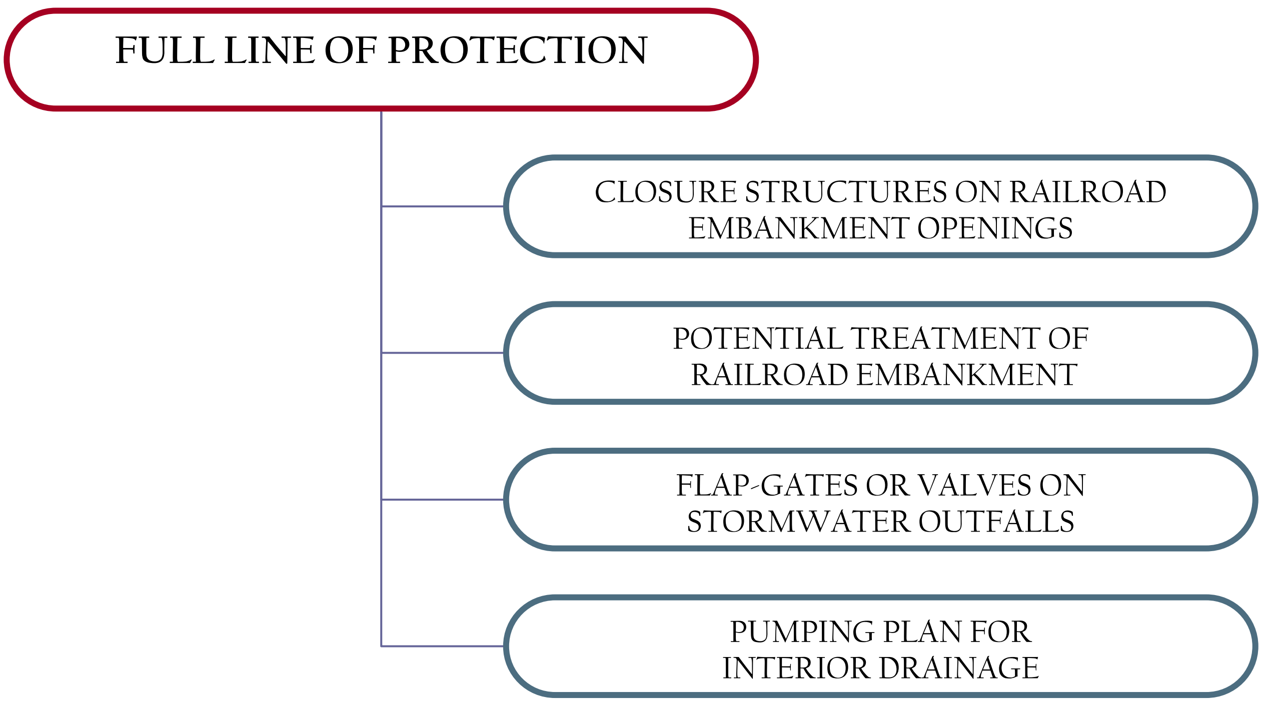
Figure 4.1
Level of Protection for Port Deposit
Flood Risk Management Plan
0 250 500 1,000 Feet
1 in = 500 feet
N
Norfolk Southern Railroad Embankment Function as Levee
Proposed Level of Protection=
50-gate flood plus 3.5 ft. of ponding on the Conowingo Dam
with both regulating gates open
Existing Level of Protection=
50-gate flood plus 3.5 ft. of ponding on
the Conowingo Dam with both
regulating gates open
Susquehanna
River
NORTHERN AREA
Proposed Level of Protection=
50-gate flood plus 3.5 ft. of ponding on the Conowingo Dam
with both regulating gates open
Existing Level of Protection=
Agnes or Above
Existing Level of Protection=
50-gate flood plus 3.5 ft. of ponding on
the Conowingo Dam with both
regulating gates open
Existing Level of Protection=
50-gate flood plus 3.5 ft. of ponding on
the Conowingo Dam with both
regulating gates open
Existing Level of Protection=
50-gate flood plus 1.0 ft. of ponding on
the Conowingo Dam with both
regulating gates open
Proposed Level of Protection=
50 Gate Open Flood
Tomes Landing
Tomes Landing Pool Bldg.
Newport Landing
Tomes Landing Marina
Marina Park
Susquehanna
River
SOUTHERN AREA

regulating gates open flood, with a flow of 1,000,000 cfs and a storm recurrence interval of 300-years, all during MTL. During a MHHW tide, this level of protection is slightly lower in the downstream area near Marina Park (48 gates, flow of 745,000 cfs), and in the rare instance that a large riverine flood occurs during an abnormally higher tide (above elevation 2.0), the level of protection would also be reduced. The level of protection discussed above is based upon current hydrologic and hydraulic data and is subject to change based upon future weather patterns. Also, because the level of protection is based upon hydraulic modeling, which inherently has a level of uncertainty, the Town should be prepared for action well ahead of the 50-gate open flood for damages to occur.

4.2 GENERAL PLAN

The general plan for reducing the risk of flood damages in the landside flood areas in Port Deposit includes the installation of closure structures at the above ground railroad embankment openings (Vannort Drive and Netters Alley), the potential treatment of the railroad embankment to function as a levee, the installation of flap-gates or valves at stormwater outfalls, and a pumping plan for interior drainage. All of these actions are required in order to provide a full line of protection from floodwaters in the landside flood areas of Port Deposit (Figure 4.2)

Figure 4.2: General Plan for Port Deposit Flood Risk Management



The full flood risk management plan is shown in Figures 4.3. In addition to the structural components of the plan shown on Figure 4.2 and Figure 4.3, non-structural actions are also required. These non-structural actions include routine maintenance of the flap-gates or valves on the stormwater outfalls and an action plan to install the closure structures on the railroad embankment openings prior to an impending flood.

Figure 4.3
Flood Risk Management Plan
for Town of Port Deposit
0 250 500 1,000 Feet
1 in = 500 feet
N
Potential Treatment of Railroad Embankment with Slurry Wall
Outfall 24 Tideflex Valve to be Installed by SHA
Outfall 23 Locate Outfall and Install Typical Duckbill Valve
Install Netters Alley Stoplog Closure Structure
Outfall 22 Tideflex Valve to be Installed by SHA
Outfall 21 Locate Outfall and Install Typical Duckbill Valve
Area H Portable Pump (900 gpm)
Install Headwall
Replace with 8.0' x 5.0' reinforced concrete box culvert
Outfall 20 Locate Outfall and Install Typical Duckbill Valve
Outfall 19 Install Headwall with Flap Gate
Area G Portable Pump (700-2500 gpm)
Outfall 18 Locate Outfall and Install Typical Duckbill Valve
Outfall 16 Locate Outfall and Install Typical Duckbill Valve
Outfall 15 Tideflex Valve to be Installed by SHA
Susquehanna River
NORTHERN AREA
Flood Risk Management Actions
Actions by SHA
Proposed Actions with Plan
Portable Pump Location
Norfolk Southern Railroad
Future-Conditions Stormwater Pipe
Existing 50-Gate Open Flood Area
Post-Project 50-Gate Open Flood Area
Install Vannort Drive Stoplog Closure Structure
Area F Portable Pump (160-300 gpm)
Area E Portable Pump (700-3000 gpm)
Potential Treatment of Railroad Embankment with Slurry Wall
Area D Portable Pump (700-1200 gpm)
Install Manhole with Sluice Gate
Outfall 9 Install Headwall and Flap Gate
Install Manhole with Sluice Gate
Outfall 7 Install Typical Duckbill Valve
Outfall 6 Install Typical Duckbill Valve
Area B Portable Pump (100-160 gpm)
Outfall 5 Install Headwall and Flap Gate
Outfall 1D Tideflex Valve to be Installed by SHA
Outfall 4 Locate Outfall and Install Typical Duckbill Valve
Outfall 3 Locate Outfall and Install Typical Duckbill Valve
Outfall 2 Tideflex Valve to be Installed by SHA
Susquehanna River
SOUTHERN AREA

4.3 CLOSURE STRUCTURES ON RAILROAD EMBANKMENT OPENINGS

Two options are provided for closure structures on the railroad embankment openings. These options include temporary closures and permanent closures. Temporary closures can allow for these openings to remain open for non-flood situations. These would be installed days or hours prior to a flood event. Permanent closures would close off these openings permanently, not allowing access during non-flood situations.

OPTION 1-TEMPORARY CLOSURES

Temporary closures can be provided in several different ways depending upon site conditions, flood warning times, local public works staff capabilities, and cost. Among the various options are stoplogs or stop panels, horizontal rolling gates, and miter gates. Based on sufficient warning time and ease of emergency installation, the stoplog closure structure is recommended for the Town of Port Deposit at both the Vannort Drive closure and Netters Alley closure. Figure 4.4 is an example of a stand-alone stoplog structure at a USACE project in northeast Pennsylvania.

Figure 4.4: Example of Stoplog Closure Structure

In order to minimize the height of the closure and difficulties in stoplog installation, the closures will be placed on the landside of the railroad openings. At the landside end of the existing landside wingwalls, piers will be constructed to hold the slots for the stoplog and resist the loads imposed by the floodwaters. The piers may require pile or concrete foundation depending upon depth of rock. The railroad wingwalls will be extended vertically by anchoring dowels into the top of the walls and casting them in a formed concrete wall up to the required level of protection for the design storms. For this study, it is assumed that the 16.0 ft. wide opening of Vannort Drive will require a removable center post to minimize the size and thus the weight of the individual stoplogs for ease of installation prior to a flood event. The socket for the post will be provided with a removable cover plate.

The existing concrete roadway and any granular base material will be removed within the limits of the closure. A concrete cutoff wall will be constructed below the closure for a depth of 4 feet unless rock is encountered at a lesser depth. The stoplogs should be stored in a secure area at the discretion and convenience of the Town.

At Vannort Drive, there is a sanitary sewer line encased in one-foot by one-foot concrete box that runs parallel to the roadway under the railroad. It is recommended that a control manhole be constructed over this pipe and a pinch valve be provided to prevent backflow into Port Deposit during high river stages. Also, depending upon the type of pipe material and condition, a portion of this pipe may need to be replaced.

<u>OPTION 2-PERMANENT CLOSURES</u>

The possibility of permanently closing Vannort Drive and Netters Alley was also considered. A permanent closure would be similar to the stoplog closure except that permanent cast in place concrete would be constructed in lieu of stoplogs. However, construction of this permanent closure may be more appropriate on the riverside of the railroad. The concrete wall would be dowelled into the railroad underpass walls. Additional lateral support may or may not be required. Concrete pavement and granular base removal and the cutoff wall would still be required. For the sanitary sewer line that parallels the roadway at Vannort Drive, it is recommended that a control manhole be constructed over this pipe and a pinch valve be provided to prevent backflow into Port Deposit during high river stages.

For this plan and through discussions with the Town of Port Deposit staff, temporary closure structures are preferred to permanent closures. At Vannort Drive, this opening provides vehicle access to residents and emergency access vehicles, and permanently closing this access off would be detrimental to the community. At Netters Alley, although the roadway does not lead to any residences or businesses, the area is used by fisherman and again, permanently closing it off would be detrimental to the community and a safety risk because people may be inclined to cross the railroad tracks for fishing access. Therefore, Option 1, temporary closures, will only be considered moving forward in this plan.

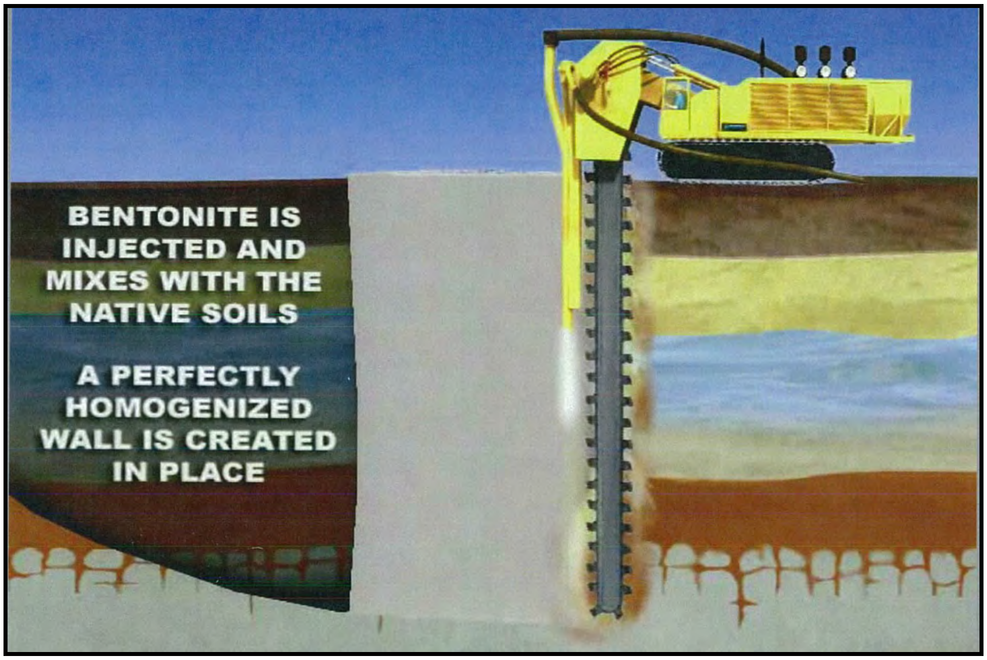
4.4 POTENTIAL TREATMENT OF RAILROAD EMBANKMENT

Either temporary or permanent closure of the two railroad underpasses will require the railroad embankment that parallels the Susquehanna River to act as a levee to prevent flooding into town. Since this study does not include a geotechnical investigation, the suitability of the railroad fill to act as a levee cannot be confirmed. The concern is that the railroad embankment may consist of various materials that would permit the river to seep through the embankment leading to flooding or possible weakening and failure of the embankment during a flood event.

The next step in this investigation should include a geotechnical investigation to determine the suitability of material in the railroad embankment to function as a levee. For the purposes of this investigation, however, it is assumed the material is not sufficient and it is proposed that an impervious section would be incorporated into the railroad embankment. One possibility would be the construction of a soil-bentonite slurry wall through the riverside portion of the railroad embankment. The impervious slurry wall, which would prevent seepage under the railroad embankment, would generally be required wherever the design flood event is higher than the landside ground elevation. This slurry wall could range from 1.0 ft. to 10.0 feet vertically, depending on the location along the railroad. The slurry wall would be constructed by excavating an 18"-24" wide trench adjacent to the railroad tracks. The trench would be backfilled with a mixture of the soil and bentonite. Figure 4.5 shows an actual slurry wall under construction and Figure 4.6 shows a cross section of the slurry wall.

Figure 4.5: Slurry Wall under Construction

Figure 4.6: Typical Cross-Section of a Slurry Wall



As noted, the next step in this investigation should include a geotechnical investigation to determine the suitability of material in the railroad embankment to function as a levee. This information would also be required during the design phase of the closure structures. After the geotechnical investigation, it may be concluded that the existing material along some or the entire railroad embankment is impervious enough that the slurry wall would not be required.

4.5 FLAP-GATES OR VALVES ON STORMWATER OUTFALLS

Preventing floodwaters from entering the landside flood areas in Port Deposit will also require preventing backflow through the stormwater pipes and channels. For the purposes of this investigation, the future-conditions stormwater mapping was used because this scenario will be what is in the ground at the time of any improvements outlined in this plan.

There are a total of 25 stormwater outfalls that will convey rainfall runoff from the Town of Port Deposit to the Susquehanna River in the future conditions scenario. Of these 25 outfalls, four have no relevance to the general flood risk management plan because they are outside of the area protected (Outfalls 8, 10, 14, and 25). Four of the 25 outfalls have existing duckbill valves that prevent Susquehanna River flooding from entering the stormwater system (Outfalls 11, 12, 13 and 17). And an additional five outfalls in the future-conditions scenario (Outfalls 1D, 2, 15, 22, and 24) will have a Tideflex check valve or equivalent installed by MSHA with the stormwater improvements for MD Route 222.

The remaining 12 stormwater outfalls will require a flap-gate device as part of this flood risk management plan to prevent Susquehanna River flooding from entering the stormwater system. Of these 12 outfalls, 8 will require a typical duckbill valve and 4 will require a more complex solution.

<u>OUTFALLS 3, 4, 6, 16, 18, 20 ,21, and 23</u>

These outfalls, listed on Table 4.1, will require a typical duckbill valve similar to those installed currently on Outfalls 11, 12,13, and 17 (Figure 4.7).

Table 4.1: Outfalls Requiring Typical Duckbill Valve

Outfall	Description
3	4" round cast iron pipe (assumed)
4	10" round cast iron pipe (assumed)
6	8" round cast iron pipe
16	4" round cast iron pipe (assumed)
18	8" round cast iron pipe (assumed)
20	8" round PVC pipe (assumed)
21	12" round PVC pipe (assumed)
23	12" round terra cotta pipe (assumed)

Figure 4.7: Typical Existing Duckbill Valve in Port Deposit

The majority of these outfalls, listed on Table 4.1, are older, as many could not even be located in the field due to being submerged or silted in. Other than Outfall 6, the exact location of these outfalls will need to be determined during future efforts in this flood risk management plan. Locating the outfalls may require dye-testing or similar methods, and if the outfalls cannot be located it is recommended that the source stormwater infrastructure be disconnected from this outfall and re-routed to other locations.

OUTFALL 5

Outfall 5 is an existing 6.0 ft. wide by 6.0 ft. high box culvert located in the Tomes Landing Marina. Much of the outfall structure is underwater, with an existing invert elevation of -1.50 ft. NAVD88; therefore, the exact type and condition of the underground culvert pipe could not be determined. For the purposes of this study, it is assumed that the pipe is a reinforced concrete box culvert or similar material.

Preventing backflow from the Susquehanna River would be accomplished by adding a headwall to the existing Outfall 5 with a 6.0 ft. wide by 6.0 ft. high flap gate at the discharge end. An example is shown in Figure 4.8.

In addition, since the actual outfall is approximately 210.0 feet from the railroad embankment and the condition of the culvert is unknown, it is recommended that a secondary closure structure be constructed as close to the railroad embankment as possible. The placement of a closure gate at the protective embankment is standard practice so that a long reach of culvert is not subject to high external water pressure between the gate and the embankment. In order to provide positive closure, an 8.0 ft. by 8.0 ft. reinforced concrete manhole approximately 15.0 ft. deep should be constructed over the culvert riverside of the railroad embankment. A 6.0 ft. wide by 6.0 ft. high sluice gate or flap gate would be installed inside the manhole. An example is shown in Figure 4.9.

Figure 4.8: Typical Rectangular Flap-Gate on Headwall

Figure 4.9: Typical Control Manhole with Sluice Gate

OUTFALL 7

Outfall 7 is an existing 24-inch diameter reinforced concrete pipe that discharges through a steel sheetpile bulkhead near Newport Landing. Much of the outfall structure is underwater, with an existing invert elevation of -0.50 ft. NAVD88; therefore, the condition of the underground culvert pipe could not be determined.

A 24-inch duckbill valve would be installed at the discharge end to prevent backflow from the Susquehanna River (Figure 4.7). In addition, as with Outfall 5, since the actual outfall is approximately 225.0 feet from the railroad embankment and the condition of the culvert is unknown, it is recommended that a secondary closure structure be constructed as close to the railroad embankment as possible. This secondary closure would include a 6.0 ft. by 6.0 ft. reinforced concrete manhole approximately 15.0 feet deep being constructed over the culvert riverside of the railroad. A 24-inch sluice gate or flap gate would be installed inside this manhole (Figure 4.9).

OUTFALL 9

Outfall 9, with an invert elevation of -2.0 ft. NAVD88, is an existing 6.5 ft. wide by 4.0 ft. high box culvert located near Tomes Landing. Because much of the outfall structure is underwater, the exact type and condition of the underground culvert pipe could not be determined. For the purposes if this study, it is assumed that the pipe is a reinforced concrete box culvert or similar material.

Preventing backflow from the Susquehanna River would be accomplished by adding a headwall to the existing Outfall 5 with a 6.5 ft. wide by 4.0 ft. high flap gate at the discharge end (Figure 4.8). In addition, as with Outfalls 5 and 7, since the actual outfall is approximately 225.0 feet from the railroad embankment and the condition of the culvert is unknown, it is recommended that a secondary closure structure be constructed as close to the railroad embankment as possible. In order to provide positive closure, an 8.0 ft. by 8.0 ft. reinforced concrete manhole approximately 15.0 ft. deep should be constructed over the culvert riverside of the railroad embankment. A 6.5 ft. wide by 4.0 ft. high sluice gate or flap gate would be installed inside the manhole (Figure 4.9).

OUTFALL 19

Outfall 19 is located near the Sunset North development. It is an existing 8.0 ft. wide by 5.0 ft. high box culvert. The invert is at an elevation of -2.20 ft. NAVD88. Preventing backflow from the Susquehanna River at Outfall 19 could be accomplished by adding a headwall with an 8.0 ft. wide by 5.0 ft. high flap gate at the discharge end. However, the construction appears to be of concrete block and not reinforced concrete and the invert appears to be natural stream bottom. At the time of field survey, woody debris and rocks were present in the culvert. The type and quality of construction, together with the possible natural invert and bed load raise concerns regarding the ability of a flap gate to seal properly and the structure to resist water pressure with the walls and invert. Therefore, this culvert should be replaced with a reinforced concrete box culvert with integral headwall and flap gate (Figure 4.8).

4.6 PUMPING PLAN FOR INTERIOR DRAINAGE

According to *USACE Engineering Manual (EM) 1110-2-1413, dated January 1987*, an interior area is defined as the area protected from direct riverine, lake, or tidal flooding by levees, floodwalls or seawalls and low depressions or natural sinks. The actions in the flood risk management plan will convert the existing Norfolk Southern railroad embankment into a levee system (line of protection) to reduce the risk of flooding to the landside areas. The line of protection blocks riverine flooding, but does not prevent, and sometimes aggravates, localized flooding in the interior areas from heavy rainfall events because the drainage outlets are now blocked (valves, flap gates, and closure structures). Thus, protected interior areas, formerly flooded by the river by slowly rising, less frequent regional storms may now be subject to flooding by more frequent, localized rainfall events if the river is at a high level.

With this flood risk management plan, an analysis of the risk of flooding from interior drainage was necessary to ensure that if a heavy rainfall were to occur during a flooding event on the Susquehanna River when all drainage outlets are blocked, that interior flooding from the heavy rainfall event would not cause damages to buildings. Therefore, this task involved (1) determining interior flood areas for several scenarios (riverine flood level vs. interior rainfall) with the actions outlined in the flood risk management plan in place and (2) if the flooding is significant (i.e. causing damages to buildings), developing a plan for locating and sizing pump stations to alleviate the interior flooding.

The interior drainage analysis is located in Appendix E of this report. The interior drainage analysis uses the results of the HEC-RAS modeling outlined in Appendix A (riverine flooding) with future-conditions XPStorm modeling (interior flooding). The probability of a significant riverine or coastal flood on the Susquehanna River occurring at the same time as a significant rainfall event in Port Deposit is low. These events can be considered independent, because the rainfall that would produce a high riverine flood on the Susquehanna River would occur in New York and Pennsylvania days or even a week prior to the localized, heavy rainfall event in Port Deposit.

Establishing these two events as independent allows simple calculation of the joint probability of these occurring simultaneously. When two events are independent, the probability of them both occurring together is the product of their probabilities. For example, the annual exceedence probability of a 10-year flood event occurring on the Susquehanna River is .10 (i.e., a 10% chance of this flood occurring in any given year). The annual exceedence probability of a 10-year rainfall occurring in Port Deposit is also .10-percent. The annual exceedence probability of these two events occurring together (i.e. joint probability) is .10 x .10, which equals .01, or a 100-year flood event (1% chance of occurring in any given year). Four events were analyzed in the interior drainage analysis, with two being used for the pumping plan (Scenarios 2 and 3, shown in Table 4.2). The 50-percent annual chance rainfall (2-year) used in the analysis was 3.27 inches during a 24-hour period and the 10-percent annual chance rainfall (10-year) is 4.99 inches over a 24-hour period.

Table 4.2: Scenarios used in Pumping Plan

Scenario	River Flood Annual Exceedance Probability (Flood Frequency)	Interior Rainfall Annual Exceedance Probability (Flood Frequency)	Joint Probability (Flood Frequency)
2	.10 (10-year, @ 31 Gates Open)	.10 (10-year)	.01 (100-year)
3	.0135* (80-year, 50 Gates Open)	.50 (2-year)	.00675 (148-year)

The results of the interior drainage analysis show ten distinct areas of interior flooding, named "interior flood areas" for the purposes of this study, and shown in Figure 4.10.

The goal of the pumping plan is simply to reduce the risk of damages to buildings as a result of interior flooding. Ponding of floodwaters on roadways is deemed acceptable. Based upon the results of the analysis, pumping would be required in order to keep buildings dry during Scenario 2 from interior flooding in Areas B, D, E, F, G, and the same for Scenario 3 with the addition of Area H. The approximate pumping rate required to meet the goal of this plan was determined for each of the identified areas.

Figure 4.10
Interior Flood Areas

The maximum pump rate determined in this analysis should be considered planning level and a conservative estimate of the ideal pump rate for an interior flood area. Many factors not included in the analysis should be considered when choosing a pump, including physical site constraints (access) and dynamic head. The estimated pump rates required for the interior flood areas are shown in Table 4.3.

Based upon the rates listed in Table 4.3, the results of the analysis show that the Town of Port Deposit should be prepared to mobilize numerous, small capacity portable pumps to interior flood areas B, D, E, F, G, and H to keep buildings dry during a heavy rainfall that occurs simultaneously with high flood stages on the Susquehanna River. No permanent pump station is required. The value in this analysis is to identify where in the Town emergency responders should mobilize for potential pumping rather than the rate of the pump. For costing purposes, it is assumed that these pumps would be readily available through local fire departments, the County Emergency Management Department, or State and/or Federal disaster preparedness teams, thus, no cost is included in this plan. However, the Town may consider purchasing one or several pumps in the future if coordination with these entities shows a lack of available pumps during an emergency.

Table 4.3: Estimated Pump Rate Required for Interior Flood Areas

Interior Flood Area	Estimated Maximum Pump Rate Required (gallons per minute)	
	Scenario 2	Scenario 3
B	100	160
D	700	1,200
E	700	3,000
F	160	300
G	700	2,500
H	n/a	900

4.7 PROJECT COST

A project cost estimate was developed for the flood risk management plan outlined in this report (Table 4.4). The base plan features include the Vannort Drive and Netters Alley closures, and the flap-gates or duckbill valves on stormwater outfalls. The slurry wall features include costs associated with the slurry wall, if required, based upon the results of the recommended geotechnical investigation.

All costs are in 2015 dollars and include a 30% contingency. Design and construction management costs were estimated based upon previous and similar USACE studies. Costs include all labor, materials, and mobilization and demobilization. The cost estimate for the Vannort Drive closure includes costs associated with the sanitary sewer replacement. Real estate costs (for easements) were not included.

Table 4.4: Estimated Project Costs

Base Plan Features	
Feature	Construction Cost (2015 Dollars)
Vannort Drive Closure[1]	$383,000
Netters Alley Closure[1]	$300,000
Outfall 5	$72,000
Outfall 7	$25,000
Outfall 9	$74,800
Outfall 19	$207,000
Duckbill Valves (Outfalls 3,4, 6, 16, 18, 20, 21, 23)	$421,000
Construction Cost	$1,482,000
Design Cost	$195,000
Construction Management	$100,000
Total Base Project Cost	**$1,757,000**
Slurry Wall Features	
Feature	Construction Cost
Slurry Wall[2]	$3,160,000-$5,190,000
Design Cost	$200,000
Construction Management	$200,000
Total Slurry Wall Cost	**$3,560,000-$5,590,000**

[1] *Cost of closure structures assumes level of protection to Agnes storm.*
[2] *Range of costs dependent on level of protection and specific site considerations. Further refinements to estimated costs required after geotechnical evaluation.*

4.8 IMPACTS OF PROJECT

Typically, the construction of a levee or floodwall within the floodplain can result in increases in flood elevations in upstream areas. The increase in flood elevations are caused by reducing the amount of area available for flood conveyance in the floodplain, thus contracting the floodplain in the location of the levee or floodwall, and causing higher flood elevations upstream. In Port

Deposit, the area behind the existing railroad embankment during existing-conditions flood scenarios is defined as an "ineffective flow area". Ineffective flow areas are locations where water will pond, but the velocity of that water in a downstream direction is close to or equal to zero. Thus, these areas have no floodwater conveyance. By blocking off the railroad embankment at Vannort Drive and Netters Alley with closure structures, and the stormwater outfalls with flap-gates or valves, the overall floodwater conveyance will not be reduced, and flood elevations will not increase in upstream areas.

4.9 NEXT STEPS

This flood risk management plan is the first step in identifying a potential solution to reduce the risk of flooding in Port Deposit. The next steps in the process are essential in order to continue the process to implementing the actions outlined in this plan.

COORDINATION

The Town of Port Deposit will need to coordinate with Norfolk Southern in order to present the results of this study. Currently, during flood events, the openings in the railroad, although letting flooding into the Town, also allows water to pond on both sides of the railroad embankment, equalizing the pressure on the railroad. By constructing the closure structures, this will put additional pressure on the riverside embankment, potentially jeopardizing this asset, the railroad. The geotechnical investigation will clarify whether the existing railroad embankment can support the additional water pressure; however, Norfolk Southern would need to provide permissions to the Town in order to conduct the geotechnical investigation below and construct the actions outlined in this plan, in particular the potential slurry wall and closure structures.

GEOTECHINCAL INVESTIGATION

A geotechnical investigation should be performed along the Norfolk Southern railroad embankment. This investigation would include digging a series of test pits, trenches, or soil borings in the railroad embankment to determine the physical properties of the soil. Mechanical analysis (gradation) tests would be performed on soil samples as well as visual observations to determine whether or not the embankment could possibly serve as a water retaining levee without additional modifications. A seepage analysis may also be performed to verify that through seepage is not an issue and the risk of failure during an extreme event is very low. In addition, drive sample borings would be conducted at the location of the Vannort Drive and Netters Alley closures to serve for support of future designs of the closure structures. Identification tests would be performed on representative samples and final boring logs would be made. A report of findings will be prepared by a senior geotechnical engineer with recommendations for design requirements.

APPENDIX A

Riverine Hydraulic Analysis

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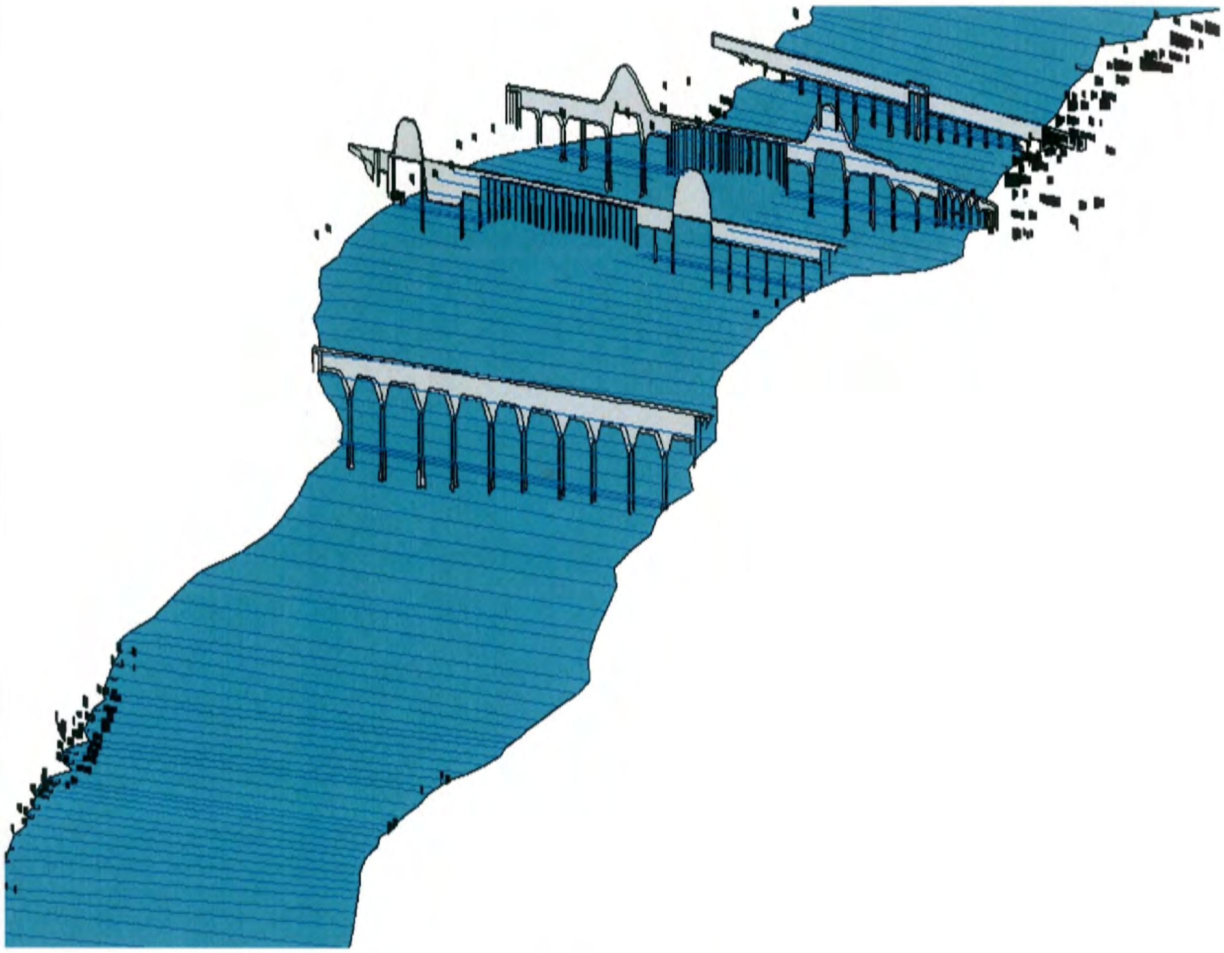
FLOOD RISK MANAGEMENT PLAN FOR THE TOWN OF PORT DEPOSIT, CECIL COUNTY, MARYLAND

APPENDIX A: RIVERINE HYDRAULIC ANALYSIS



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A.1 BACKGROUND

Hydraulic modeling was completed for the Susquehanna River from the Conowingo Dam downstream to the Chesapeake Bay (Figure A.1) in support of a flood risk management plan being completed by the U.S. Army Corps of Engineers (USACE), Baltimore District, for the Town of Port Deposit, Maryland. This purpose of the investigation, being completed under the USACE Floodplain Management Services Program (FPMS), was to (1) identify the flood risk in the Town of Port Deposit from riverine flooding from the Susquehanna River and (2) develop a plan that would mitigate the risk of damages to the Town from this flooding.

The hydraulic modeling was completed in order to identify the estimated water surface elevations in the Town of Port Deposit during various flow releases from the Conowingo Dam and tidal conditions on the Chesapeake Bay. The USACE HEC-RAS (River Analysis System), version 4.1, was used to develop a geo-referenced hydraulic model of the Susquehanna River from the Conowingo Dam downstream to the Chesapeake Bay. The HEC-GeoRAS pre- and post-processor utilities were used to assist in the development of cross-sections and the mapping of the floodplain.

A.2 PREVIOUS STUDIES

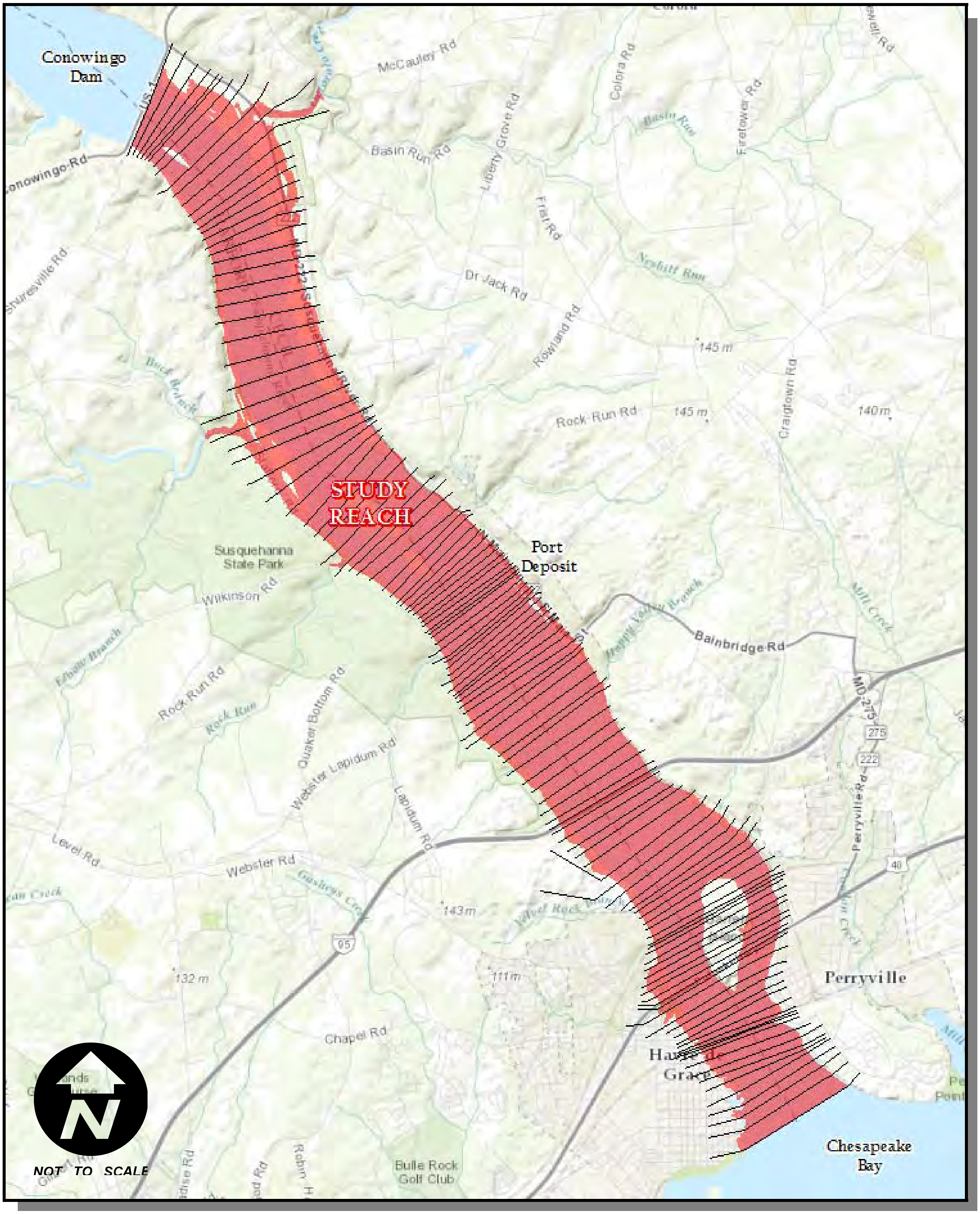
May 2015: Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for Cecil County, Maryland and Incorporated Areas

This study is used by FEMA to delineate the Special Flood Hazard Area (SFHA) on the effective Flood Insurance Rate Maps (FIRMs). Although the date of the study is 2015, the hydrologic and hydraulic analysis for the Susquehanna River was completed in August 1976 by the Susquehanna River Basin Commission (SRBC). Peak flow values for the Susquehanna River were determined by SRBC by extrapolating from discharge-frequency curves for Sunbury and Harrisburg, Pennsylvania. Water surface elevations for floods of selected recurrence intervals were computed by SRBC using the USACE HEC-2 step-backwater program, but did not include any bridge geometry.

August 2012: Final Study Report Effect of Project Operations on Downstream Flooding RSP 3.29, Conowingo Hydroelectric Project, FER Project No. 405

This study was completed by Gomez and Sullivan Engineers, P.C. for Exelon, the owners and operators of the Conowingo Dam. The purpose of the study was to determine how dam operations affect downstream flooding. As part of the study, a HEC-RAS model was developed for the Susquehanna River that extends from approximately 1,350 feet upstream of the Holtwood Dam to the mouth of the Susquehanna River, but did not include any geometry for the bridges crossing the river. The model was calibrated to several storms and includes flow values computed from the dam's OASIS operations model.

Figure A.1: Riverine Hydraulic Analysis Study Reach



July 2010: Millard E. Tydings & Thomas J. Hatem Memorial Bridges Over the SusquehannaRiver Hydraulic and Scour Analysis Report

This study was completed by STV, Inc. and was provided to USACE by the Maryland Transportation Authority (MTA). The study consisted of hydraulic and scour analyses to determine the potential scour for the Tydings and Hatem Bridges. This was done in accordance with Federal Highway Administration (FHWA) and Maryland State Highway Administration (MSHA) requirements for bridge scour evaluations in order to determine the scour critical ratings for the proposed conditions at each bridge and make recommendations with regard to any required scour countermeasures. The USACE HEC-RAS, Version 4.0 program was used for the one-dimensional unsteady flow hydraulic model and to compute the hydraulic variables necessary for the scour analysis. The geometry did include information for all the bridges that cross the Susquehanna River.

All three of these studies were obtained and reviewed prior to initiating this project. It was determined that the geometry data from the effective FEMA FIS (actual study date of 1976) was out of date based upon the bathymetric and topographic data available at the present time and it does not include bridge geometry. The August 2012 Exelon study and the July 2010 MTA studies both were focused on specific flooding conditions. August 2012 Exelon study was focused on larger, less frequent flood events, including dam breaks, and did not include bridge geometric data. It also was done prior to the September 2011 flooding and was not able to utilize high water marks from that event. The July 2010 MTA study was focused on smaller, scour causing events, did include bridge data, but lacked the detail in geometry in the floodplain areas. Because of these issues, it was determined that new HEC-RAS geometry, that contains the bridge data and utilizes the best available bathymetric and topographic data, was warranted to support the flood risk management study in Port Deposit.

A.3 HYDRAULIC MODEL DEVELOPMENT-GEOMETRY

The development of the HEC-RAS model included first assembling the geometric file, and adding flow data from known flood events to calibrate the geometry file. Therefore, two geometry files exist. "*SusquehannaRiver_Calibration*" is geometry calibrated to high water marks and other historical information. After calibration, "*SusquehannaRiver_ExistingConditions*" was developed, which is the same as the calibrated geometry but without the high water mark notes in the description boxes.

Topographic Data

Cross-sections in the HEC-RAS model were developed using various sources. For the overbank areas, elevation data was obtained from a digital elevation model (DEM) obtained for Cecil County and Harford County. These DEMs were developed by Maryland Department of Natural Resources (MDNR), were created at a resolution of 2.0 meters (Cecil County) and 1.2 meters (Harford County), and are dated 2005 and 2013, respectively. The Cecil County and Harford County DEMs were merged together to create a DEM specifically for this project, which is at a resolution of 2.0 meters.

Bathymetry data for the Susquehanna River, or the "wet" portion of the cross-sections, was obtained from various sources. These sources included: Cecil County Office of Planning & Zoning; a bridge scour analysis for Millard E. Tydings & Thomas J. Hatem Memorial Bridges; and underwater investigations for the AMTRAK railroad bridge.

Further detail in the cross-sections was obtained through a USACE field survey in January 2014. This survey included capturing locations and elevations of various seawalls along the Susquehanna River and top of railroad elevations in the Town of Port Deposit.

Cross-sections (XS) were spatially referenced using the HEC-GeoRAS pre-processor in feet upstream of the confluence with the Chesapeake Bay. Therefore, XS 43651 is located 43,651 feet upstream of the confluence with the Chesapeake Bay.

<u>Bridges</u>

There are a total of four bridges included in the HEC-RAS model. These bridges, and the source of hydraulic data (elevations, pier shapes, opening lengths, etc…) for each bridge, are listed in Table A.1.

Table A.1: Bridges in the Susquehanna River HEC-RAS Model

HEC-RAS Station	Name	Data Source	Date
17108	U.S. Route 95 (Millard E. Tydings Memorial Bridge)	*Millard E. Tydings & Thomas J. Hatem Memorial Bridges Over the Susquehanna River Hydraulic and Scour Analysis Report*, provided by STV, Inc.	July 2010
10707	CSX Railroad Bridge	As-Built Plans provided by CSX	Various
8409	U.S. Route 40 (Thomas J. Hatem Memorial Bridge)	*Millard E. Tydings & Thomas J. Hatem Memorial Bridges Over the Susquehanna River Hydraulic and Scour Analysis Report*, provided by STV, Inc.	July 2010
5738	AMTRAK Bridge	As-Built Plans provided by AMTRAK	Various

The low flow bridge modeling approach used for all bridges included computations for energy and momentum, with the highest energy answer being used by the program. For the momentum equation, the appropriate drag coefficient was selected based upon the representative shapes of the piers on the bridge. A high flow method or "energy only" was used for all bridges since the bridge decks are so high that pressure or weir flow would not be possible. Contraction and expansion coefficients were left at the default value of .1 and .3, respectively due to the lack of contraction and expansion effects these high bridges have on the floodplain.

Manning's Roughness Values

Field observations and high-resolution aerial photographs were used to select initial (pre-calibration) Manning's roughness coefficients ("*n*" values) for energy (friction) loss calculations. Initial runs of the model using only horizontally varying "n" values compared well with the high water marks from Lee in September 2011. However, once flow and high water mark data from Agnes in 1972 were entered into the model and run, the model results computed significantly higher water surface elevations than the elevations of the observed high water marks. It was determined that the friction loss is less once flow has increased to a point where water surface elevations are over natural obstructions, such as islands in the channel. Therefore, vertical variations in "n" values were input into the model at select reaches using the "Flow Roughness Factors" tool in HEC-RAS. Table A.2 shows the changes in channel n values for the reaches of the HEC-RAS model between the base channel and higher flow events.

Table A.2: Vertical Variations in Channel n Values for Susquehanna River

Reach (HEC-RAS XS)	Base Channel n	Channel n at Lee Flow (668,050 cfs)	Channel n at Agnes Flow (1,130,000 cfs)
52605-49048	0.038	0.018	0.020
48451-35118	.040-.048	.031-.037	.026-.031
34513-28450	0.038	0.024	0.024
28192-25969	.043-.047	.043-.047	.026-.028
25808-13523	.038-.043	.024-.027	.018-.019
13036-1409	0.030	0.021	0.015

For the overbank areas, n values ranged from .013 for concrete areas, 0.12 for heavily wooded areas, and 0.20 for areas with buildings. These values would also be subject to the multipliers assigned in the flow roughness factor tool.

For Reach 52605-49048, the channel n value slightly increases during flows above approximately 550,000 cfs. This slight increase was to obtain a more precise calibration to Rating Curve 4.2 at USGS 01578310, which is located at XS 52605 (discussed further below). This slight increase could be attributed to the operation of the dam or flow discrepancy issues at the gage, which is discussed in Section A.4. For Reach 28192-25969, the channel n value slightly decreases below flows of approximately 466,000 cfs to obtain a more precise calibration to Lee high water marks and avoid crossing profiles.

Ineffective Flow Areas and Obstructions

Ineffective flow areas were set appropriately. Obstructions in the model represent single buildings that would occupy storage space for floodwaters or blocks of buildings in highly urbanized areas.

A.4 HYDRAULIC MODEL DEVELOPMENT-FLOW DATA

Flow

Flow data for input into the steady-state HEC-RAS model was provided by Exelon, the owners and operators of the Conowingo Dam. All flow into the Susquehanna River within the study reach is controlled by the operation of the Conowingo Dam. Based upon the August 2012 *Final Study Report Effect of Project Operations on Downstream Flooding RSP 3.29, Conowingo Hydroelectric Project, FER Project No. 405*, the water surface in the Conowingo Pond behind the dam is typically maintained at an elevation of 109.2 ft., which is considered normal pool. When inflow is above the projects generation capacity of 86,000 cfs, crest gates are opened to maintain the water at normal pond. The dam spillway has 50 crest gates which are opened and closed individually by three gantry cranes located permanently on the dam. Normally two gantry cranes are active, and each takes 7 minutes to open a gate. Each gate is 38 ft. wide by 22.5 ft. tall, with gate crest at an elevation of 86.7 ft. In addition to the crest gates, there are two 38 ft. wide by 10 ft. tall regulation gates at crest elevations of 98.5 ft. Once all gates are open, if the inflow into the pond is more than the outflow from the gates, the pond will rise in elevation.

For calibration, Exelon provided the flow information for Lee (September 2011) and Agnes (1972). During Lee, 43 gates were open, producing a peak flow of 665,000 cfs. During Agnes, all gates were open and the flow from the dam reached 1,130,000 cfs. Note that there is a United Stated Geological Survey (USGS) stream flow gage just downstream of the Conowingo Dam (USGS 01578310- SUSQUEHANNA RIVER AT CONOWINGO, MD). The gage recorded a peak flow value of 778,000 cfs for Lee, which is significantly higher than the flow provided by the dam. Through discussions with Exelon, it is believed that the USGS gage overestimated flows and there are questions with the upper end of the rating curve at the gage because it was based upon only one measurement which was taken during Agnes. In addition, the higher flow value does not fit with data from the dam spillway rating and the trend in flows from upstream gages. Because the dam is a partner with the Town of Port Deposit during flood emergencies and has better knowledge on the operations of the dam, it was determined that using the flow data provided by Exelon is appropriate for this investigation.

For existing-conditions modeling, Exelon provided a gate-flow data table to correlates the amount of flow exiting the dam to the number of gates open and all gate open scenarios. This flow data, shown on Table A.3, was used in the HEC-RAS modeling flow files with several different downstream boundary conditions.

Downstream Boundary

For the calibration flow file, the downstream boundary condition was set at 0.77 ft. NAVD88, which corresponds to the estimated elevation of the tide during Lee. This was interpolated based upon National Oceanic and Atmospheric Administration (NOAA) on-line tide data. For Agnes, this elevation was deemed acceptable as well, since tide elevation has minimal effect on flood elevations for such a high flow event.

Table A.3: Input Flow Data for Susquehanna River HEC-RAS Modeling

Scenario (Gates Open)	Flow (cfs)	Scenario (Gates Open)	Flow (cfs)	Scenario (Gates Open)	Flow (cfs)
0 _Gen	75,000	8_NoGen	125,000	15_Gen	310,000
1_NoGen	15,000	8_Gen	200,000	16_NoGen	250,000
1_Gen	90,000	9_NoGen	140,000	16_Gen	325,000
2_NoGen	30,000	9_Gen	215,000	17_NoGen	265,000
2_Gen	105,000	10_NoGen	155,000	17_Gen	340,000
3_NoGen	45,000	10_Gen	230,000	18_NoGen	280,000
3_Gen	120,000	11_NoGen	170,000	18_Gen	355,000
4_NoGen	60,000	11_Gen	245,000	19_NoGen	295,000
4_Gen	135,000	12_NoGen	185,000	19_Gen	370,000
5_NoGen	80,000	12_Gen	260,000	20_Gen	310,000
5_Gen	155,000	13_NoGen	200,000	20_NoGen	385,000
6_NoGen	95,000	13_Gen	275,000	21	325,000
6_Gen	170,000	14_NoGen	215,000	22	340,000
7_NoGen	110,000	14_Gen	290,000	23	355,000
7_Gen	185,000	15_NoGen	235,000	24	370,000

Table A.3: Input Flow Data for Susquehanna River HEC-RAS Modeling (Continued)

Scenario (Gates Open)	Flow (cfs)	Scenario (Gates Open)	Flow (cfs)	Scenario (Gates Open)	Flow (cfs)
25	390,000	38	590,000	50+2Reg	785,000
26	405,000	39	605,000	50+2Reg +0.5HW	815,000
27	420,000	40	620,000	50+2Reg +1.0HW	845,000
28	435,000	41	635,000	50+2Reg +1.5HW	875,000
29	450,000	42	650,000	50+2Reg +2.0HW	900,000
30	465,000	43	665,000	50+2Reg +2.5HW	930,000
31	480,000	44	685,000	50+2Reg +3.0HW	985,000
32	495,000	45	700,000	50+2Reg +3.5HW	1,000,000
33	510,000	46	715,000		
34	530,000	47	730,000	*Gen= Generation*	
35	545,000	48	745,000	*NoGen= No Generation*	
36	560,000	49	760,000	*2Reg=Regulation Gates Open*	
37	575,000	50	775,000	*HW=Headwater Depth on Pond*	

For the existing-conditions flow file, 28 different downstream boundary conditions were input into the model, leading to that many separate flow files. Thus, the flow file contains the flows listed in Table A.3, with a downstream boundary condition shown in Table A.4.

Table A.4: Downstream Boundary Conditions in HEC-RAS Model

Flow File	Elevation (feet NAVD88)	Description
f.01	-1.33	Mean Lower Low Water (MLLW)
f.02	-1.12	Mean Low Water (MLW)
f.03	-0.18	Mean Tide Level (MTL)
f.04	0.77	Mean High Water (MHW)
f.05	1.11	Mean Higher High Water (MHHW)
f.06	2.00	Tide Elevation of 2.0
f.07	2.70	Category 1 Hurricane Storm Surge (During Normal Tide)*
f.08	2.50	Tide Elevation of 2.5
f.09	3.00	Tide Elevation of 3.0
f.10	3.50	Tide Elevation of 3.5
f.11	4.00	Tide Elevation of 4.0
f.12	4.50	Tide Elevation of 4.5
f.13	4.70	Category 1 Hurricane Storm Surge (During High Tide)*
f.14	5.00	Tide Elevation of 5.0
f.15	5.30	FEMA 10-perecent annual chance storm surge elevation**
f.16	5.50	Tide Elevation of 5.5
f.17	6.00	Tide Elevation of 6.0
f.18	6.50	Tide Elevation of 6.5
f.19	6.67	Category 2 Hurricane Storm Surge (During Normal Tide)*
f.20	6.70	FEMA 2-perecent annual chance storm surge elevation**
f.21	7.00	Tide Elevation of 7.0
f.22	7.30	FEMA 1-perecent annual chance storm surge elevation**
f.23	7.50	Tide Elevation of 7.5
f.24	8.00	Tide Elevation of 8.0
f.25	8.50	Tide Elevation of 8.5
f.26	8.60	FEMA 0.2-perecent annual chance storm surge elevation**
f.27	9.00	Tide Elevation of 9.0
f.28	9.47	Category 2 Hurricane Storm Surge (During High Tide)*

**Based upon NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) model data.*
***Based upon effective FEMA FIS for Cecil County, Maryland*

The model was constructed in this steady-state environment to determine flood elevations for over 1,500 different scenarios on the Susquehanna River, ranging from highly probable events, such as normal dam operations with normal tidal conditions, to highly improbable events, such as 50 gates open during a Category 1 hurricane storm surge.

A.5 HYDRAULIC MODELING RESULTS

The data described above was input into the HEC-RAS model and 29 different plan files were created to compute water surface elevations for the calibration run and the 28 downstream boundary conditions scenarios.

Calibration

For the calibration plan, the geometry was calibrated to high water marks from Lee (Sept 2011) and Agnes (1972) as well as Rating Curve 4.2 at USGS 01578310, which is located at XS 52605. Results were also verified to the Town of Port Deposit Emergency Flood Information Plan.

High water marks for Lee were field surveyed by USACE in September 2013. A high water mark for Agnes was also field surveyed by USACE on an existing building in the Town of Port Deposit, and an additional high water mark was taken from the U.S. Route 95 bridge plans provided by MTA.

As shown on Table A.5, the computed water surface elevations from the HEC-RAS model are within +/- 0.4 feet for both Lee and Agnes.

Table A.5: Calibration Results for Lee and Agnes

HEC-RAS XS	High Water Mark Type	Observed WSE (ft. NAVD88)	Computed WSE (ft. NAVD88)	Difference (ft.)
Lee (September 2011)				
52605	Lee 2011: USGS Gage	34.9	35.0	0.1
30513	Lee 2011-USACE Field Survey	14.5	14.6	0.1
28192	Lee 2011-USACE Field Survey	12.9	13.0	0.1
27935	Lee 2011-USACE Field Survey	12.9	12.7	-0.2
27254	Lee 2011-USACE Field Survey	12.1	11.8	-0.3
27068	Lee 2011-USACE Field Survey	11.9	11.5	-0.4
26612	Lee 2011-USACE Field Survey	10.7	10.7	0.0
25610	Lee 2011-USACE Field Survey	9.6	9.9	0.3
23716	Lee 2011-USACE Field Survey	9.6	9.8	0.2
23377	Lee 2011-USACE Field Survey	9.5	9.8	0.3
22693	Lee 2011-USACE Field Survey	9.3	9.7	0.4
7546	Lee 2011-USACE Field Survey	6.4	6.4	0.0
6537	Lee 2011-USACE Field Survey	6.4	6.5	0.1
Agnes (June 1972)				
52605	Agnes 1972-USGS Gage	41.0	41.1	0.1
27068	Agnes 1972-USACE Field Survey	15.2	15.5	0.3
17228	Agnes 1972-MTA Bridge Plans	14.4	14.5	0.1

In addition to the high water marks for Lee and Agnes, the model was also calibrated at the upstream end to Rating Curve 4.2 at USGS 01578310. The results of the calibration at the gage are within +/- 0.2 ft. for 57 different flow/stage points (Table A.6)

Table A.6: Calibration at USGS 01578310 (HEC-RAS XS 52605)

Flow	Observed WSE (ft. NAVD88)	Computed WSE (ft. NAVD88)	Diff. (ft.)	Flow	Observed WSE (ft. NAVD88)	Computed WSE (ft. NAVD88)	Diff. (ft.)
90,000	20.7	20.6	-0.1	465,000	31.5	31.4	-0.1
105,000	21.4	21.3	-0.1	480,000	31.8	31.7	-0.1
120,000	22.1	22.0	-0.1	495,000	32.1	32.0	-0.1
135,000	22.7	22.7	0.0	510,000	32.4	32.3	-0.1
155,000	23.5	23.5	0.0	530,000	32.7	32.6	-0.1
170,000	24.0	24.1	0.1	545,000	33.0	32.8	-0.2
185,000	24.6	24.6	0.0	560,000	33.2	33.0	-0.2
200,000	25.0	25.1	0.1	575,000	33.5	33.3	-0.2
215,000	25.5	25.5	0.0	590,000	33.7	33.7	0.0
230,000	26.0	26.0	0.0	605,000	34.0	34.0	0.0
245,000	26.4	26.4	0.0	620,000	34.2	34.2	0.0
260,000	26.8	26.9	0.1	635,000	34.5	34.5	0.0
275,000	27.2	27.3	0.1	650,000	34.7	34.8	0.1
290,000	27.6	27.7	0.1	665,000	34.9	35.0	0.1
310,000	28.2	28.2	0.0	685,000	35.2	35.4	0.2
325,000	28.5	28.6	0.1	700,000	35.5	35.6	0.1
340,000	28.9	29.0	0.1	715,000	35.7	35.9	0.2
355,000	29.3	29.3	0.0	730,000	35.9	36.1	0.2
370,000	29.6	29.6	0.0	745,000	36.1	36.3	0.2
385,000	29.9	29.9	0.0	760,000	36.3	36.4	0.1
325,000	28.5	28.6	0.1	775,000	36.5	36.6	0.1
340,000	28.9	29.0	0.1	800,000	36.9	36.8	-0.1
355,000	29.3	29.3	0.0	850,000	37.6	37.4	-0.2
370,000	29.6	29.6	0.0	900,000	38.2	38.1	-0.1
390,000	30.0	30.0	0.0	950,000	38.8	38.8	0.0
405,000	30.4	30.3	-0.1	1,000,000	39.4	39.4	0.0
420,000	30.7	30.6	-0.1	1,050,000	40.0	40.0	0.0
435,000	31.0	30.8	-0.2	1,130,000	41.0	41.1	0.1
450,000	31.3	31.1	-0.2				

Existing-Conditions

Because over 1,500 scenarios can be run in the HEC-RAS model, a summarization of the results is not possible. In order to assist users of the model in reviewing the results, USACE is in the process of developing a flood inundation mapping and interactive Geographic Information System (GIS) application for the Susquehanna River to view the results of the analysis. It is anticipated that the application will enhance the Conowingo Dam and Port Deposit's emergency action flood plan by allowing the user to review the inundation areas and associated flood depths for user-defined conditions. The user-defined conditions include a downstream tide elevation (ranging from Mean Lower Low Tide, MLLW to a tide elevation of 5.0 ft.) and the number of open gates at Conowingo Dam. This application will likely be completed within one year of the date of this report.

The tide level has an impact on the flood elevations in Port Deposit during a riverine event, with the impact being less the higher the flows exiting the dam. Table A.7 shows that during a lower flow flood, with 25 gates open, the difference in flood elevations if the flood were to occur during a MLLW tide or a MHHW tide is 1.0 ft. For a higher flow event, such as 50-gates open, this range is reduced to 0.3 ft.

Table A.7: Tidal Impacts on Flood Elevations in Port Deposit

Scenario	Flow (cubic feet per second)	Flood Elevation (feet NAVD 88) at HEC-RAS XS 26914			Range (ft.)
		MLLW (-1.33 ft.)	Mean Tide Level (-0.18 ft.)	MHHW (1.11 ft.)	
25 Gates	390,000	6.5	6.9	7.5	1.0
30 Gates	465,000	7.7	8.1	8.6	0.9
43 Gates (Lee)	665,000	10.9	11.1	11.4	0.5
50 Gates	775,000	11.0	11.2	11.3	0.3

A.6 FEMA MULTIPLE FREQUENCY AND FLOODWAY ANALYSIS

At the request of FEMA Region III, the HEC-RAS model developed in this investigation was used to run a multiple-frequency and floodway encroachment analysis to be used for future updates to the effective FEMA Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) for Cecil and Harford Counties in Maryland.

Hydrology

The effective FEMA peak flows listed in Summary of Discharges table in the effective FEMA FIS for Cecil County and Incorporated Areas, dated May 4, 2015, were computed by extrapolation from discharge frequency curves from Sunbury (USGS 01554000) and Harrisburg (USGS 01570500), Pennsylvania. Although the date of the FIS is 2015, the actual hydrologic analysis was completed using data no later than water year 1976. The effective 1-percent annual chance flood peak flow is 780,000 cfs.

A more recent analysis of peak flow frequency for the Susquehanna River downstream of the Conowingo Dam was completed by Gomez & Sullivan in August 2012 (*Final Study Report Effect of Project Operations on Downstream Flooding RSP 3.29, Conowingo Hydroelectric Project, FER Project No. 405*). Although this study is dated after Lee in 2011, the actual hydrologic analysis, which was done using flow proration from a frequency analysis of an upstream USGS gage in Harrisburg (USGS 01570500), did not include the peak flow from Lee in September 2011. This method was used instead of a flow frequency analysis at USGS 01578310 (Conowingo Dam) because that gate only has 42 years of record, compared to the 111 years of record at the Harrisburg gage This proration was similar to the methodology used in the effective FEMA FIS. It was determined in this analysis that the flows at the Conowingo Dam (drainage area = 27,100 square miles) are 1.078 times the flow at the Harrisburg gage (drainage area= 24,100 square miles). The 1-percent annual chance flood peak flow from the Gomez & Sullivan study is 815,000 cfs.

For this FEMA multiple frequency and floodway analysis, revised estimations of the required peak flows is warranted since the effective FEMA FIS and Gomez & Sullivan analyses did not include the flow from Lee in September 2011, which was the second highest recorded flow on the Susquehanna River. As part of the report titled "*Flood Recovery Report Tropical Storm Lee-Wyoming Valley*", completed by USACE for FEMA in June 2013, USGS provided a revised flood-frequency analysis for USGS 01570500 in Harrisburg. This revised flood frequency analysis was completed after and includes the flow from Lee in September 2011. Using the flows at the Harrisburg gage provided by USGS and the multiplier of 1.078 from the Gomez & Sullivan report (which is similar methodology to the effective FEMA FIS), revised peak flows were determined for the study reach (Table A.8).

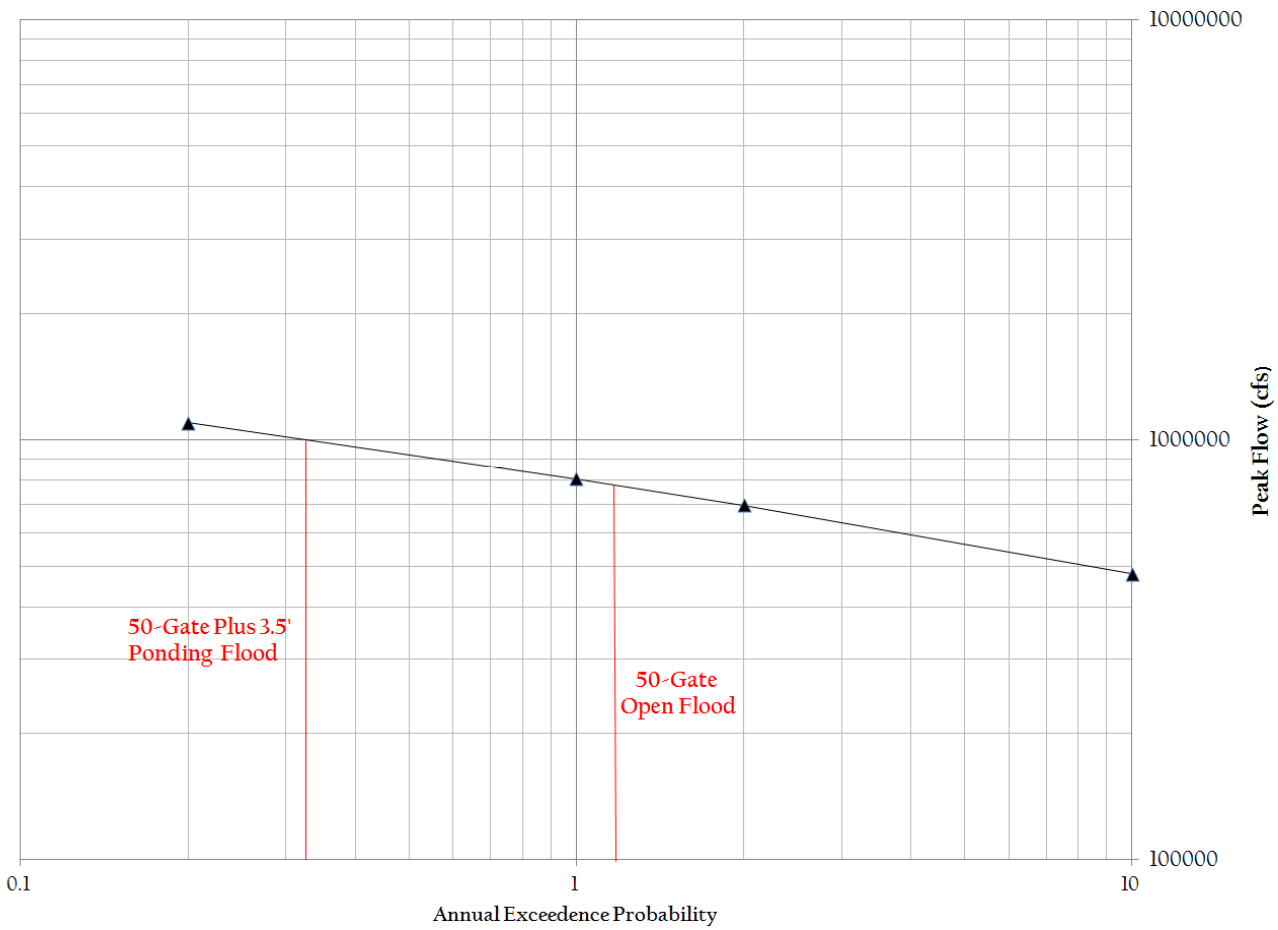
Table A.8: Revised Peak Flow Computations for Susquehanna River at Conowingo Dam

Annual Chance Flood	Peak Flow (cfs)	
	USGS 01570500 (Harrisburg)[1]	At Conowingo Dam[2]
10-percent	444,000	478,600
2-percent	647,000	697,500
1-percent	747,000	805,300
0.2-percent	1,020,000	1,099,600

[1] *From USGS Flood Frequency Analysis, Post Lee (September 2011)*
[2] *Computed using multiplier of 1.078 from Gomez & Sullivan and effective FIS studies*

The revised peak flows shown in Table A.8 at the Conowingo Dam are to be used as the existing-conditions peak flow and would replace the values listed on the Summary of Discharges table in the effective FIS for Cecil County, Maryland. A revised flood-frequency curve for the Susquehanna River from the Conowingo Dam downstream to the Chesapeake Bay is shown in Figure A.2

Figure A.2: Revised Flood-Frequency Curve for Study Area



Hydraulics

The existing-conditions geometry file in the HEC-RAS model developed for the flood risk management plan for Port Deposit was used along with a flow file containing the multiple frequency flows required by FEMA. All other plans were removed for the FEMA version of the model to avoid confusion. The downstream boundary condition for the FEMA model was set at MHHW (elevation 1.11 ft. NAVD 88) to be conservative.

The model contains, along with the calibration plan, "SusquehannaRiver_EffectiveFEMAFlows", which is a multiple profile run using effective FEMA flows from May 4, 2015 FIS. This represents the corrected effective model.

The plan titled "SusquehannaRiver_RevisedFrequencyFlows" is considered the existing-conditions plan because it uses the revised frequency flows listed in Table A.8. The results of the revised FEMA HEC-RAS model show differences in flood elevations for a 1-percent annual chance flood (or base flood elevation). The differences between the revised HEC-RAS model and the effective Cecil County FIS are shown in Table A.9.

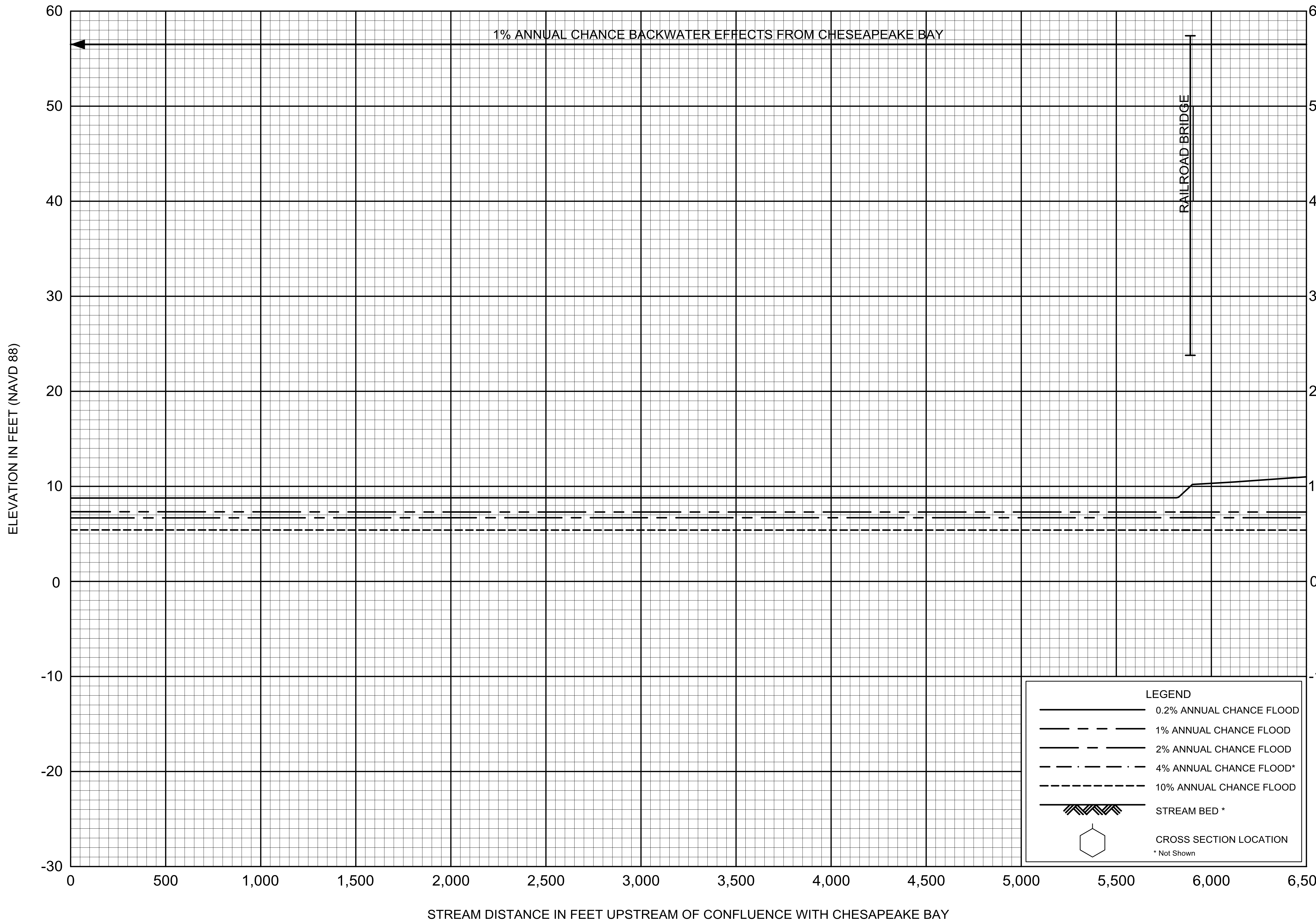
Table A.9: Revised vs. Effective FEMA 1-percent Annual Chance Flood Elevations

Effective XS (Lettered)	Revised HEC-RAS XS	Base Flood Elevation (feet NAVD88)		Difference
		Effective	Revised	
A	13036	7.6	8.6	+ 1.0
B	16998	8.8	9.2	+0.4
C	20276	9.8	10.6	+0.8
D	24045	10.5	11.0	+0.5
E	28192	11.6	13.6	+2.0
F	30078	13.4	14.8	+1.4
G	31115	14.3	15.9	+2.6
H	33864	14.9	17.4	+2.5
I	35118	16.4	18.2	+1.8
J	36970	17.3	20.6	+3.3
K	38935	21.4	23.7	+2.3
L	40648	23.1	25.5	+2.4
M	43651	25.5	29.3	+3.8
N	45920	26.7	31.8	+4.4
O	50261	29.4	34.1	+4.7
P	51469	33.6	35.7	+2.1
Q	52252	36.8	35.7	-1.1

The higher elevations can be attributed to several factors including (1) the use of higher peak flows, (2) more accurate topographic data, (3) the inclusion of the bridges, (4) calibration, and (4) exact cross-section correlation location.

A flood profile showing the revised flood elevations for the study area is shown in Figure A.3.

Figure A.3: Flood Profile for Susquehanna River (Panels 01P-09P)



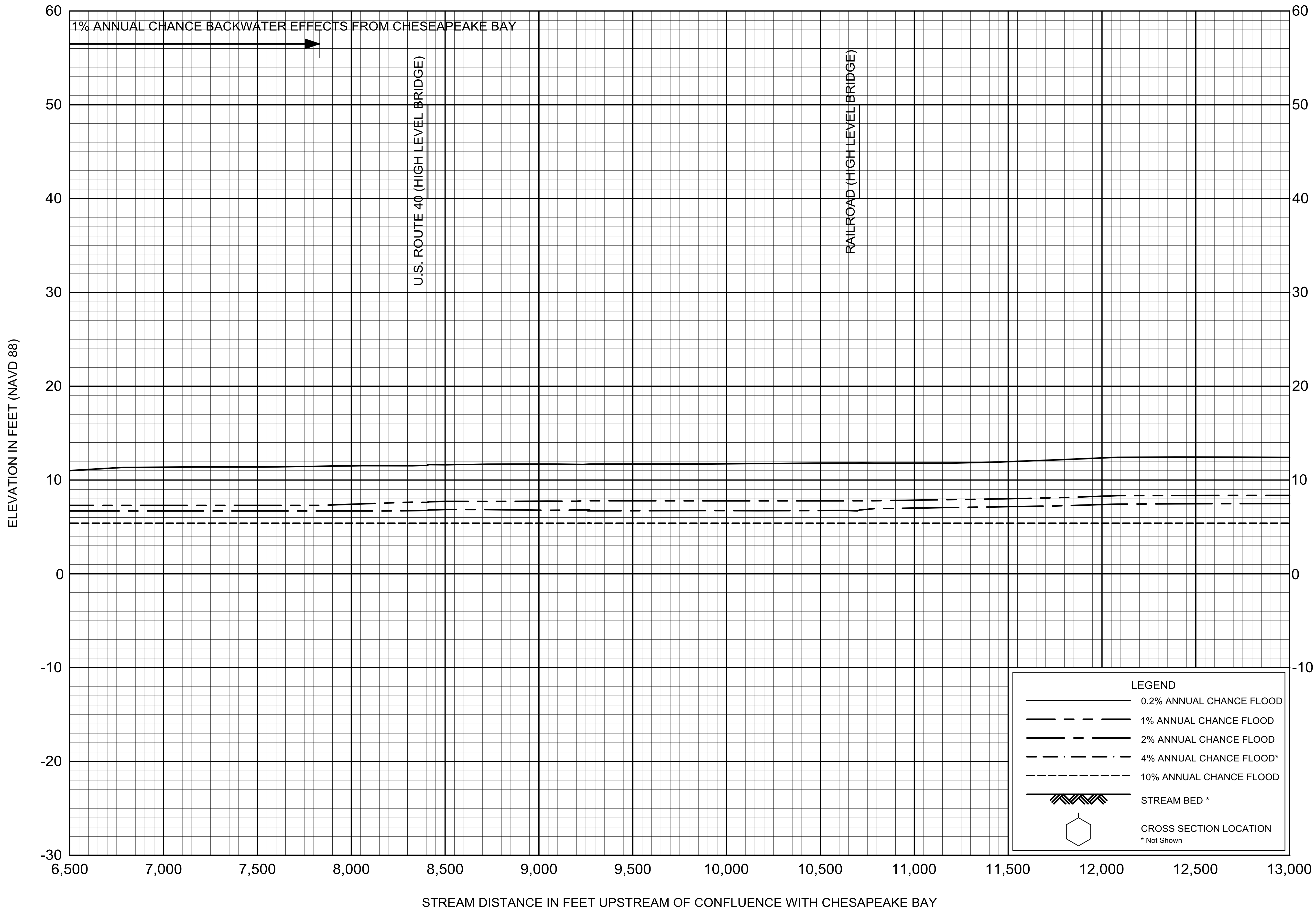
FLOOD PROFILES

SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGMENT AGENCY

CECIL COUNTY, MARYLAND

AND INCORPORATED AREAS



FLOOD PROFILES

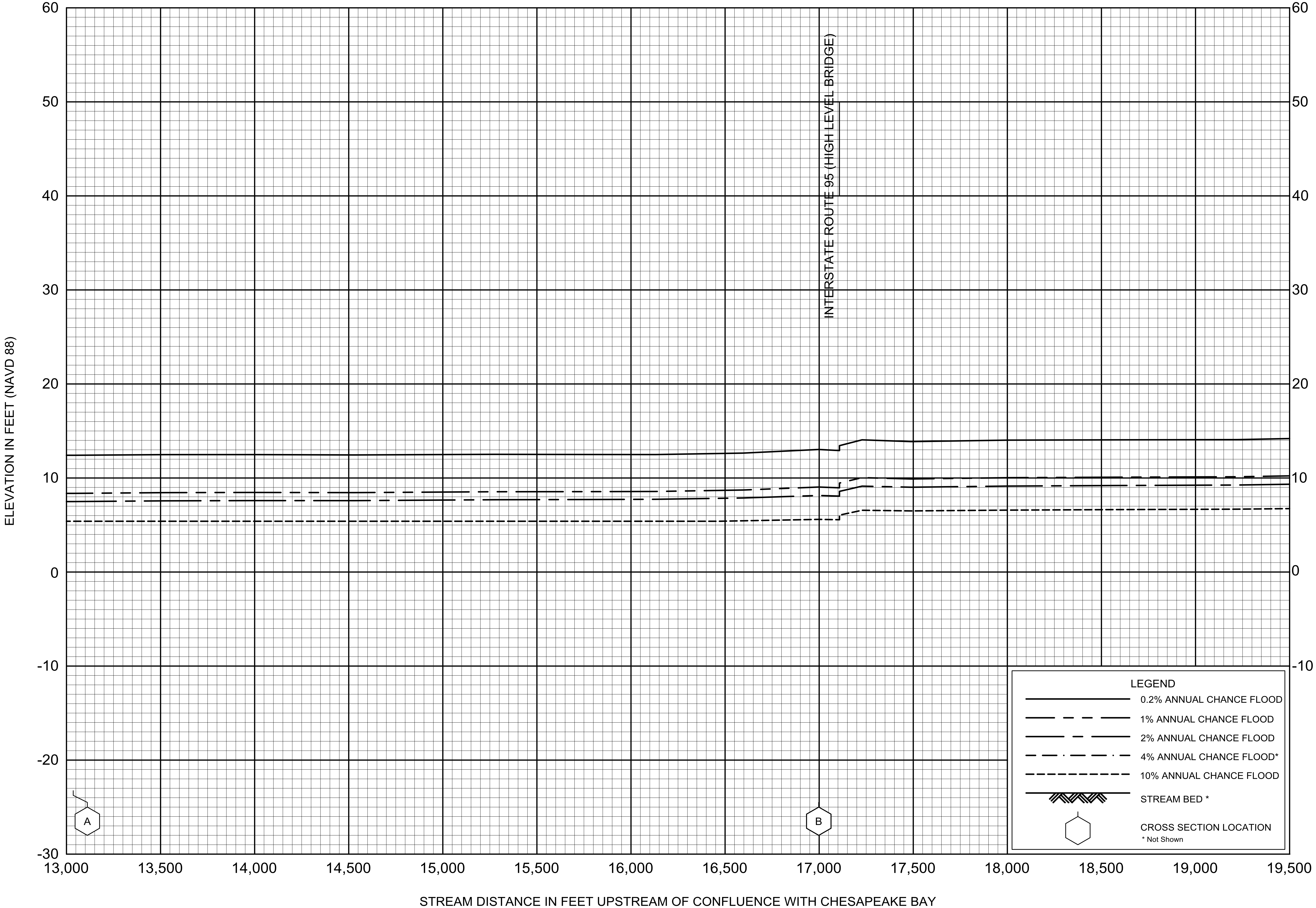
SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CECIL COUNTY, MARYLAND

AND INCORPORATED AREAS

02P



FLOOD PROFILES

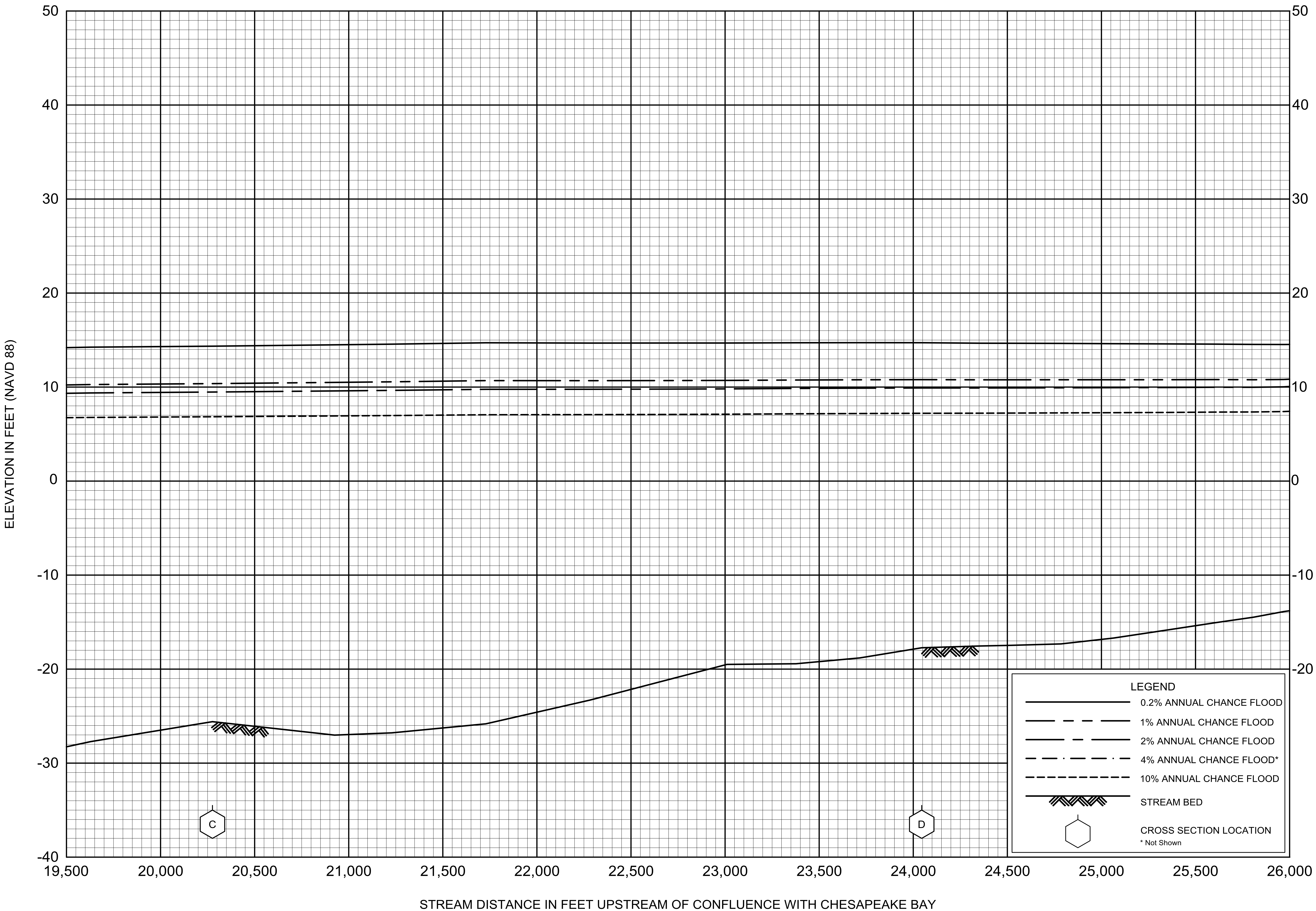
SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CECIL COUNTY, MARYLAND

AND INCORPORATED AREAS

03P



FLOOD PROFILES

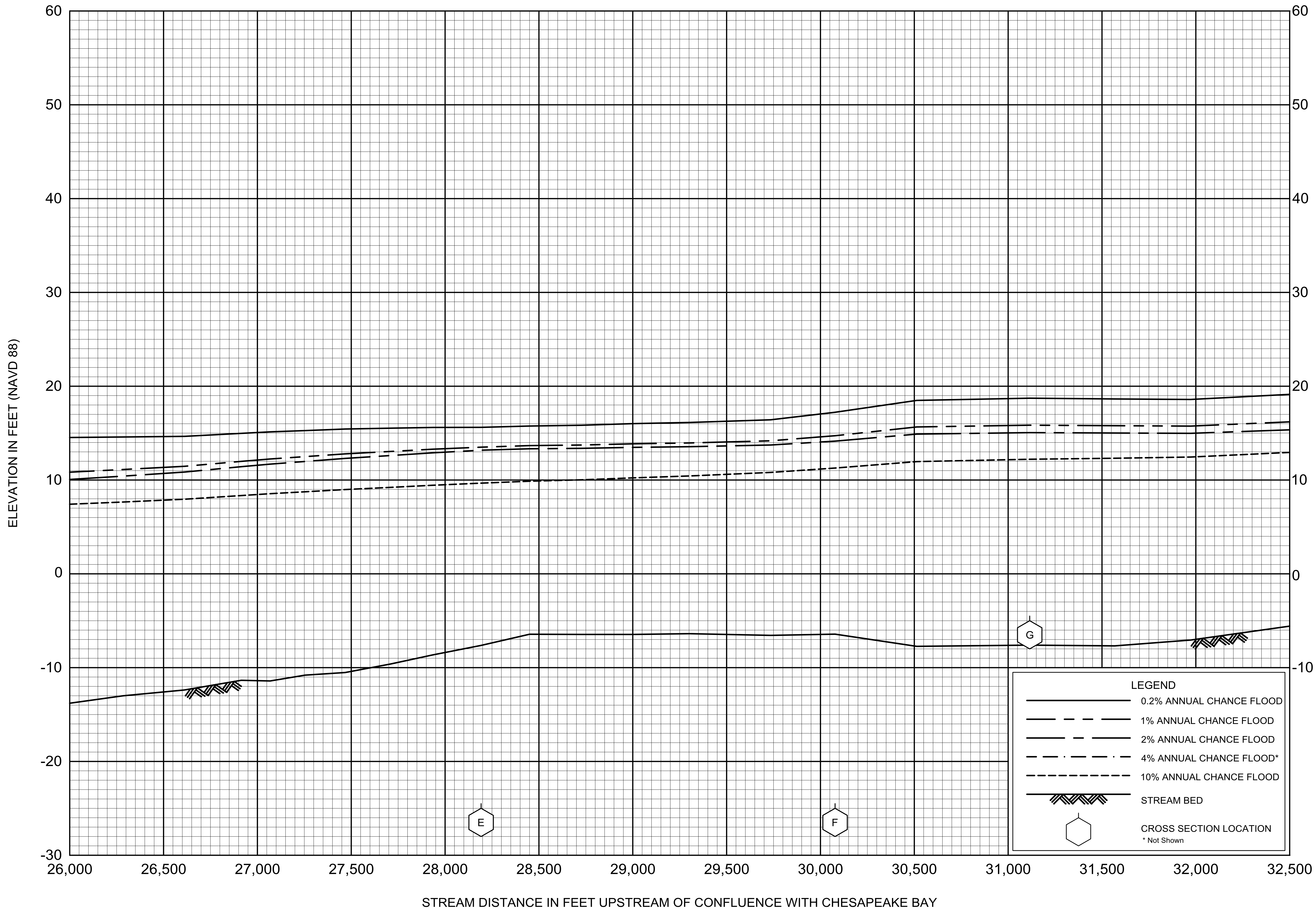
SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CECIL COUNTY, MARYLAND

AND INCORPORATED AREAS

04P



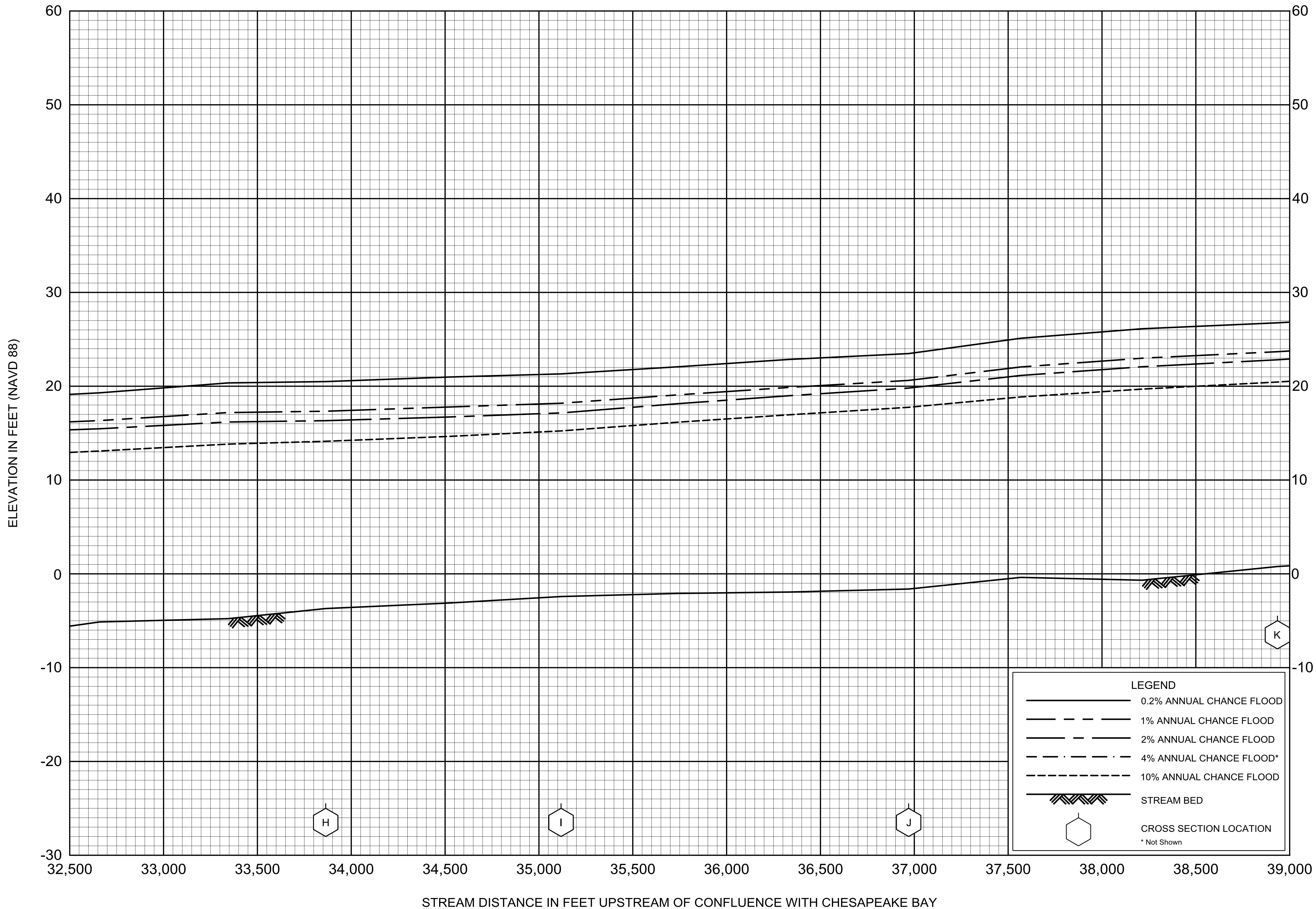
FLOOD PROFILES

SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CECIL COUNTY, MARYLAND

AND INCORPORATED AREAS



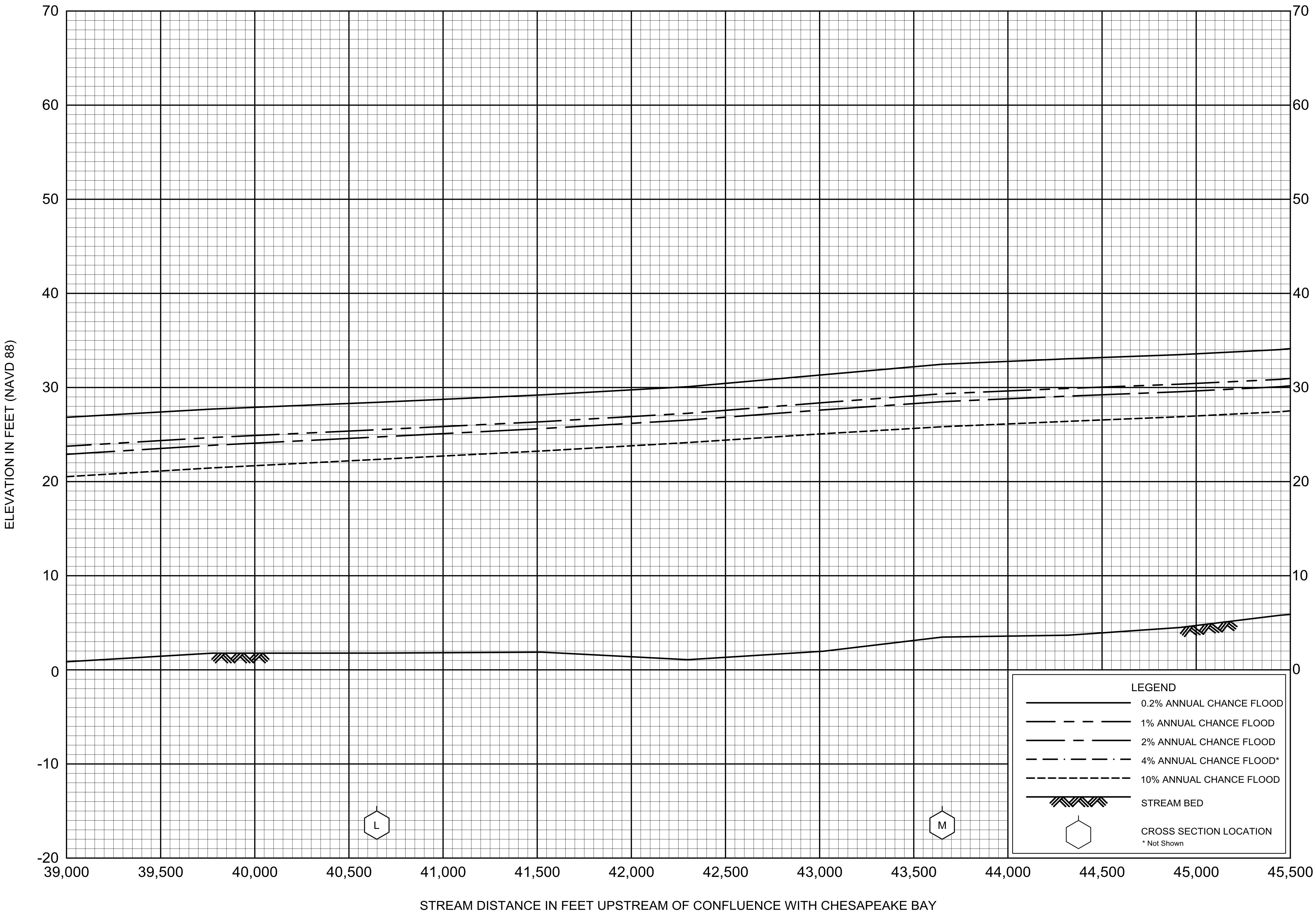
FLOOD PROFILES

SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CECIL COUNTY, MARYLAND

AND INCORPORATED AREAS



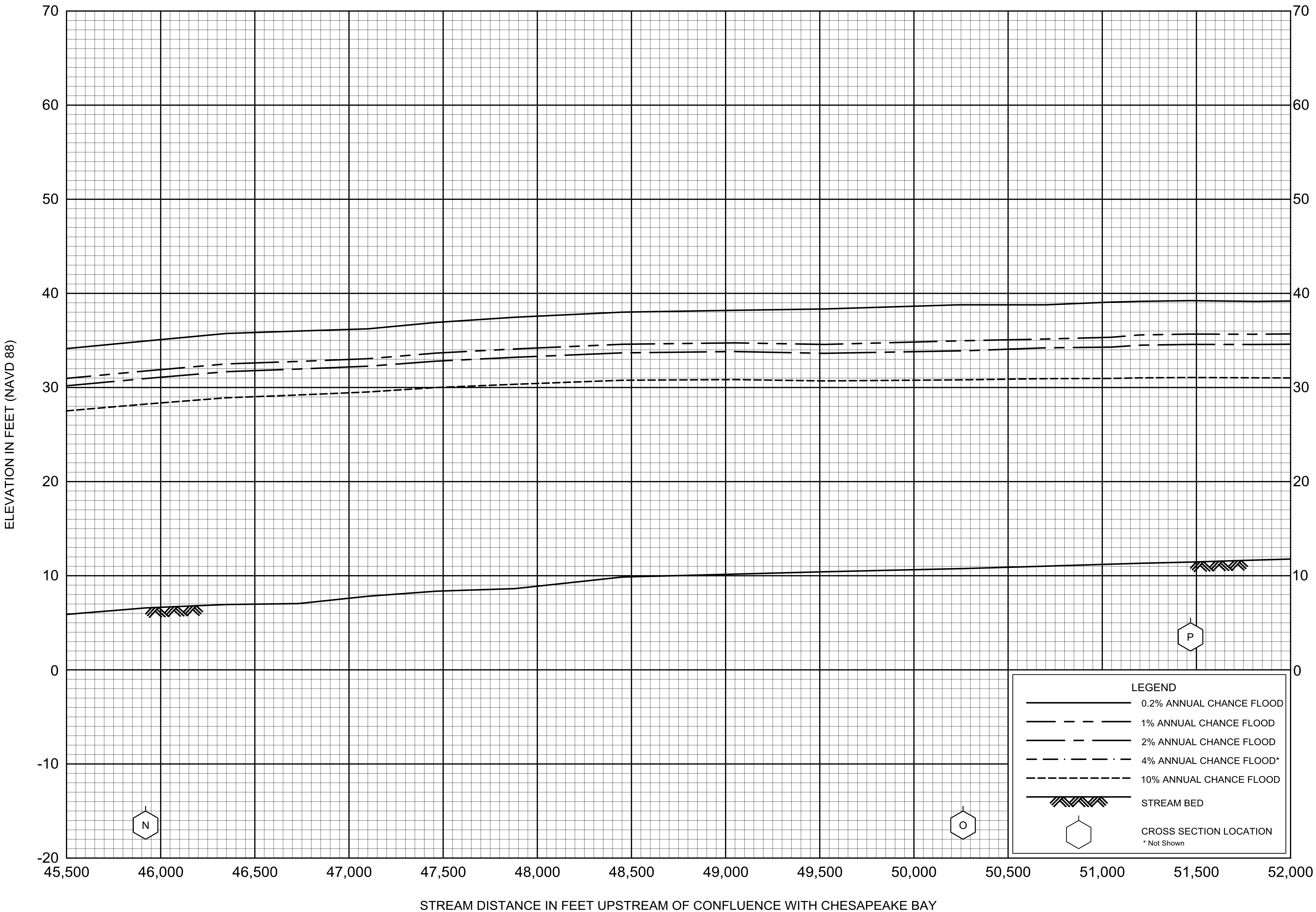
FLOOD PROFILES

SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CECIL COUNTY, MARYLAND

AND INCORPORATED AREAS



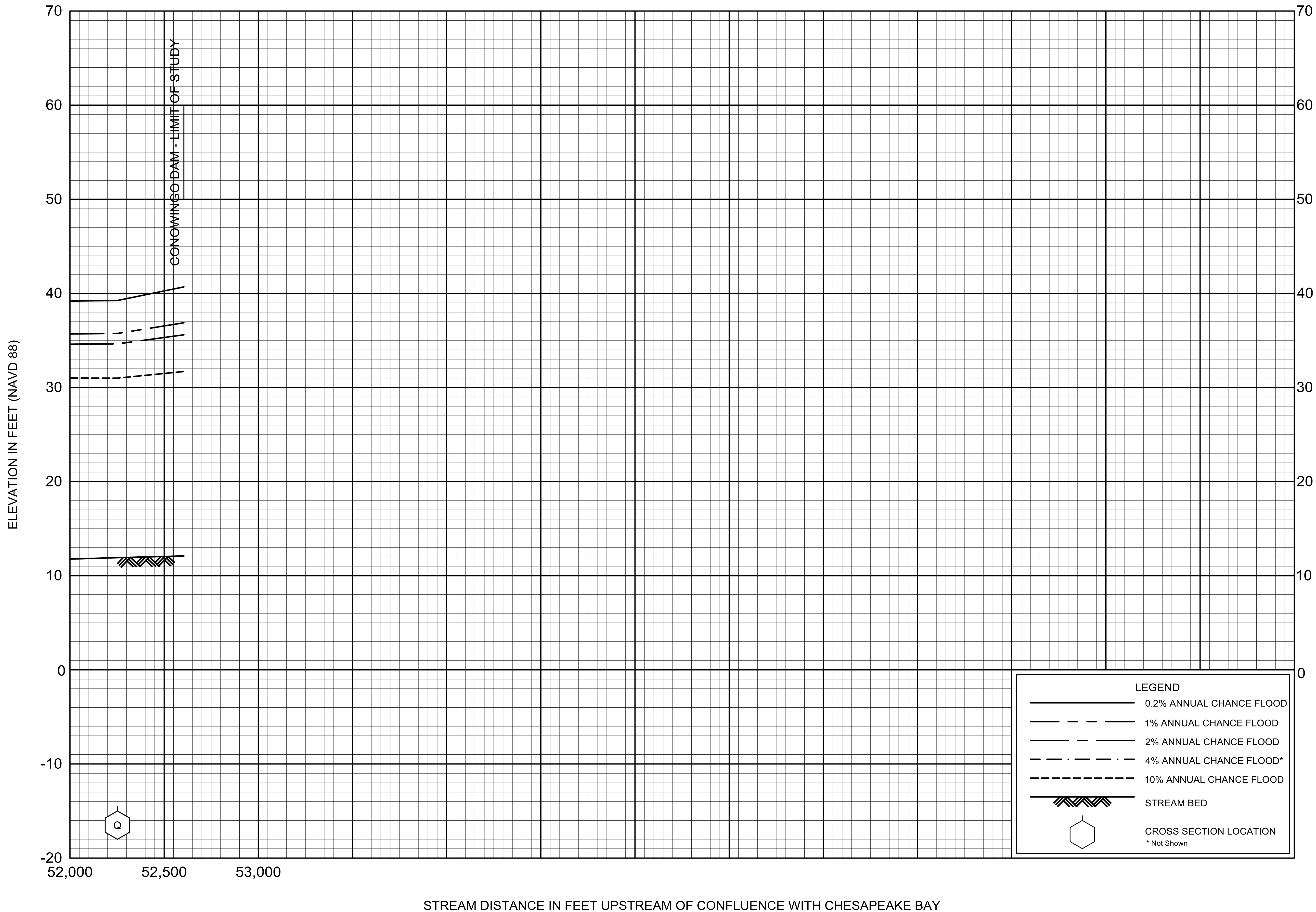
FLOOD PROFILES

SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CECIL COUNTY, MARYLAND

AND INCORPORATED AREAS



FLOOD PROFILES

SUSQUEHANNA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CECIL COUNTY, MARYLAND

AND INCORPORATED AREAS

09P

Floodplain Boundaries

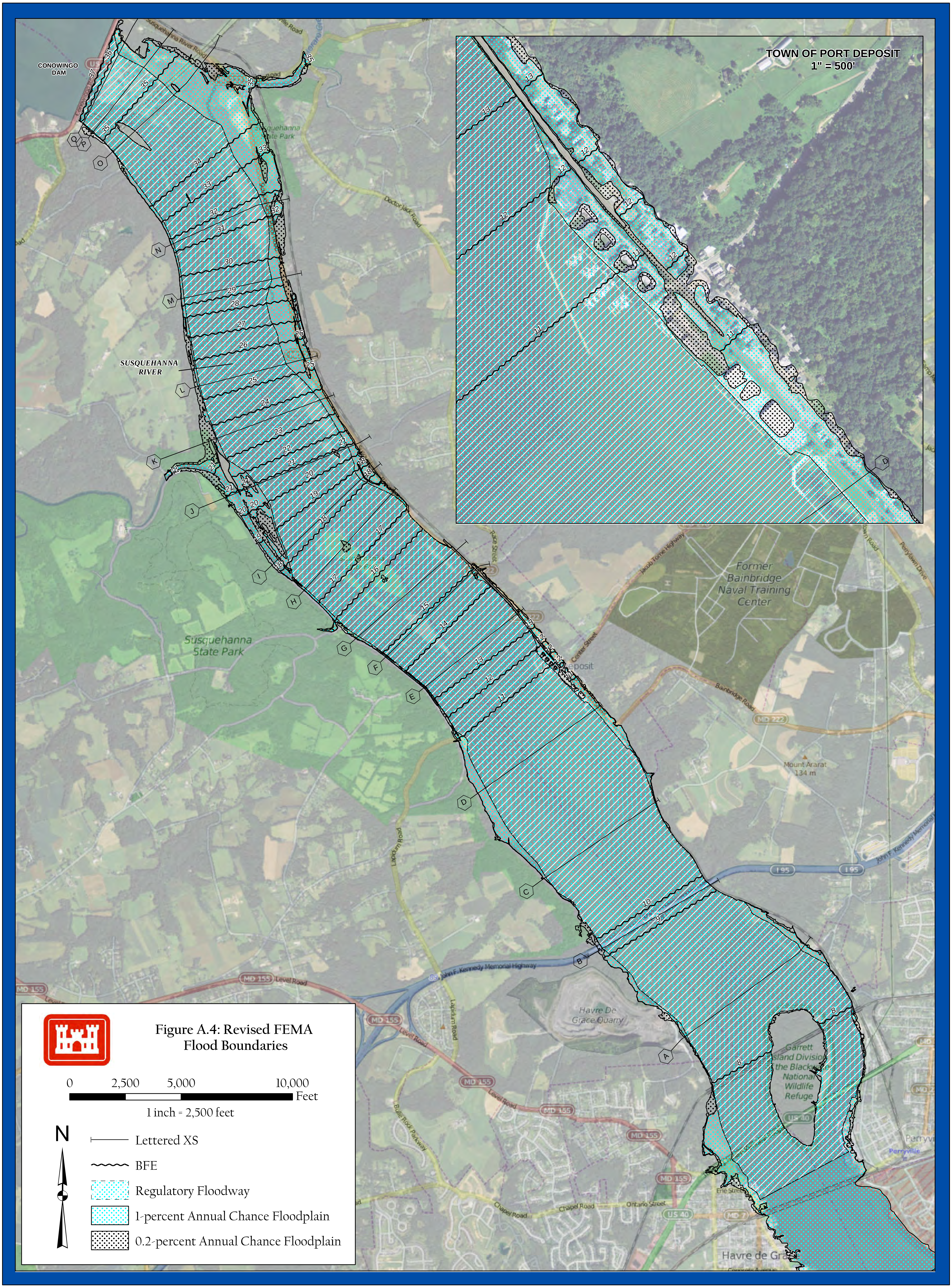
The results of the HEC-RAS modeling were used to create digital floodplain mapping for the 1-percent annual chance flood and the 0.2-percent annual chance flood. The HEC-GeoRAS post-processor and the DEM were used to delineate the floodplain boundaries. Floodplain mapping for the study area is shown in Figure A.4. GIS shapefiles showing the floodplain boundaries are located on the attached project disc, along with HEC-RAS shapefiles such as stream centerline, cross-sections, and flow paths.

Near XS 6537, the coastal 1-percent annual chance flood elevations become higher than the riverine, and near XS 5655, the 0.2-percent annual chance flood elevations become higher than the riverine. Therefore, the mapping was manipulated so that the revised floodplain ties into existing FEMA mapping. This existing FEMA mapping is the effective mapping for Cecil County and the preliminary mapping in Harford County. On tributaries entering the Susquehanna River, the flood mapping was not manipulated, meaning the areas shown are strictly backwater elevations from the Susquehanna River.

Regulatory Floodway

The FEMA regulatory floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 1-percent annual chance flood can be carried without substantial increases to flood heights. Section C.3.3.2 of FEMA's guidelines and specifications states that the effective regulatory floodway configuration should be maintained wherever possible; due to the significant changes in 100-year floodplain widths along the studied flooding sources, the effective floodway boundaries could not be maintained. Therefore, an existing-conditions floodway encroachment analysis was performed within the guidelines of Section C.3.2.2 of FEMA's guidelines and specifications. HEC-RAS was used to complete the floodway encroachment analysis. Method 4 in HEC-RAS was initially used to specify a target water-surface increase, which is 1-ft. Method 1 was then employed to further refine the floodway encroachment stations. A revised floodway data table for the study area is shown in Table A.10.

The regulatory floodway mapping starts at XS 6537. Areas downstream of this cross-section have a higher 1-percent annual chance flood elevation from coastal flood events.



TOWN OF PORT DEPOSIT
1" = 500'
CONOWINGO DAM
SUSQUEHANNA RIVER
Susquehanna State Park
Former Bainbridge Naval Training Center
Mount Ararat 134 m
Havre De Grace Quarry
Garrett Island Division of the Blackwater National Wildlife Refuge
Havre de Grace
Perryville
Figure A.4: Revised FEMA Flood Boundaries
0 2,500 5,000 10,000 Feet
1 inch = 2,500 feet
N
Lettered XS
BFE
Regulatory Floodway
1-percent Annual Chance Floodplain
0.2-percent Annual Chance Floodplain

Table A.10: Floodway Data Table

FLOODING SOURCE		FLOODWAY			1-PERCENT ANNUAL CHANCE FLOOD WATER SURFACE			
CROSS SECTION[1]	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (FT/SEC)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NAVD 88)			
Susquehanna River								
A	13036	4,859	115,304	7.0	8.6	8.6	8.6	0.0
B	16998	4,315	133,516	6.0	9.2	9.2	9.2	0.0
C	20276	4,578	122,373	6.6	10.6	10.6	10.6	0.0
D	24045	4,638	116,657	6.9	11.0	11.0	11.0	0.0
E	28192	4,021	78,960	10.2	13.6	13.6	13.6	0.0
F	30078	4,108	72,452	11.1	14.8	14.8	14.8	0.0
G	31115	4,438	87,071	9.2	15.9	15.9	16.0	0.1
H	33864	4,167	72,663	11.1	17.4	17.4	17.4	0.0
I	35118	3,584	67,351	12.0	18.2	18.2	18.3	0.1
J	36970	3,293	63,174	12.7	20.6	20.6	20.7	0.1
K	38935	3,800	72,506	11.1	23.7	23.7	23.8	0.1
L	40648	3,085	69,826	11.5	25.5	25.5	25.6	0.1
M	43651	3,100	74,687	10.8	29.3	29.3	29.5	0.2
N	45920	3,354	69,308	11.6	31.8	31.8	31.8	0.0
O	50261	2,535	57,065	14.1	34.1	34.1	34.3	0.2
P	51469	2,812	66,391	12.1	35.7	35.7	35.7	0.0
Q	52252	2,683	60,530	13.5	35.7	35.7	35.7	0.0

[1] *Feet upstream of confluence with Chesapeake Bay*

CECIL AND HARFORD COUNTIES, MARYLAND	FLOODWAY DATA
	SUSQUEHANNA RIVER

APPENDIX B

Existing-Conditions Stormwater Survey Data

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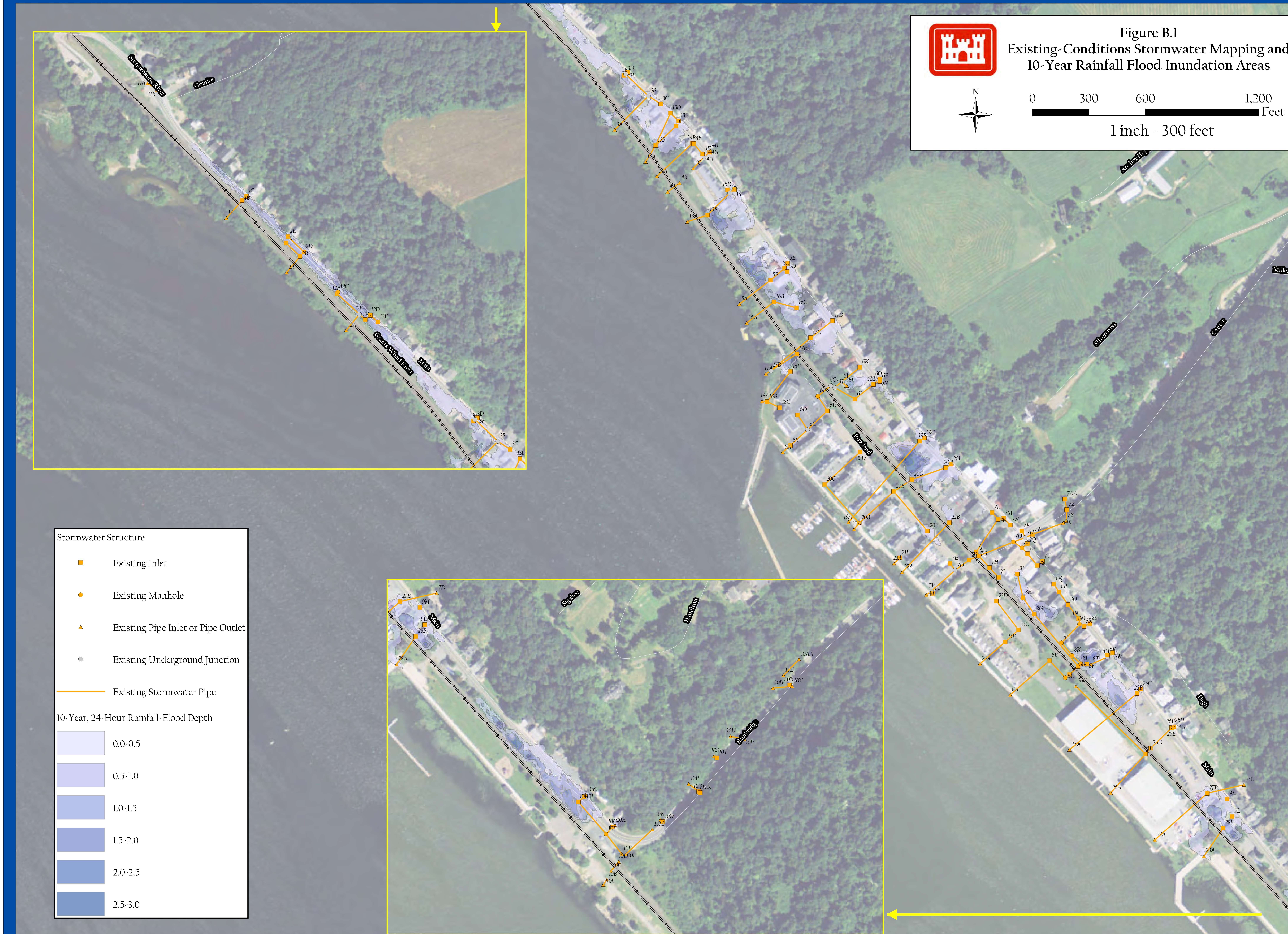
Stormwater Structures Attribution Key		
GIS Attribution Title	Title	Description
Id	n/a	A unique identifier created by the GIS
FIELD_ID	Field ID	The field identifier assigned by the field team
PERM_ID	Permanent ID	The permanent identifier assigned by the field team
LOC_SOURCE	Location Source	The source of the geographic location of the structure
ELEV_SOURC	Elevation Source	The source of the vertical elevation of the top of structure or invert of pipe inlet or outlet
TYPE	Type	The type of stormwater structure
PHYS_COND	Physical Condition	The physical condition of the stormwater structure
CONV_COND	Conveyance Condition	The conveyance condition of the stormwater structure
STAND_H20	Standing Water	If yes, there was standing water in the structure at the time of the survey.
ILLIC_DISC	Illicit Discharge	A yes or no if illicit discharge was noted at structure
TOP_ELEV	Top elevation	The vertical elevation of the top of the structure (in feet NAVD88)
CI_LENGTH	Curb Inlet Length	The length (in feet) of the curb inlet
CI_HEIGHT	Curb Inlet Height	The height (in feet) of the curb inlet
GI_LENGTH	Grate Inlet Length	The length (in feet) of the grate inlet
GI_WIDTH	Grate Inlet Width	The width (in feet) of the grate inlet
GI_TYPE	Grate Inlet Type	The type of grate (normal, slotted, reticuline, etc...)
PIPE_HW	Pipe Headwall	A yes if a headwall is present on a pipe inlet or pipe outlet
PIPE_HW_MA	Pipe Headwall Material	The material the headwall is composed of (concrete, stone, etc...)
PIPE_HW_AN	Pipe Headwall Angle	The angle of the headwall (45 deg., 90 deg., etc...)
WEIR_SHAPE	Weir Shape	The shape of the weir (box, trapezoid, etc...)
WEIR_LENGT	Weir Length	The length of the weir (in feet)
WEIR_WIDTH	Weir Width	The width of the weir (in feet)
WEIR_DEPTH	Weir Depth	The depth of the weir (in feet)
WEIR_MATE	Weir Material	The material the weir is composed of (concrete, rip-rap, etc...)
PIPEA_SIZE*	Pipe A Size*	The size of Pipe A* (in inches) within the stormwater structure
PIPEA_SHAP*	Pipe A Shape*	The shape of Pipe A* within the stormwater structure

Stormwater Structures Attribution Key		
GIS Attribution Title	Title	Description
PIPEA_MATE*	Pipe A Material*	The material of Pipe A* within the stormwater structure
PIPEA_DIST*	Pipe A Distance*	The distance (in feet) from the top of structure to the bottom of Pipe A*
PIPEA_INV*	Pipe A Invert*	The invert elevation (in feet NAVD88) of Pipe A*
PIPEA_TO_F*	Pipe A To or From*	The stormwater structure that the pipe is coming from or going to
PLAN_NO	Plan Number	If As-Builts used as source, the plan number
PLAN_ID	Plan ID	If As-Builts used as source, the ID on the plan
NOTES	Notes	Notes about the stormwater structure per the field survey
DATE_	Date	The date of the survey
X	X	The geographic X coordinate of the structure, in UTM Zone 18 NAD83
Y	Y	The geographic Y coordinate of the structure, in UTM Zone 18 NAD83
** Fields repeated for Pipes B, C, and D*		

Stormwater Pipes Attribution Key		
GIS Attribution Title	Title	Description
FIELD_ID	Field ID	The field identifier assigned by the field team based upon the field identifier of bounding stormwater structures.
PERM_ID	Permanent ID	The permanent identifier assigned by the field team based upon the permanent identifier of bounding stormwater structures.
LOC_SOURC	Location Source	The source of the geographic location of the pipe (Field Surveyed or As-Built)
ELEV_SOURC	Elevation Source	The source of the vertical elevation of the pipe
SIZE_IN	Size	The size of the pipe in inches
SIZE_FT	Size	The size of the pipe in feet
PIPE_SHAPE	Shape	The shape of the pipe (round, box, etc...)
MATERIAL	Material	The material which composes the pipe (concrete, corrugated metal, etc...)
LENGTH	Length	The length of the pipe in feet
ELEV_IN	Elevation In	The vertical invert elevation at the upstream end of the pipe (in feet NAVD88)
ELEV_OUT	Elevation Out	The vertical invert elevation at the downstream end of the pipe (in feet NAVD88)
SLOPE	Slope	The slope of the pipe in feet/feet
NOTES	Notes	Notes about the pipe per the field survey

Figure B.1
Existing-Conditions Stormwater Mapping and 10-Year Rainfall Flood Inundation Areas



EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	LOC_SOURCE	ELEV_SOURC	TYPE	PHYS_COND	CONV_COND	STAND_H20	ILLIC_DISC	TOP_ELEV	CI_LENGTH	CI_HEIGHT	GI_LENGTH	GI_WIDTH	GI_TYPE	PIPE_HW	PIPE_HW_MA	PIPE_HW_AN	WEIR_SHAPE	WEIR_LENGT	WEIR_WIDTH
10A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	5.39	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
10AA	State Highway Plans	State Highway Plans	Pipe Inlet	Good	Good	No	No	95.04	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
10B	USACE Field Survey	USACE Field Survey	Pipe Inlet	Good	Good	No	No	6.83	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
10C	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	7.80	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
10D	USACE Field Survey	USACE Field Survey	Pipe Inlet	Good	Good	No	No	11.20	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
10E	State Highway Plans	State Highway Plans	Pipe Outlet	Good	Poor	No	No	6.00	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
10F	USACE Field Survey	USACE Field Survey	Manhole	Good	Fair	No	No	10.99	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10G	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Poor	No	No	8.91	n/a	n/a	3.0	2.7	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
10H	USACE Field Survey	USACE Field Survey	Pipe Inlet	Fair	Fair	No	No	9.21	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
10I	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Poor	No	No	6.69	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
10J	USACE Field Survey	USACE Field Survey	Combination Inlet	Fair	Poor	No	No	6.34	5.8	0.5	5.8	3.0	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
10K	USACE Field Survey	USACE Field Survey	Pipe Inlet	Good	Fair	No	No	7.13	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
10L	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	10.92	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
10M	USACE Field Survey	USACE Field Survey	Pipe Inlet	Good	Good	No	No	23.60	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	90-deg.	n/a	n/a	n/a
10N	State Highway Plans	State Highway Plans	Pipe Outlet	Good	Good	No	No	23.86	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
10O	State Highway Plans	State Highway Plans	Grate Inlet	Good	Good	No	No	25.75	n/a	n/a	2.0	1.5	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
10P	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	41.25	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
10Q	State Highway Plans	State Highway Plans	Grate Inlet	Good	Good	No	No	43.81	n/a	n/a	2.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
10R	State Highway Plans	State Highway Plans	Drop Inlet	Good	Good	No	No	43.84	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10S	State Highway Plans	State Highway Plans	Pipe Outlet	Good	Good	No	No	54.00	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
10T	State Highway Plans	State Highway Plans	Grate Inlet	Good	Good	No	No	56.27	n/a	n/a	2.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
10U	State Highway Plans	State Highway Plans	Pipe Outlet	Good	Good	No	No	62.97	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
10V	State Highway Plans	State Highway Plans	Grate Inlet	Good	Good	No	No	65.25	n/a	n/a	2.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
10W	State Highway Plans	State Highway Plans	Pipe Outlet	Good	Good	No	No	87.42	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	90-deg.	n/a	n/a	n/a
10X	State Highway Plans	State Highway Plans	Grate Inlet	Good	Good	No	No	88.98	n/a	n/a	2.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
10Y	State Highway Plans	State Highway Plans	Pipe Inlet	Good	Good	No	No	89.94	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	90-deg.	n/a	n/a	n/a
10Z	State Highway Plans	State Highway Plans	Pipe Outlet	Good	Good	No	No	91.35	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
11A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	9.96	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
11B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	15.50	n/a	n/a	2.0	2.0	Grid	n/a	n/a	n/a	n/a	n/a	n/a
12A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	Unknown	Unknown	6.26	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
12B	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknown	11.32	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
12C	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	10.82	n/a	n/a	2.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
12D	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	11.21	n/a	n/a	2.0	2.0	Grid	No	n/a	n/a	n/a	n/a	n/a
12E	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	11.18	n/a	n/a	2.0	2.0	Grid	No	n/a	n/a	n/a	n/a	n/a
12F	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	10.46	n/a	n/a	2.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
12G	USACE Field Survey	USACE Field Survey	Manhole	Good	Good	No	No	10.30	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
13A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	Unknown	Unknown	3.00	n/a	n/a	n/a	n/a	n/a	Unknown	Unknown	Unknown	n/a	n/a	n/a
13B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	5.92	n/a	n/a	2.0	2.0	Grid	n/a	n/a	n/a	n/a	n/a	n/a
13C	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	13.60	n/a	n/a	2.3	1.1	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
13D	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	13.28	n/a	n/a	1.7	n/a	Round Grid	n/a	n/a	n/a	n/a	n/a	n/a
13E	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	13.35	n/a	n/a	2.0	1.0	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
14A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	Unknown	Unknown	7.10	n/a	n/a	n/a	n/a	n/a	Unknown	Unknown	Unknown	n/a	n/a	n/a
14B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	12.58	n/a	n/a	1.8	1.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
15A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	Unknown	Unknown	3.49	n/a	n/a	n/a	n/a	n/a	Unknown	Unknown	Unknown	n/a	n/a	n/a
15B	USACE Field Survey	USACE Field Survey	Grate Inlet	Poor	Poor	No	No	6.90	n/a	n/a	3.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
15C	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknown	12.17	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
15D	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	12.65	n/a	n/a	2.7	2.5	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
15E	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	12.25	n/a	n/a	2.4	1.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
16A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	Unknown	Unknown	1.84	n/a	n/a	n/a	n/a	n/a	Unknown	Unknown	Unknown	n/a	n/a	n/a
16B	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Poor	No	No	7.36	n/a	n/a	2.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
16C	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Poor	No	No	7.39	n/a	n/a	3.0	1.7	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
17A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	-0.72	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
17B	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknown	2.20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
17C	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	5.82	n/a	n/a	2.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	LOC_SOURCE	ELEV_SOURC	TYPE	PHYS_COND	CONV_COND	STAND_H20	ILLIC_DISC	TOP_ELEV	CI_LENGTH	CI_HEIGHT	GI_LENGTH	GI_WIDTH	GI_TYPE	PIPE_HW	PIPE_HW_MA	PIPE_HW_AN	WEIR_SHAPE	WEIR_LENGT	WEIR_WIDTH
17D	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	9.65	n/a	n/a	2.5	1.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
17E	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	2.90	n/a	n/a	2.3	1.8	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
18A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Fair	Poor	No	No	3.81	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
18B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	10.77	n/a	n/a	3.0	2.0	Grid	n/a	n/a	n/a	n/a	n/a	n/a
18C	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	8.01	n/a	n/a	4.0	3.3	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
18D	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Poor	No	No	7.00	n/a	n/a	5.8	2.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
19A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	2.61	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
19B	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Poor	No	No	8.43	5.3	0.5	1.5	5.3	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
19C	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	8.38	n/a	n/a	5.3	1.5	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
1A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	No	No	5.71	n/a	n/a	n/a	n/a	n/a	Unknown	Unknown	Unknown	n/a	n/a	n/a
1B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	9.00	n/a	n/a	2.0	1.3	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
1C	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	9.99	n/a	n/a	2.0	1.3	Grid	n/a	n/a	n/a	n/a	n/a	n/a
20A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	0.90	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
20B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Fair	Yes	No	5.44	n/a	n/a	5.8	2.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
20C	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	4.67	n/a	n/a	5.8	2.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
20D	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	8.16	n/a	n/a	5.8	2.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
20E	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	7.86	n/a	n/a	5.8	3.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
20F	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	8.08	n/a	n/a	5.8	2.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
20G	USACE Field Survey	USACE Field Survey	Grate Inlet	Poor	Poor	No	No	5.99	n/a	n/a	4.0	2.7	Grid	n/a	n/a	n/a	n/a	n/a	n/a
20H	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Good	No	No	7.88	n/a	n/a	5.3	1.5	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
20I	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Good	No	No	7.82	n/a	n/a	5.3	1.5	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
21A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	2.44	n/a	n/a	n/a	n/a	n/a	Yes	Wood	180-deg.	n/a	n/a	n/a
21B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	5.62	n/a	n/a	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
22A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	Unknown	Unknown	1.00	n/a	n/a	n/a	n/a	n/a	Unknown	Unknown	Unknown	n/a	n/a	n/a
22B	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	6.88	n/a	n/a	2.0	1.5	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
23A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	6.36	n/a	n/a	n/a	n/a	n/a	Yes	Wood	180-deg.	n/a	n/a	n/a
23B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	9.70	n/a	n/a	5.8	3.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
23C	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	8.62	n/a	n/a	5.8	3.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
23D	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Poor	No	No	8.68	n/a	n/a	5.8	3.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
25A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	Unknown	Unknown	-0.17	n/a	n/a	n/a	n/a	n/a	Unknown	Unknown	Unknown	n/a	n/a	n/a
25B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Poor	Yes	No	10.97	n/a	n/a	2.7	2.7	Grid	n/a	n/a	n/a	n/a	n/a	n/a
25C	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Poor	No	No	11.21	n/a	n/a	2.5	1.7	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
26A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	Yes	No	6.17	n/a	n/a	n/a	n/a	n/a	Yes	Stone	180-deg.	n/a	n/a	n/a
26B	USACE Field Survey	USACE Field Survey	Drop Inlet	Good	Good	No	No	9.87	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
26C	USACE Field Survey	USACE Field Survey	Pipe Inlet	Good	Good	No	No	8.57	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
26D	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	8.48	n/a	n/a	9.0	4.0	Grid	n/a	n/a	n/a	n/a	n/a	n/a
26E	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	10.79	n/a	n/a	1.5	1.5	Grid	n/a	n/a	n/a	n/a	n/a	n/a
26F	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	14.58	n/a	n/a	n/a	n/a	n/a	Yes	Stone	180-deg.	n/a	n/a	n/a
26G	USACE Field Survey	USACE Field Survey	Slotted Inlet	Good	Good	No	No	11.12	n/a	n/a	5.0	1.5	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
26H	USACE Field Survey	USACE Field Survey	Pipe Inlet	Good	Good	No	No	14.58	n/a	n/a	n/a	n/a	n/a	Yes	Stone	90-deg.	n/a	n/a	n/a
27A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	Unknown	Unknown	-0.17	n/a	n/a	n/a	n/a	n/a	Unknown	Unknown	Unknown	n/a	n/a	n/a
27B	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Good	No	No	8.26	n/a	n/a	2.8	1.7	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
27C	USACE Field Survey	USACE Field Survey	Pipe Inlet	Poor	Poor	No	No	9.83	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	90-deg.	n/a	n/a	n/a
28A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	Unknown	Unknown	0.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
28B	USACE Field Survey	USACE Field Survey	Grate Inlet	Poor	Fair	No	No	6.94	n/a	n/a	2.0	1.7	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
2A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Poor	Poor	No	No	5.15	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
2B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	9.57	n/a	n/a	2.0	1.8	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
2C	USACE Field Survey	USACE Field Survey	Curb Inlet	Fair	Poor	No	No	9.54	2.0	0.5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2D	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Fair	No	No	9.67	n/a	n/a	2.4	1.7	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
2E	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	9.73	n/a	n/a	1.0	n/a	Round Parallel	n/a	n/a	n/a	n/a	n/a	n/a
3A	Assumed	DEM	Pipe Outlet	Unknown	Unknown	Unknown	Unknown	3.85	n/a	n/a	n/a	n/a	n/a	Unknown	Unknown	Unknown	n/a	n/a	n/a
3B	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknown	13.55	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3C	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	13.41	n/a	n/a	2.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
3D	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknown	13.40	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	LOC_SOURCE	ELEV_SOURC	TYPE	PHYS_COND	CONV_COND	STAND_H20	ILLIC_DISC	TOP_ELEV	CI_LENGTH	CI_HEIGHT	GI_LENGTH	GI_WIDTH	GI_TYPE	PIPE_HW	PIPE_HW_MA	PIPE_HW_AN	WEIR_SHAPE	WEIR_LENGT	WEIR_WIDTH
3E	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	12.91	n/a	n/a	1.8	n/a	Grid	n/a	n/a	n/a	n/a	n/a	n/a
3F	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	12.51	n/a	n/a	2.6	1.5	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
4A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	9.32	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
4B	USACE Field Survey	USACE Field Survey	Pipe Inlet	Good	Good	No	No	9.71	n/a	n/a	n/a	n/a	n/a	Yes	Stone	180-deg.	n/a	n/a	n/a
4C	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	9.20	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
4D	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknown	13.91	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4E	USACE Field Survey	USACE Field Survey	Grate Inlet	Poor	Poor	No	No	13.71	n/a	n/a	1.7	n/a	Round Grid	n/a	n/a	n/a	n/a	n/a	n/a
4F	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	13.49	n/a	n/a	2.3	1.7	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
4G	USACE Field Survey	USACE Field Survey	Curb Inlet	Good	Good	No	No	15.84	6.0	0.5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4H	USACE Field Survey	USACE Field Survey	Pipe Inlet	Good	Good	No	No	16.67	n/a	n/a	n/a	n/a	n/a	Yes	Stone	180-deg.	n/a	n/a	n/a
5A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	2.93	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
5B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	7.75	n/a	n/a	2.0	n/a	Round Parallel	n/a	n/a	n/a	n/a	n/a	n/a
5C	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	8.90	n/a	n/a	2.4	1.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
5D	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	8.79	n/a	n/a	2.4	1.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
5E	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Good	No	No	9.32	n/a	n/a	2.5	1.5	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
6A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	1.52	n/a	n/a	n/a	n/a	n/a	No	n/a	n/a	n/a	n/a	n/a
6B	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Fair	Yes	No	6.16	n/a	n/a	5.8	2.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
6C	Assumed	Assumed	Underground Junction	Unknown	Unknown	Unknown	Unknown	7.97	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6D	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	7.83	n/a	n/a	5.8	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
6E	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	Yes	No	8.19	n/a	n/a	2.7	2.7	Grid	n/a	n/a	n/a	n/a	n/a	n/a
6F	USACE Field Survey	USACE Field Survey	Manhole	Good	Good	No	No	9.19	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6G	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknown	14.01	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6H	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknown	13.92	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6I	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknown	6.92	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6J	USACE Field Survey	USACE Field Survey	Pipe Inlet	Fair	Fair	No	No	4.68	n/a	n/a	n/a	n/a	n/a	Yes	Concrete	180-deg.	n/a	n/a	n/a
6K	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Fair	No	No	10.26	6.8	0.5	2.3	2.3	Grid	n/a	n/a	n/a	n/a	n/a	n/a
6L	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	13.35	n/a	n/a	2.0	n/a	Round Grid	n/a	n/a	n/a	n/a	n/a	n/a
6M	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	12.34	4.0	0.5	6.0	1.7	Grid	n/a	n/a	n/a	n/a	n/a	n/a
6N	USACE Field Survey	USACE Field Survey	Underground Junction	Unknown	Unknown	Unknown	Unknown	11.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6O	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	11.94	n/a	n/a	1.7	1.7	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
6P	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	11.19	n/a	n/a	2.3	1.7	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	6.05	n/a	n/a	n/a	n/a	n/a	Yes	Wood	180-deg.	n/a	n/a	n/a
7AA	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	35.66	4.0	0.5	4.0	2.0	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7B	USACE Field Survey	USACE Field Survey	Underground Junction	Unknown	Unknown	Unknown	Unknown	6.53	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7C	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	5.79	n/a	n/a	5.8	3.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
7D	USACE Field Survey	USACE Field Survey	Underground Junction	Unknown	Unknown	Unknown	Unknown	10.07	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7E	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	9.01	n/a	n/a	2.0	2.0	Grid	n/a	n/a	n/a	n/a	n/a	n/a
7F	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	11.41	n/a	n/a	14.0	5.0	Grid	n/a	n/a	n/a	n/a	n/a	n/a
7G	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	11.20	n/a	n/a	14.0	5.0	Grid	n/a	n/a	n/a	n/a	n/a	n/a
7H	USACE Field Survey	USACE Field Survey	Grate Inlet	Poor	Poor	No	No	11.91	n/a	n/a	2.0	1.5	Grid	n/a	n/a	n/a	n/a	n/a	n/a
7I	USACE Field Survey	USACE Field Survey	Grate Inlet	Poor	Poor	No	No	11.71	n/a	n/a	2.0	1.5	Grid	n/a	n/a	n/a	n/a	n/a	n/a
7J	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	10.35	n/a	n/a	2.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7K	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	11.85	5.0	0.5	2.8	5.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7L	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	10.97	5.8	0.5	5.0	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7M	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	12.71	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7N	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	13.66	5.8	0.5	5.0	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7O	USACE Field Survey	USACE Field Survey	Manhole	Good	Good	No	No	14.84	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7P	USACE Field Survey	USACE Field Survey	Manhole	Good	Good	No	No	15.95	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7Q	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	15.64	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7R	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	15.51	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7S	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	16.09	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7T	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	15.85	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7U	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknwon	16.21	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7V	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	15.96	4.0	0.5	4.0	2.0	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	LOC_SOURCE	ELEV_SOURC	TYPE	PHYS_COND	CONV_COND	STAND_H20	ILLIC_DISC	TOP_ELEV	CI_LENGTH	CI_HEIGHT	GI_LENGTH	GI_WIDTH	GI_TYPE	PIPE_HW	PIPE_HW_MA	PIPE_HW_AN	WEIR_SHAPE	WEIR_LENGT	WEIR_WIDTH
7W	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	18.51	4.0	0.5	4.0	2.0	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
7X	USACE Field Survey	USACE Field Survey	Pipe Inlet	Good	Good	No	No	28.85	n/a	n/a	n/a	n/a	n/a	Yes	Stone	90-deg.	n/a	n/a	n/a
7Y	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	No	No	24.35	n/a	n/a	n/a	n/a	n/a	Yes	Stone	180-deg.	n/a	n/a	n/a
7Z	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	33.54	4.0	0.5	4.0	2.0	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
8A	USACE Field Survey	USACE Field Survey	Pipe Outlet	Good	Good	Yes	No	6.36	n/a	n/a	n/a	n/a	n/a	Yes	Wood	180-deg.	n/a	n/a	n/a
8B	USACE Field Survey	USACE Field Survey	Grate Inlet	Poor	Poor	No	No	7.34	n/a	n/a	5.5	2.5	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
8C	USACE Field Survey	USACE Field Survey	Manhole	Good	Good	No	No	9.36	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8D	USACE Field Survey	USACE Field Survey	Grate Inlet	Good	Good	No	No	7.40	n/a	n/a	5.8	3.8	Grid	n/a	n/a	n/a	n/a	n/a	n/a
8E	USACE Field Survey	USACE Field Survey	Drop Inlet	Good	Good	No	No	3.08	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8F	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Poor	No	No	3.34	n/a	n/a	2.0	2.0	Grid	n/a	n/a	n/a	n/a	n/a	n/a
8G	USACE Field Survey	USACE Field Survey	Grate Inlet	Poor	Poor	No	No	7.10	n/a	n/a	3.0	1.5	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
8H	USACE Field Survey	USACE Field Survey	Grate Inlet	Poor	Poor	No	No	7.41	n/a	n/a	3.0	1.5	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
8I	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	8.39	n/a	n/a	2.0	1.5	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
8J	USACE Field Survey	USACE Field Survey	Manhole	Good	Good	No	No	5.97	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8K	USACE Field Survey	USACE Field Survey	Manhole	Good	Good	No	No	6.76	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8L	USACE Field Survey	USACE Field Survey	Manhole	Good	Good	No	No	7.67	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8M	USACE Field Survey	USACE Field Survey	Manhole	Good	Good	No	No	9.57	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8N	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	10.38	5.8	0.5	5.8	3.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
8O	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	11.94	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
8P	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	13.84	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
8Q	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	15.28	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
8R	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	9.75	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
8S	USACE Field Survey	USACE Field Survey	Combination Inlet	Good	Good	No	No	10.14	5.8	0.5	5.8	2.8	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
8T	Cecil County Dye Test	USACE Field Survey	Pipe Outlet	Poor	Poor	No	No	4.90	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8U	Assumed	DEM	Underground Junction	Unknown	Unknown	Unknown	Unknown	9.00	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8V	USACE Field Survey	USACE Field Survey	Grate Inlet	Poor	Poor	No	No	9.12	n/a	n/a	2.5	1.7	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
8W	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Fair	No	No	9.27	n/a	n/a	2.5	1.7	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a
9L	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Poor	No	No	9.55	n/a	n/a	2.0	2.0	Parallel	n/a	n/a	n/a	n/a	n/a	n/a
9M	USACE Field Survey	USACE Field Survey	Grate Inlet	Fair	Poor	No	No	9.78	n/a	n/a	2.8	1.7	Reticuline	n/a	n/a	n/a	n/a	n/a	n/a

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	WEIR_DEPTH	WEIR_MATE	PIPEA_SIZE	PIPEA_SHAP	PIPEA_MATE	PIPEA_DIST	PIPEA_INV	PIPEA_TO_F	PIPEB_SIZE	PIPEB_SHAP	PIPEB_MATE	PIPEB_DIST	PIPEB_INV	PIPEB_TO_F	PIPEC_SIZE	PIPEC_SHAP	PIPEC_MATE	PIPEC_DIST	PIPEC_INV	PIPEC_TO_F
10A	n/a	n/a	24" (3)	Round	Concrete	3.00	0.39	From 10B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10AA	n/a	n/a	24"	Round	Concrete	2.00	93.04	To 10Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10B	n/a	n/a	24" (3)	Round	Concrete	5.25	1.58	To 10A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10C	n/a	n/a	66"	Round	Corrugated Metal	5.50	2.30	From 10D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10D	n/a	n/a	66"	Round	Corrugated Metal	7.67	3.53	To 10C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10E	n/a	n/a	24"	Round	Concrete	2.00	4.00	From 10F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10F	n/a	n/a	24"	Round	Concrete	6.50	4.49	To 10E	18"	Round	Concrete	6.50	4.49	From 10G	12"	Round	Concrete	6.42	4.57	From 10I
10G	n/a	n/a	18"	Round	Concrete	4.17	4.74	To 10F	18"	Round	Corrugated Metal	3.83	5.08	From 10H	n/a	n/a	n/a	n/a	n/a	n/a
10H	n/a	n/a	18"	Round	Corrugated Metal	2.33	6.88	To 10G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10I	n/a	n/a	12"	Round	Concrete	2.08	4.61	To 10F	12"	Round	Concrete	2.17	4.52	From 10J	n/a	n/a	n/a	n/a	n/a	n/a
10J	n/a	n/a	12"	Round	Concrete	1.75	4.59	To 10I	15"	Round	Corrugated Metal	1.75	4.59	From 10K	n/a	n/a	n/a	n/a	n/a	n/a
10K	n/a	n/a	15"	Round	Corrugated Metal	2.00	5.13	To 10J	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10L	n/a	n/a	70" x 42"	Rectangle	Concrete	6.00	4.92	From 10M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10M	n/a	n/a	48"	Round	Concrete	7.08	16.52	To 10L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10N	n/a	n/a	15"	Round	Corrugated Metal	1.25	22.61	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10O	n/a	n/a	15"	Round	Corrugated Metal	2.00	23.75	To 10N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10P	n/a	n/a	15"	Round	Corrugated Metal	1.25	40.00	From 10Q	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10Q	n/a	n/a	15"	Round	Concrete	2.00	41.81	From 10R	15"	Round	Corrugated Metal	2.53	41.15	To 10P	n/a	n/a	n/a	n/a	n/a	n/a
10R	n/a	n/a	15"	Round	Concrete	2.00	41.84	To 10Q	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10S	n/a	n/a	15"	Round	Corrugated Metal	1.25	52.75	From 10T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10T	n/a	n/a	15"	Round	Corrugated Metal	2.00	54.27	To 10S	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10U	n/a	n/a	15"	Round	Concrete	1.25	61.72	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10V	n/a	n/a	15"	Round	Concrete	2.00	63.25	To 10U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10W	n/a	n/a	66"	Round	Concrete	8.00	79.42	From 10Y	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10X	n/a	n/a	15"	Round	Concrete	2.00	86.98	To 10Y	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10Y	n/a	n/a	66"	Round	Concrete	8.00	81.94	To 10W	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10Z	n/a	n/a	24"	Round	Concrete	3.00	88.35	From 10AA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
11A	n/a	n/a	15"	Round	Concrete	1.25	8.71	From 11B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
11B	n/a	n/a	15"	Round	Concrete	3.83	11.67	To 11A	15"	Round	Concrete	3.75	11.75	From Unknown	n/a	n/a	n/a	n/a	n/a	n/a
12A	n/a	n/a	12"	Round	Terra Cotta	1.00	5.26	From 12B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
12B	n/a	n/a	12"	Round	Terra Cotta	4.32	7.00	From 12F	12"	Round	Terra Cotta	4.32	7.00	From 12C	n/a	n/a	n/a	n/a	n/a	n/a
12C	n/a	n/a	6"	Round	Terra Cotta	2.58	8.24	From 12D	12"	Round	Terra Cotta	2.58	8.24	To 12B	n/a	n/a	n/a	n/a	n/a	n/a
12D	n/a	n/a	6"	Round	Terra Cotta	1.67	9.54	From 12E	6"	Round	Terra Cotta	2.00	9.21	To 12C	n/a	n/a	n/a	n/a	n/a	n/a
12E	n/a	n/a	4"	Round	PVC	1.33	9.85	To 12D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
12F	n/a	n/a	12"	Round	Corrugated Metal	3.25	7.21	From 12G	12"	Round	Terra Cotta	3.25	7.21	To 12B	n/a	n/a	n/a	n/a	n/a	n/a
12G	n/a	n/a	12"	Round	Corrugated Metal	3.50	6.80	To 12F	8"	Round	Terra Cotta	4.00	6.30	Abandoned	8"	Round	Terra Cotta	4.00	6.30	Abandoned
13A	n/a	n/a	12"	Round	PVC	1.00	2.00	From 13B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
13B	n/a	n/a	12"	Round	Terra Cotta	3.50	2.42	From 13C	12"	Round	PVC	3.67	2.25	To 14A	6"	Round	PVC	2.42	3.50	From 13D
13C	n/a	n/a	6"	Round	HDPE	1.58	12.02	To 13B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
13D	n/a	n/a	8"	Round	Concrete	1.67	11.61	From 13E	8"	Round	Concrete	1.67	11.61	To 13B	n/a	n/a	n/a	n/a	n/a	n/a
13E	n/a	n/a	8"	Round	Concrete	1.83	11.52	To 3D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
14A	n/a	n/a	8"	Round	PVC	0.67	6.43	From 14B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
14B	n/a	n/a	8"	Round	PVC	1.00	11.58	From Building	8"	Round	PVC	1.50	11.08	To 14A	n/a	n/a	n/a	n/a	n/a	n/a
15A	n/a	n/a	8"	Round	Terra Cotta	0.67	2.82	From 15B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
15B	n/a	n/a	8"	Round	Terra Cotta	2.42	4.48	From 15C	8"	Round	Terra Cotta	2.42	4.48	To 15A	n/a	n/a	n/a	n/a	n/a	n/a
15C	n/a	n/a	6"	Round	PVC	2.17	10.00	From 15D	6"	Round	Terra Cotta	2.17	10.00	From 15E	8"	Round	Terra Cotta	2.17	10.00	To 15B
15D	n/a	n/a	6"	Round	PVC	1.75	10.90	To 15C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
15E	n/a	n/a	6"	Round	Terra Cotta	1.17	11.08	To 15C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
16A	n/a	n/a	4"	Round	Concrete	0.33	1.51	From 16B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
16B	n/a	n/a	4"	Round	PVC	1.58	5.78	From 16C	4"	Round	Concrete	1.67	5.69	To 16A	4"	Round	Concrete	1.67	5.69	From Building
16C	n/a	n/a	4"	Round	PVC	0.83	6.56	To 16B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
17A	n/a	n/a	12"	Round	HDPE	1.00	-1.72	From 17B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
17B	n/a	n/a	12"	Round	HDPE	3.70	-1.50	To 17A	10"	Round	Corrugated Metal	3.70	-1.50	From 17C	12"	Round	Concrete	3.70	-1.50	From 17E
17C	n/a	n/a	10"	Round	Corrugated Metal	2.67	3.15	To 17B	12"	Round	Concrete	2.67	3.15	From 17D	6"	Round	Concrete	1.58	4.24	From Building

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	WEIR_DEPTH	WEIR_MATE	PIPEA_SIZE	PIPEA_SHAP	PIPEA_MATE	PIPEA_DIST	PIPEA_INV	PIPEA_TO_F	PIPEB_SIZE	PIPEB_SHAP	PIPEB_MATE	PIPEB_DIST	PIPEB_INV	PIPEB_TO_F	PIPEC_SIZE	PIPEC_SHAP	PIPEC_MATE	PIPEC_DIST	PIPEC_INV	PIPEC_TO_F
17D	n/a	n/a	12"	Round	Concrete	3.08	6.57	To 17C	6"	Round	Terra Cotta	2.67	6.98	From Building	n/a	n/a	n/a	n/a	n/a	n/a
17E	n/a	n/a	12"	Round	Concrete	2.08	0.82	To 17B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
18A	n/a	n/a	12"	Round	Concrete	1.00	2.81	From 18B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
18B	n/a	n/a	12"	Round	Concrete	8.25	2.52	To 18A	12"	Round	PVC	8.25	2.52	From 18D	12"	Round	PVC	8.08	2.69	From 18C
18C	n/a	n/a	12"	Round	PVC	2.50	5.51	To 18B	10"	Round	PVC	2.00	6.01	From Building	10"	Round	PVC	1.67	6.34	From Building
18D	n/a	n/a	12"	Round	PVC	2.00	5.00	To 18B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
19A	n/a	n/a	15"	Round	Cast Iron	1.25	1.36	From 19B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
19B	n/a	n/a	6"	Round	Cast Iron	4.00	4.43	From 9C	15"	Round	Cast Iron	4.00	4.43	To 9A	n/a	n/a	n/a	n/a	n/a	n/a
19C	n/a	n/a	6"	Round	Cast Iron	3.42	4.96	To 19B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1A	n/a	n/a	15"	Round	Terra Cotta	1.25	4.46	From 1B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1B	n/a	n/a	6"	Round	Terra Cotta	0.92	8.08	From 1C	15"	Round	Terra Cotta	2.17	6.83	To 1A	n/a	n/a	n/a	n/a	n/a	n/a
1C	n/a	n/a	6"	Round	Terra Cotta	1.33	8.66	To 1B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
20A	n/a	n/a	18"	Round	Concrete	1.50	-0.60	From 20B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
20B	n/a	n/a	18"	Round	Concrete	5.92	-0.48	To 20A	18"	Round	Concrete	4.17	1.27	From 20C	18"	Round	Concrete	5.92	-0.48	From 20E
20C	n/a	n/a	15"	Round	Concrete	1.83	2.84	From 20D	18"	Round	Concrete	2.00	2.67	To 20B	6"	Round	HDPE	1.75	2.92	From Building
20D	n/a	n/a	15"	Round	Concrete	2.83	5.33	To 20C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
20E	n/a	n/a	18"	Round	Concrete	6.83	1.03	To 20B	12"	Round	Concrete	6.50	1.36	From 20F	15"	Round	Concrete	6.33	1.53	From 20G
20F	n/a	n/a	12"	Round	Concrete	5.33	2.75	To 20E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
20G	n/a	n/a	15"	Round	Concrete	3.00	2.99	To 20E	8"	Round	Cast Iron	2.25	3.74	From 20H	n/a	n/a	n/a	n/a	n/a	n/a
20H	n/a	n/a	8" (2)	Round	Cast Iron	1.67	6.21	From 20I	8"	Round	Cast Iron	1.67	6.21	To 20G	n/a	n/a	n/a	n/a	n/a	n/a
20I	n/a	n/a	8" (2)	Round	Cast Iron	1.42	6.40	To 20H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
21A	n/a	n/a	15"	Round	Concrete	1.25	1.19	From 21B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
21B	n/a	n/a	15"	Round	Concrete	2.75	2.87	To 21A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
22A	n/a	n/a	12"	Round	Concrete	1.00	0.00	From 22B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
22B	n/a	n/a	12"	Round	Concrete	1.50	5.38	To 22A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
23A	n/a	n/a	15"	Round	Corrugated Metal	5.00	1.35	From 23B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
23B	n/a	n/a	15"	Round	Concrete	6.42	3.28	To 23A	15"	Round	Concrete	6.42	3.28	From 23C	n/a	n/a	n/a	n/a	n/a	n/a
23C	n/a	n/a	15"	Round	Concrete	4.17	4.45	To 23B	15"	Round	Concrete	3.75	4.87	From 23D	n/a	n/a	n/a	n/a	n/a	n/a
23D	n/a	n/a	15"	Round	Concrete	2.75	5.93	To 23C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
25A	n/a	n/a	8"	Round	Cast Iron	0.67	-0.50	From 25B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
25B	n/a	n/a	8"	Round	Cast Iron	3.83	7.14	To 25A	8"	Round	Cast Iron	3.83	7.14	From 25C	n/a	n/a	n/a	n/a	n/a	n/a
25C	n/a	n/a	8"	Round	Cast Iron	3.08	8.13	To 25B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
26A	n/a	n/a	72" x 72"	Box	Stone	7.67	-1.50	From 26B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
26B	n/a	n/a	72" x 72"	Rectangle	Stone	7.50	2.37	To 26A	60" x 42"	Rectangle	Concrete	7.33	2.54	From 26D	10"	Round	Cast Iron	7.42	2.45	From 26C
26C	n/a	n/a	10"	Round	Cast Iron	2.75	5.81	To 26B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
26D	n/a	n/a	60" x 42"	Rectangle	Concrete	6.42	2.06	To 26B	60" x 42"	Rectangle	Stone	6.42	2.06	From 26E	n/a	n/a	n/a	n/a	n/a	n/a
26E	n/a	n/a	36" x 30"	Rectangle	Stone	5.00	5.79	From 26H	60" x 42"	Box	Stone	5.00	5.79	To 26D	n/a	n/a	n/a	n/a	n/a	n/a
26F	n/a	n/a	4"	Round	PVC	7.00	7.58	From 26G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
26G	n/a	n/a	4"	Round	PVC	1.00	10.12	To 26G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
26H	n/a	n/a	36" x 30"	Rectangle	Stone	6.75	7.84	To 26E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
27A	n/a	n/a	10"	Round	Cast Iron	0.83	-1.00	From 27B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
27B	n/a	n/a	10"	Round	Cast Iron	3.00	5.26	To 27A	10"	Round	Cast Iron	3.00	5.26	From 27C	n/a	n/a	n/a	n/a	n/a	n/a
27C	n/a	n/a	10"	Round	Cast Iron	0.83	9.00	To 27B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
28A	n/a	n/a	4"	Round	Cast Iron	0.33	-0.33	From 26B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
28B	n/a	n/a	4"	Round	Cast Iron	1.00	5.94	To 28A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2A	n/a	n/a	27"	Round	Concrete	2.25	2.90	From 2B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2B	n/a	n/a	8"	Round	Cast Iron	3.50	6.07	From 2D	27"	Round	Concrete	5.92	3.65	To 2A	6"	Round	Terra Cotta	1.50	8.07	From 2C
2C	n/a	n/a	6"	Round	Terra Cotta	1.00	8.54	To 2B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2D	n/a	n/a	8"	Round	Cast Iron	2.08	7.59	To 2B	6"	Round	Cast Iron	1.92	7.75	From 2E	n/a	n/a	n/a	n/a	n/a	n/a
2E	n/a	n/a	6"	Round	Cast Iron	0.92	8.81	To 2D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3A	n/a	n/a	12"	Round	Terra Cotta	1.00	2.85	From 3B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3B	n/a	n/a	8"	Round	Terra Cotta	4.55	9.00	From 3C	8"	Round	Terra Cotta	4.55	9.00	From 3D	12"	Round	Terra Cotta	4.55	9.00	To 3A
3C	n/a	n/a	8"	Round	Terra Cotta	1.83	11.58	To 3B	8"	Round	Terra Cotta	1.83	11.58	From Building	n/a	n/a	n/a	n/a	n/a	n/a
3D	n/a	n/a	6"	Round	PVC	3.40	10.00	From 13F	6"	Round	PVC	3.40	10.00	From 13D	8"	Round	Terra Cotta	3.40	10.00	To 3B

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	WEIR_DEPTH	WEIR_MATE	PIPEA_SIZE	PIPEA_SHAP	PIPEA_MATE	PIPEA_DIST	PIPEA_INV	PIPEA_TO_F	PIPEB_SIZE	PIPEB_SHAP	PIPEB_MATE	PIPEB_DIST	PIPEB_INV	PIPEB_TO_F	PIPEC_SIZE	PIPEC_SHAP	PIPEC_MATE	PIPEC_DIST	PIPEC_INV	PIPEC_TO_F
3E	n/a	n/a	6"	Round	PVC	2.00	10.91	To 3D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3F	n/a	n/a	6"	Round	PVC	2.00	10.51	To 3D	6"	Round	PVC	1.50	11.01	From Spring	n/a	n/a	n/a	n/a	n/a	n/a
4A	n/a	n/a	96" x 60"	Rectangle	Concrete	7.50	1.82	From 4B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4B	n/a	n/a	96" x 60"	Rectangle	Concrete	7.50	2.21	To 4A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4C	n/a	n/a	60" x 60"	Box	Concrete	5.00	4.20	From 4D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4D	n/a	n/a	60" x 60"	Box	Concrete	7.00	6.91	From 4G	60" x 60"	Box	Concrete	7.00	6.91	To 4C	8"	Round	Concrete	3.00	10.91	From 4E
4E	n/a	n/a	8"	Round	Concrete	1.50	12.21	From 4F	8"	Round	Concrete	1.50	12.21	To 4D	n/a	n/a	n/a	n/a	n/a	n/a
4F	n/a	n/a	8"	Round	Concrete	1.25	12.24	To 4E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4G	n/a	n/a	72" x 36"	Rectangle	Stone	5.00	10.84	From 4H	60" x 60"	Box	Stone	5.00	10.84	To 4C	n/a	n/a	n/a	n/a	n/a	n/a
4H	n/a	n/a	72" x 36"	Rectangle	Stone	4.33	12.34	To 4G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
5A	n/a	n/a	12"	Round	Cast Iron	1.00	1.93	From 5B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
5B	n/a	n/a	12"	Round	Cast Iron	2.00	5.75	From 5C	12"	Round	Cast Iron	2.00	5.75	To 5A	n/a	n/a	n/a	n/a	n/a	n/a
5C	n/a	n/a	10"	Round	Corrugated Metal	1.83	7.07	From 5E	4"	Round	Cast Iron	1.67	7.23	From 5D	12"	Round	Cast Iron	2.00	6.90	To 5B
5D	n/a	n/a	4"	Round	Cast Iron	1.08	7.71	To 5C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
5E	n/a	n/a	10"	Round	Corrugated Metal	2.17	7.15	To 5C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6A	n/a	n/a	38" x 24"	Elliptical	Concrete	2.00	-0.52	From 6B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6B	n/a	n/a	38" x 24"	Elliptical	Concrete	6.50	-0.34	To 6A	38" x 24"	Elliptical	Concrete	6.25	-0.09	From 6C	n/a	n/a	n/a	n/a	n/a	n/a
6C	n/a	n/a	38" x 24"	Elliptical	Concrete	7.97	0.00	From 6E	38" x 24"	Elliptical	Concrete	7.97	0.00	To 6B	12"	Round	Concrete	7.97	0.00	From 6D
6D	n/a	n/a	12"	Round	Concrete	4.75	3.08	To 6C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6E	n/a	n/a	38" x 24"	Elliptical	Concrete	7.92	0.27	To 6C	38" x 24"	Elliptical	Concrete	7.92	0.27	From 6F	n/a	n/a	n/a	n/a	n/a	n/a
6F	n/a	n/a	38" x 24"	Elliptical	Concrete	7.92	1.27	To 6E	42" x 42"	Box	Concrete	7.92	1.27	From 6G	n/a	n/a	n/a	n/a	n/a	n/a
6G	n/a	n/a	42" x 42"	Box	Concrete	11.01	3.00	To 6F	24"	Round	Concrete	11.01	3.00	From 6H	n/a	n/a	n/a	n/a	n/a	n/a
6H	n/a	n/a	24"	Round	Concrete	10.42	3.50	To 6G	24"	Round	Concrete	10.42	3.50	From 6L	6"	Round	PVC	10.42	3.50	From 6I
6I	n/a	n/a	6"	Round	PVC	2.92	4.00	From 6J	6"	Round	PVC	2.92	4.00	From 6K	6"	Round	PVC	2.92	4.00	To 6H
6J	n/a	n/a	4"	Round	Concrete	0.33	4.35	To 6I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6K	n/a	n/a	6"	Round	PVC	0.92	9.34	To 6I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6L	n/a	n/a	30" x 30"	Box	Concrete	7.58	5.77	From 6M	24"	Round	Concrete	7.75	5.60	To 6H	n/a	n/a	n/a	n/a	n/a	n/a
6M	n/a	n/a	8"	Round	Cast Iron	3.17	9.17	From 6N	30" x 30"	Box	Concrete	4.67	7.67	To 6L	n/a	n/a	n/a	n/a	n/a	n/a
6N	n/a	n/a	4"	Round	PVC	1.50	9.50	From 6P	6"	Round	PVC	1.50	9.50	From 6O	8"	Round	Cast Iron	1.50	9.50	To 6M
6O	n/a	n/a	6"	Round	PVC	0.75	11.19	To 6N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6P	n/a	n/a	4"	Round	PVC	1.17	10.02	To 6N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7A	n/a	n/a	78" x 48"	Rectangle	Concrete	8.08	-2.03	From 7B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7AA	n/a	n/a	18"	Round	Concrete	4.00	31.66	To 7Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7B	n/a	n/a	78" x 48"	Rectangle	Concrete	7.96	-1.43	From 7D	78" x 48"	Rectangle	Concrete	7.96	-1.43	To 7A	15"	Round	Concrete	3.53	3.00	From 7C
7C	n/a	n/a	15"	Round	Concrete	2.25	3.54	To 7B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7D	n/a	n/a	78" x 48"	Rectangle	Concrete	8.27	1.80	From 7F	78" x 48"	Rectangle	Concrete	8.27	1.80	To 7B	6"	Round	PVC	4.07	6.00	From 7E
7E	n/a	n/a	6"	Round	PVC	1.42	7.59	To 7D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7F	n/a	n/a	78" x 48"	Rectangle	Concrete	8.17	3.24	To 7D	78" x 48"	Rectangle	Concrete	8.17	3.24	From 7G	n/a	n/a	n/a	n/a	n/a	n/a
7G	n/a	n/a	78" x 48"	Rectangle	Concrete	9.25	1.95	To 7F	60"	Round	Concrete	6.42	4.78	From 7O	15"	Round	Corrugated Metal	2.00	9.20	From 7H
7H	n/a	n/a	15"	Round	Corrugated Metal	1.25	10.66	To 7G	12"	Round	Corrugated Metal	1.25	10.66	From 7I	n/a	n/a	n/a	n/a	n/a	n/a
7I	n/a	n/a	12"	Round	Corrugated Metal	1.00	10.71	To 7H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7J	n/a	n/a	18"	Round	Concrete	4.33	6.02	To 7G	18"	Round	Concrete	4.25	6.10	From 7K	n/a	n/a	n/a	n/a	n/a	n/a
7K	n/a	n/a	18"	Round	Concrete	3.83	8.02	To 7J	8"	Round	Concrete	3.50	8.35	From 7L	15"	Round	Concrete	3.67	8.18	From 7M
7L	n/a	n/a	8"	Round	Concrete	2.00	8.97	To 7K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7M	n/a	n/a	15"	Round	Concrete	2.67	10.04	To 7K	15"	Round	Concrete	2.67	10.04	From 7N	n/a	n/a	n/a	n/a	n/a	n/a
7N	n/a	n/a	15"	Round	Concrete	3.08	10.58	To 7M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7O	n/a	n/a	60"	Round	Concrete	7.33	7.51	To 7G	18"	Round	Concrete	7.33	7.51	From 7P	60"	Round	Concrete	7.33	7.51	From 7U
7P	n/a	n/a	18"	Round	Concrete	6.00	9.95	To 7O	18"	Round	Concrete	5.00	10.95	From 7Q	18"	Round	Concrete	6.00	9.95	From 7R
7Q	n/a	n/a	18"	Round	Concrete	2.83	12.81	To 7P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7R	n/a	n/a	18"	Round	Concrete	5.50	10.01	To 7P	18"	Round	Concrete	5.42	10.09	From 7S	n/a	n/a	n/a	n/a	n/a	n/a
7S	n/a	n/a	18"	Round	Concrete	4.75	11.34	To 7R	15"	Round	Concrete	3.42	12.67	From 7T	n/a	n/a	n/a	n/a	n/a	n/a
7T	n/a	n/a	15"	Round	Concrete	3.00	12.85	To 7S	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7U	n/a	n/a	96" x 72"	Rectangle	Concrete	7.21	9.00	From 7W	60"	Round	Concrete	7.21	9.00	To 7O	18"	Round	Concrete	6.21	10.00	From 7V
7V	n/a	n/a	18"	Round	Concrete	3.08	12.88	To 7U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	WEIR_DEPTH	WEIR_MATE	PIPEA_SIZE	PIPEA_SHAP	PIPEA_MATE	PIPEA_DIST	PIPEA_INV	PIPEA_TO_F	PIPEB_SIZE	PIPEB_SHAP	PIPEB_MATE	PIPEB_DIST	PIPEB_INV	PIPEB_TO_F	PIPEC_SIZE	PIPEC_SHAP	PIPEC_MATE	PIPEC_DIST	PIPEC_INV	PIPEC_TO_F
7W	n/a	n/a	96" x 72"	Rectangle	Concrete	7.67	10.84	To 7U	96" x 72"	Rectangle	Concrete	7.67	10.84	From 7X	n/a	n/a	n/a	n/a	n/a	n/a
7X	n/a	n/a	96" x 72"	Rectangle	Concrete	11.00	17.85	To 7W	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7Y	n/a	n/a	18"	Round	Concrete	1.50	22.85	From 7Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7Z	n/a	n/a	18"	Round	Concrete	6.92	26.62	To 7Y	18"	Round	Concrete	6.33	27.21	From 7AA	n/a	n/a	n/a	n/a	n/a	n/a
8A	n/a	n/a	24"	Round	Concrete	6.83	-0.47	From 8B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8B	n/a	n/a	24"	Round	Concrete	6.67	0.67	To 8A	24"	Round	Concrete	6.67	0.67	From 8C	n/a	n/a	n/a	n/a	n/a	n/a
8C	n/a	n/a	24"	Round	Concrete	8.42	0.94	To 8B	24"	Round	Concrete	8.25	1.11	From 8D	n/a	n/a	n/a	n/a	n/a	n/a
8D	n/a	n/a	24"	Round	Concrete	6.08	1.32	To 8C	15"	Round	PVC	5.83	1.57	From 8E	5"	Round	PVC	5.83	1.57	From Unknown
8E	n/a	n/a	12"	Round	Concrete	2.00	1.58	To 8D	18"	Round	Concrete	2.00	1.58	From 8J	12"	Round	HDPE	2.00	1.58	From 8F
8F	n/a	n/a	12"	Round	Concrete	1.08	2.26	To 8E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8G	n/a	n/a	8"	Round	Cast Iron	2.80	4.30	To 8E	8"	Round	Cast Iron	2.80	4.30	From 8H	n/a	n/a	n/a	n/a	n/a	n/a
8H	n/a	n/a	4"	Round	Cast Iron	3.00	4.41	From 8I	8"	Round	Cast Iron	3.00	4.41	To 8G	n/a	n/a	n/a	n/a	n/a	n/a
8I	n/a	n/a	4"	Round	Cast Iron	2.33	6.06	To 8H	8"	Round	Cast Iron	2.58	5.81	From Building	n/a	n/a	n/a	n/a	n/a	n/a
8J	n/a	n/a	18"	Round	Concrete	3.67	2.30	To 8E	18"	Round	Concrete	3.42	2.55	From 8K	n/a	n/a	n/a	n/a	n/a	n/a
8K	n/a	n/a	18"	Round	Concrete	4.17	2.59	To 8J	6"	Round	Concrete	4.17	2.59	From Building	18"	Round	Concrete	3.67	3.09	From 8L
8L	n/a	n/a	18"	Round	Concrete	3.92	3.75	To 8K	18"	Round	Concrete	3.83	3.84	From 8M	n/a	n/a	n/a	n/a	n/a	n/a
8M	n/a	n/a	18"	Round	Concrete	5.08	4.49	To 8L	18"	Round	Concrete	5.08	4.49	From 8R	18"	Round	Concrete	5.08	4.49	From 8N
8N	n/a	n/a	18"	Round	Concrete	5.67	4.71	To 8M	18"	Round	Concrete	5.67	4.71	From 8O	n/a	n/a	n/a	n/a	n/a	n/a
8O	n/a	n/a	18"	Round	Concrete	6.58	5.36	To 8N	18"	Round	Concrete	6.33	5.61	From 8P	n/a	n/a	n/a	n/a	n/a	n/a
8P	n/a	n/a	18"	Round	Concrete	7.00	6.84	To 8O	18"	Round	Concrete	7.00	6.84	From 8Q	n/a	n/a	n/a	n/a	n/a	n/a
8Q	n/a	n/a	18"	Round	Concrete	8.17	7.11	To 8P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8R	n/a	n/a	18"	Round	Concrete	5.00	4.75	To 8M	15"	Round	Concrete	4.92	4.83	From 8S	n/a	n/a	n/a	n/a	n/a	n/a
8S	n/a	n/a	15"	Round	Concrete	5.25	4.89	To 8R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8T	n/a	n/a	10"	Round	Cast Iron	0.83	4.07	From 8U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8U	n/a	n/a	10"	Round	Cast Iron	2.00	7.00	From 8V	10"	Round	Cast Iron	2.00	7.00	From 8W	10"	Round	Cast Iron	2.00	7.00	To 8T
8V	n/a	n/a	10"	Round	Cast Iron	2.00	7.12	To 8U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8W	n/a	n/a	10"	Round	Cast Iron	2.00	7.27	To 8U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
9L	n/a	n/a	4"	Round	PVC	1.00	8.55	Abandoned	4"	Round	PVC	1.00	8.55	Abandoned	n/a	n/a	n/a	n/a	n/a	n/a
9M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	PIPED_SIZE	PIPED_SHAP	PIPED_MATE	PIPED_DIST	PIPED_INV	PIPED_TO_F	PLAN_NO	PLAN_ID	NOTES	DATE_	X	Y
10A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Triple 24" concrete pipes.	17July2013	1563215.630605	704924.212225
10AA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1564007.473573	705850.114168
10B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Triple 24" concrete pipes.	17July2013	1563229.525694	704945.206737
10C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563247.217746	704980.536018
10D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563278.418257	705018.497610
10E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Granite rock blocking outlet.	17July2013	1563289.472035	705050.326097
10F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe C 50-percent filled with sediment.	17July2013	1563225.086156	705129.981685
10G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563252.145815	705159.224241
10H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563261.525305	705166.458077
10I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563109.946309	705260.483369
10J	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563133.556427	705281.759532
10K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563140.438394	705289.965660
10L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563307.630804	705050.076395
10M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Changes to box culvert prior to 10L.	17July2013	1563414.320595	705151.129715
10N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563446.722963	705191.371923
10O	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563455.665165	705182.926510
10P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563561.729622	705338.173080
10Q	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563602.963111	705307.372160
10R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563608.427790	705302.901059
10S	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563664.068161	705452.682950
10T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563675.245914	705445.727903
10U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563730.886284	705534.156349
10V	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563783.794315	705523.723780
10W	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563902.154300	705732.623564
10X	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Inlet goes to underground connection.	17July2013	1563970.462791	705745.043290
10Y	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563981.143755	705740.323794
10Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1563945.374945	705784.289623
11A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Outfalls in bridge abutment.	17July2013	1558606.855137	710336.882683
11B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe B in from across road, assumed abondoned.	17July2013	1558648.523423	710309.977275
12A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure could not be located in field. Location assumed. Elevation from DEM.	17July2013	1559429.938317	709336.963724
12B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Invert elevations interpolated. No manhole. Location assumed.	17July2013	1559483.548785	709403.169423
12C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Sump elevation at 7.82; Pipe B assumed to underground junction.	17July2013	1559507.955901	709381.000286
12D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Sump at elevation 8.96.	17July2013	1559528.454850	709400.020003
12E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1559559.176591	709372.172061
12F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe B assumed to underground junction.	17July2013	1559390.662500	709487.162094
12G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Metal square top. Pipes B and C abaondoned.	17July2013	1559395.118131	709492.869946
13A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure could not be found in field. Assumed location and elevation from DEM.	17July2013	1560046.389043	708622.209800
13B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe A in from 13C switches from HDPE to terra cotta underground.	17July2013	1560087.079513	708689.337051
13C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560170.278018	708768.888548
13D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560146.427707	708821.294414
13E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560179.427328	708789.789720
14A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure could not be located in field. Assumed location. Elevation from DEM.	17July2013	1560093.924579	708563.070002
14B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe A from building.	17July2013	1560237.900032	708699.734204
15A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure could not be located in field. Location assumed. Elevation from DEM.	17July2013	1560220.192800	708379.142785
15B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Cracked and filled with debris.	17July2013	1560302.046125	708406.774830
15C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Location assumed. Invert elevations interpolated.	17July2013	1560391.976238	708497.629897
15D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560383.667909	708510.599905
15E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560410.940648	708512.283536
16A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure not found in field. Elevations from DEM. Location assumed.	17July2013	1560467.667950	707968.929371
16B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe C from building.	17July2013	1560577.339123	708056.128837
16C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Sump at elevation 5.39. Filled with sediment.	17July2013	1560670.049953	708032.813738
17A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560547.856445	707762.197763
17B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Location assumed. No manhole found.	17July2013	1560568.053844	707775.726361
17C	6"	Round	Cast Iron	1.58	4.24	From Building	n/a	n/a	Pipes C and D from buildings.	17July2013	1560729.669147	707910.630467

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	PIPED_SIZE	PIPED_SHAP	PIPED_MATE	PIPED_DIST	PIPED_INV	PIPED_TO_F	PLAN_NO	PLAN_ID	NOTES	DATE_	X	Y
17D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe B from building.	17July2013	1560818.162798	707981.749323
17E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560674.415089	707845.040431
18A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Flared concrete end section. Sediment in pipe.	17July2013	1560532.660057	707650.113935
18B	12"	Round	PVC	7.08	3.69	From Building	n/a	n/a	Pipe D from building.	17July2013	1560553.452556	707648.641137
18C	5"	Round	PVC	1.58	6.43	From Building	n/a	n/a	Pips B, C, and D from building.	17July2013	1560605.776370	707625.397205
18D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Non functional. Entire inlet filled with stone.	17July2013	1560647.790935	707772.297780
19A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure contains Duckbill Checkvalve.	17July2013	1560891.403765	707160.782891
19B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure 100-percent filled with sediment. Invert estimated and pipe sizes assumed.	17July2013	1561179.775859	707493.816114
19C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561199.380434	707506.529239
1A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure could not be located in field. Location assumed. Elevation from DEM.	17July2013	1558935.206188	709790.109180
1B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1558999.268845	709862.415392
1C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1559016.027179	709879.561742
20A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure has Duckbill Checkvalve.	17July2013	1560914.987702	707132.901378
20B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipes submerged at time of survey.	17July2013	1560935.970860	707157.727340
20C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe C from building.	17July2013	1560792.185255	707313.599176
20D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560935.930389	707446.879748
20E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561075.297406	707287.733192
20F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561215.392820	707128.187373
20G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe A blocked with stone to prevent flow out. Pipe B broken.	17July2013	1561149.333804	707337.291297
20H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe A twin 8" cast iron pipes from 20I.	17July2013	1561287.514597	707386.604806
20I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Twin 8" cast iron pipes to 20H.	17July2013	1561309.882548	707401.290073
21A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561080.367798	706994.580251
21B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561102.679075	707017.268572
22A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure not found in field. Assumed location and elevation from DEM.	17July2013	1561113.766281	706959.054951
22B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561304.487553	707163.427459
23A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure outfalls into wood seawall.	17July2013	1561435.595197	706588.742965
23B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe A changes to CMP prior to Structure 23A.	17July2013	1561538.547931	706679.436615
23C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561592.205317	706728.833779
23D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Inlet 80-percent covered with debris.	17July2013	1561500.795774	706845.392108
25A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure not found in field. Assumed location, size, and elevation from DEM.	17July2013	1561805.905803	706241.920362
25B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure full of water. Assumed pipe sizes/material in and out.	17July2013	1562080.218882	706474.780157
25C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure full of sediment, Pipe size assumed.	17July2013	1562094.740522	706492.664730
26A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561975.196584	706067.637198
26B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1562117.044124	706227.526794
26C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Drop inlet pipe.	17July2013	1561829.381233	706500.804078
26D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1562138.020211	706251.561433
26E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1562222.640507	706335.095807
26F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe outfalls into stone wall.	17July2013	1562229.504638	706338.575823
26G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1562232.210537	706338.378238
26H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1562228.842202	706343.837117
27A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Could not locate in field. Location assumed. Elevation from DEM.	17July2013	1562158.740690	705878.530033
27B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1562371.632042	706070.252225
27C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1562521.305977	706106.367714
28A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure could not be found in field. Location assumed. Invert from DEM.	17July2013	1562360.397893	705814.285260
28B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure breaking.	17July2013	1562437.522255	705928.940250
2A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Poor condition. Blocked with rip-rap and sediment.	17July2013	1559184.449444	709571.042424
2B	12"	Round	Cast Iron	5.33	4.24	From Building	n/a	n/a	Pipe D from buildings drains across street.	17July2013	1559238.412856	709637.034247
2C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Drop inlet. Pipes not visible due to sediment. Assumed flows to 2B.	17July2013	1559180.274443	709690.914791
2D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1559254.145955	709655.547234
2E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Circular grate.	17July2013	1559187.993860	709716.962790
3A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Location assumed. Elevation from DEM. Outfall could not be located.	17July2013	1559919.049579	708751.211889
3B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Location and pipe sizes in and out assumed. Elevations interpolated.	17July2013	1560055.563858	708890.533518
3C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe B from building.	17July2013	1560106.254996	708858.439604
3D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Location assumed. Pipe C size assumed. Invert elevations interpolated.	17July2013	1559961.710291	708978.607247

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	PIPED_SIZE	PIPED_SHAP	PIPED_MATE	PIPED_DIST	PIPED_INV	PIPED_TO_F	PLAN_NO	PLAN_ID	NOTES	DATE_	X	Y
3E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Sump at elevation 10.58.	17July2013	1559954.619934	708972.766108
3F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe B from natural spring from hillside.	17July2013	1559970.234547	708986.144596
4A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Concrete box culvert.	17July2013	1560138.105212	708499.711627
4B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Concrete box culvert.	17July2013	1560186.660084	708537.541252
4C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Box culvert under building.	17July2013	1560241.835259	708597.346662
4D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Assumed location and inverts interpolated.	17July2013	1560286.497904	708644.021138
4E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure 100-percent filled with sediment. No function.	17July2013	1560279.364266	708655.390664
4F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560242.654658	708697.677673
4G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Stone box culvert in and out.	17July2013	1560307.575433	708664.055157
4H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Stone box culvert.	17July2013	1560311.094942	708669.802669
5A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure contains Duckbill Check Valve.	17July2013	1560436.302469	708045.467804
5B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560562.455055	708144.364329
5C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560619.191572	708192.554445
5D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560630.100513	708179.460458
5E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560631.141464	708213.336075
6A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure contains Duckbill Checkvalve.	17July2013	1560620.110086	707443.282306
6B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipes submerged at time of survey.	17July2013	1560650.404494	707471.123900
6C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No manhole. Location assumed. Inverts interpolated.	17July2013	1560720.652196	707536.430610
6D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560679.568806	707596.035194
6E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure submerged at time of survey.	17July2013	1560801.220880	707614.523021
6F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560761.006850	707673.124330
6G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No manhole. Location assumed. Invert elevations interpolated.	17July2013	1560814.005317	707716.605975
6H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No manhole. Location assumed. Invert elevations interpolated.	17July2013	1560830.160135	707709.007618
6I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No manhole. Location assumed. Invert elevations interpolated.	17July2013	1560859.198922	707733.444490
6J	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560878.809675	707717.195969
6K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1560931.672149	707792.370312
6L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	pipe a 30 h x30w	17July2013	1560913.258772	707662.545108
6M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Water enters at curb at elevation 11.34.	17July2013	1560987.886436	707723.647608
6N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561011.259805	707740.945853
6O	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Accepts runoff from natural spring on hillside.	17July2013	1561015.052035	707744.817354
6P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561014.802529	707736.463736
7A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Concrete box culvert.	17July2013	1561213.550088	706867.212436
7AA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561776.744048	707263.220216
7B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No manhole. Invert elevations interpolated.	17July2013	1561232.292895	706882.241502
7C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	to underground connection b4 170	17July2013	1561239.421241	706873.678477
7D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No manhole. Invert elevations interpolated.	17July2013	1561330.301044	706969.215621
7E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561309.312286	706996.745840
7F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561386.120254	707011.339653
7G	18"	Round	Concrete	5.20	6.00	From 7J	n/a	n/a	n/a	17July2013	1561425.924213	707028.730380
7H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure filled with stone.	17July2013	1561470.957218	706981.510138
7I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure and Pipe A filled with stone and sediment.	17July2013	1561508.508088	706941.845258
7J	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561415.817487	707044.501415
7K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561503.642068	707178.124871
7L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561480.114007	707205.603060
7M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561526.139503	707182.144927
7N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561554.681619	707155.888996
7O	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure contains blocked off 15" concrete pipe at elevation 10.26.	17July2013	1561567.754468	707086.706227
7P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561603.382854	707063.544153
7Q	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561625.523730	707080.487315
7R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561625.769488	707039.289494
7S	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561666.661063	706991.425828
7T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561687.441263	707008.671054
7U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No manhole. Location assumed. Invert elevations interpolated.	17July2013	1561615.837096	707104.922567
7V	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561601.749712	707132.740044

EXISTING-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	PIPED_SIZE	PIPED_SHAP	PIPED_MATE	PIPED_DIST	PIPED_INV	PIPED_TO_F	PLAN_NO	PLAN_ID	NOTES	DATE_	X	Y
7W	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561646.044604	707117.826403
7X	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	At inlet, measures 8 ft. x 8 ft. stone. Tapers to 8 ft. x 6 ft. concrete.	17July2013	1561771.424066	707166.113295
7Y	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	In stone channel wall.	17July2013	1561782.614977	707175.808602
7Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561784.571544	707220.449330
8A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe outfalls in seawall.	17July2013	1561560.620535	706463.372063
8B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure still contains erosion and sediment control devices.	17July2013	1561720.685690	706604.555849
8C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561786.092383	706535.516739
8D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe C assumed abandoned or from nearby building.	17July2013	1561802.874228	706548.349485
8E	8"	Round	Cast Iron	2.00	1.58	From 8G	n/a	n/a	Additional pipe in, 6" round PVC from building at elevation 1.58.	17July2013	1561837.781810	706582.336217
8F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe 80-percent filled with sediment; switches to HDPE prior to 8E.	17July2013	1561872.888227	706592.616075
8G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure full of muck, pipes not visible.	17July2013	1561655.876042	706792.941669
8H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure full of muck. Pipe B assumed.	17July2013	1561609.387250	706860.421037
8I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe B from building.	17July2013	1561585.270820	706955.923610
8J	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561847.931686	706593.397894
8K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe B from building.	17July2013	1561812.532779	706625.889051
8L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561767.891783	706677.438848
8M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561842.724071	706754.357383
8N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561837.610158	706776.217885
8O	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561794.082237	706832.928711
8P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561756.335220	706884.811213
8Q	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561735.244012	706916.420934
8R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561861.111682	706745.940922
8S	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561883.676846	706757.359101
8T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Location confirmed from Cecil County Dye Test in Oct 2013.	01Oct2013	1561897.463255	706558.032598
8U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No manhole, Assumed location and invert elevations interpolated.	17July2013	1561956.750429	706621.107964
8V	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure 100-percent filled with sediment. Pipe size, shape, and location assumed.	17July2013	1561957.091301	706630.311517
8W	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	17July2013	1561977.728152	706639.868300
9L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Sump at 7.55. Assumed abandoned.	17July2013	1562474.274214	705976.772948
9M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure 100-percent full of sediment. Pig dug out in field, no pipes found, sump at 6.71.	17July2013	1562453.121486	706047.521515

1B

1C

2A

2B

2C

2D

2E

3C

3E

3F

4B

4C

4E

4F

4G

4H


5A


5B


5C


5D


5E


6A


6B


6D


6E


6F


6J


6K


6L


6M


6O


6P

7A

7AA

7C

7E

7F

7G

7H

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7R

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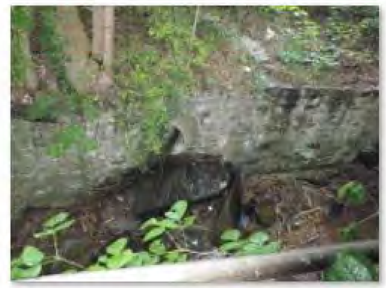
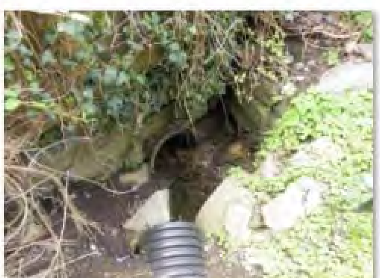

7Y

7Z

8A

8B

8C

8D

8E

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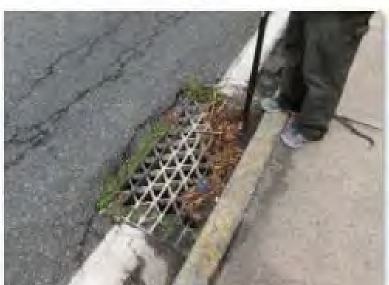
8W


9L


9M


10A

10B

10C

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10M

11B

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12D

12E


12F


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13E


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15E


16B


16C


17A


17C


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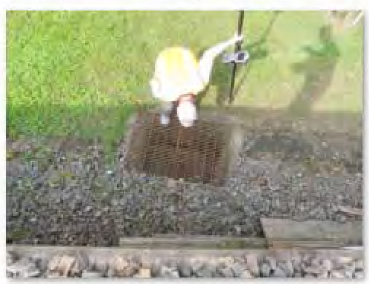
20C


20D


20E


20F


20G


20H


20I


21A


21B


22B


23A


23B


23C


23D


25B


25C


26A


26B


26C


26D


26E


26F


26G


26H


27B


27C


28B

EXISTING-CONDITIONS PIPE DATA

PERM_ID	LOC_SOURC	ELEV_SOURC	SIZE_IN	SIZE_FT	PIPE_SHAPE	MATERIAL	LENGTH	ELEV_IN	ELEV_OUT	SLOPE	NOTES
11B-11A	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	49.6	11.67	8.71	.0597	n/a
1C-1B	USACE Field Survey	USACE Field Survey	6	0.50	Round	Terra Cotta	24.0	8.66	8.08	.0242	n/a
1B-1A	Assumed	USACE Field Survey	15	1.25	Round	Terra Cotta	96.6	6.83	4.46	.0245	Downstream invert and location assumed.
2E-2D	USACE Field Survey	USACE Field Survey	6	0.50	Round	Cast Iron	90.3	8.81	7.75	.0117	n/a
2D-2B	USACE Field Survey	USACE Field Survey	8	0.67	Round	Cast Iron	24.3	7.59	6.07	.0626	n/a
2C-2B	USACE Field Survey	USACE Field Survey	6	0.50	Round	Cast Iron	79.3	8.54	8.07	.0059	Upstream invert estimated due to sedimentation.
2B-2A	USACE Field Survey	USACE Field Survey	27	2.25	Round	Concrete	85.2	3.65	2.90	.0088	n/a
12G-12F	USACE Field Survey	USACE Field Survey	12	1.00	Round	Corrugated Metal	7.2	6.80	7.21	-.0569	Negative slope accurate from field measurements.
12F-12B	USACE Field Survey	USACE Field Survey	12	1.00	Round	Terra Cotta	125.2	7.21	7.00	.0017	Downstream invert interpolated. Location assumed.
12C-12B	Assumed	USACE Field Survey	12	1.00	Round	Terra Cotta	33.0	8.24	7.00	.0376	Downstream invert interpolated. Location assumed.
12D-12C	USACE Field Survey	USACE Field Survey	6	0.50	Round	Terra Cotta	28.0	9.21	8.24	.0346	n/s
12E-12D	USACE Field Survey	USACE Field Survey	6	0.50	Round	Terra Cotta	41.5	9.85	9.54	.0075	Pipe switches from 4" PVC to 6" Terra Cotta.
12B-12A	Assumed	DEM	12	1.00	Round	Terra Cotta	85.2	7.00	5.26	.0204	Elevations interpolated. Size and location assumed.
3F-3D	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	11.4	10.51	10.00	.0447	Downstream invert interpolated.
3E-3D	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	9.2	10.91	10.00	.0989	Downstream invert interpolated.
3D-3B	Assumed	Assumed	8	0.67	Round	Terra Cotta	128.7	10.00	9.00	.0078	Size assumed. Upstream and downstream inverts interpolated.
3C-3B	USACE Field Survey	USACE Field Survey	8	0.67	Round	Terra Cotta	60.0	11.58	10.00	.0263	Downstream invert interpolated.
3B-3A	Assumed	Assumed	12	1.00	Round	Terra Cotta	195.1	9.00	2.85	.0315	Size and location assumed. Elevations interpolated.
13E-13D	USACE Field Survey	USACE Field Survey	8	0.67	Round	Concrete	45.6	11.52	11.61	-.0020	Negative slope accurate from field measurements.
13D-13B	USACE Field Survey	USACE Field Survey	8	0.67	Round	Concrete	144.7	11.61	2.42	.0635	Pipe switches to 6" round PVC prior to 13B.
13C-13B	USACE Field Survey	USACE Field Survey	6	0.50	Round	HDPE	115.1	12.02	2.42	.0834	Pipe switches to a 12" terra cotta prior to 13B.
13B-13A	USACE Field Survey	USACE Field Survey	12	1.00	Round	PVC	78.5	2.25	2.00	.0032	Downstream invert interpolated and location assumed.
14B-14A	USACE Field Survey	USACE Field Survey	8	0.67	Round	PVC	198.5	11.08	6.43	.0234	Downstream location assumed and elevation from DEM.
4E-4D	USACE Field Survey	USACE Field Survey	8	0.67	Round	Concrete	13.4	12.21	10.91	.0970	n/a
4F-4E	USACE Field Survey	USACE Field Survey	8	0.67	Round	Concrete	56.0	12.24	12.21	.0005	n/a
4D-4C	USACE Field Survey	USACE Field Survey	60 x 60	5.0 x 5.0	Box	Concrete	64.6	6.91	4.20	.0420	n/a
4B-4A	USACE Field Survey	USACE Field Survey	96 x 60	8.0 x 5.0	Rectangle	Concrete	61.5	2.21	1.82	.0063	n/a
4H-4G	USACE Field Survey	USACE Field Survey	72 x 36	6.0 x 3.0	Rectangle	Stone	6.7	12.34	10.84	.2239	n/a
4G-4D	USACE Field Survey	USACE Field Survey	60 x 60	5.0 x 5.0	Box	Concrete	29.1	10.84	6.91	.1351	n/a
15E-15C	USACE Field Survey	USACE Field Survey	6	0.5	Round	Terra Cotta	24.0	11.08	10.00	.0450	Downstream invert interpolated.
15D-15C	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	15.4	10.90	10.00	.0584	Downstream invert interpolated.
15C-15B	USACE Field Survey	USACE Field Survey	8	0.67	Round	Terra Cotta	127.8	10.00	4.48	.0432	Upstream invert interpolated.
15A-15B	USACE Field Survey	USACE Field Survey	8	0.67	Round	Terra Cotta	86.4	4.48	2.82	.0192	Downstream invert from DEM and location assumed.
5E-5C	USACE Field Survey	USACE Field Survey	10	0.83	Round	Corrugated Metal	24.0	7.15	7.07	.0033	n/a
5D-5C	USACE Field Survey	USACE Field Survey	4	0.33	Round	Cast Iron	17.0	7.71	7.23	.0282	n/a
5C-5B	USACE Field Survey	USACE Field Survey	12	1.00	Round	Cast Iron	74.4	6.90	5.75	.0155	n/a
5B-5A	USACE Field Survey	USACE Field Survey	12	1.00	Round	Cast Iron	160.3	5.75	1.93	.0238	n/a
16C-16B	USACE Field Survey	USACE Field Survey	4	0.33	Round	Concrete	96.0	6.56	5.78	.0081	n/a
16B-16A	USACE Field Survey	USACE Field Survey	4	0.33	Round	Concrete	140.1	5.69	1.51	.0298	Downstream location assumed.
17D-17C	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	113.5	6.57	3.15	.0301	n/a

EXISTING-CONDITIONS PIPE DATA

PERM_ID	LOC_SOURC	ELEV_SOURC	SIZE_IN	SIZE_FT	PIPE_SHAPE	MATERIAL	LENGTH	ELEV_IN	ELEV_OUT	SLOPE	NOTES
17C-17B	USACE Field Survey	USACE Field Survey	10	0.83	Round	Corrugated Metal	210.5	3.15	-1.50	.0221	Downstream invert interpolated.
17E-17B	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	127.0	0.82	-1.50	.0183	Downstream invert interpolated. Downstream location assumed.
17B-17A	USACE Field Survey	USACE Field Survey	12	1.00	Round	HDPE	23.5	-1.50	-1.72	.0094	Upstream location and invert interpolated.
18D-18B	USACE Field Survey	USACE Field Survey	12	1.00	Round	PVC	155.5	5.00	2.52	.0159	n/a
18C-18B	USACE Field Survey	USACE Field Survey	12	1.00	Round	PVC	57.3	5.51	2.69	.0492	n/a
18B-18A	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	20.8	2.52	2.81	-.0139	Negative slope due to sedimentation at 18A.
6M-6L	USACE Field Survey	USACE Field Survey	30 x 30	2.5 x 2.5	Box	Concrete	96.5	7.67	5.77	.0197	n/a
6L-6H	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	95.2	5.60	3.50	.0221	Downstream invert interpolated.
6J-6I	USACE Field Survey	USACE Field Survey	4	0.33	Round	Concrete	28.5	4.35	4.00	.0123	Downstream invert interpolated.
6K-6I	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	93.4	9.34	4.00	.0572	Downstream invert interpolated.
6I-6H	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	38.0	4.00	3.50	.0132	Upstream and downstream inverts interpolated.
6H-6G	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	17.9	3.50	3.00	.0279	Upstream and downstream inverts interpolated.
6G-6F	USACE Field Survey	USACE Field Survey	42 x 42	3.5 x 3.5	Box	Concrete	68.6	3.00	1.27	.0252	Upstream invert interpolated.
6F-6E	USACE Field Survey	USACE Field Survey	38 x 24	3.17 x 2.0	Elliptical	Concrete	71.1	1.27	0.27	.0141	n/a
6E-6C	USACE Field Survey	USACE Field Survey	38 x 24	3.17 x 2.0	Elliptical	Concrete	112.2	0.27	0.00	.0024	Downstream invert interpolated.
6D-6C	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	72.4	3.08	0.00	.0425	Downstream invert interpolated.
6C-6B	USACE Field Survey	USACE Field Survey	38 x 24	3.17 x 2.0	Elliptical	Concrete	95.9	0.00	-0.09	.0009	Upstream invert interpolated.
6B-6A	USACE Field Survey	USACE Field Survey	38 x 24	3.17 x 2.0	Elliptical	Concrete	41.1	-0.34	-0.52	.0044	n/a
6O-6N	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	6.3	11.19	9.50	.2683	Downstream invert interpolated.
6N-6M	USACE Field Survey	USACE Field Survey	8	0.67	Round	Cast Iron	28.9	9.50	9.17	.0114	Upstream invert interpolated.
19C-19B	USACE Field Survey	USACE Field Survey	6	0.50	Round	Cast Iron	23.4	4.96	4.43	.0269	n/a
19B-19A	USACE Field Survey	USACE Field Survey	15	1.25	Round	Cast Iron	440.5	4.43	1.36	.0070	Location assumed.
20I-20H	USACE Field Survey	USACE Field Survey	8 (2)	0.67 (2)	Round	Cast Iron	26.8	6.40	6.21	.0071	Twin 8" cast iron pipes.
20H-20G	USACE Field Survey	USACE Field Survey	8	0.67	Round	Cast Iron	146.7	6.21	3.74	.0168	n/a
20G-20E	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	89.1	2.99	1.53	.0164	Upstream end of pipe at 20G blocked with stone preventing flow.
20F-20E	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	212.3	2.75	1.36	.0065	n/a
20E-20B	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	190.6	1.03	-0.48	.0079	n/a
20B-20A	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	32.5	-0.48	-0.60	.0037	n/a
20C-20B	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	212.1	2.67	1.27	.0066	n/a
20D-20C	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	196.0	5.33	2.84	.0127	n/a
21B-21A	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	31.8	2.87	1.19	.0528	n/a
22B-22A	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	279.5	5.38	0.00	.0192	Downstream location assumed.
7W-7U	USACE Field Survey	USACE Field Survey	96 x 72	8.0 x 6.0	Rectangle	Concrete	32.8	10.84	9.00	.0561	Downstream invert interpolated.
7E-7D	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	34.6	7.59	6.00	.0460	Downstream invert interpolated.
7D-7B	USACE Field Survey	USACE Field Survey	78 x 48	6.5 x 4.0	Rectangle	Concrete	131.0	1.80	-1.43	.0247	Upstream and downstream inverts interpolated.
7C-7B	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	11.1	3.54	3.00	.0486	Downstream invert interpolated.
7B-7A	USACE Field Survey	USACE Field Survey	78 x 48	6.5 x 4.0	Rectangle	Concrete	24.0	-1.43	-2.03	.0250	Upstream invert interpolated.
7AA-7Z	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	43.5	31.66	27.21	.1023	n/a
7Z-7Y	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	44.7	26.62	22.85	.0843	n/a
7X-7W	USACE Field Survey	USACE Field Survey	96 x 72	8.0 x 6.0	Rectangle	Concrete	134.4	17.85	10.84	.0522	Pipe starts as 8' x 8' at 7X and tapers to 8' x 6'.

EXISTING-CONDITIONS PIPE DATA

PERM_ID	LOC_SOURC	ELEV_SOURC	SIZE_IN	SIZE_FT	PIPE_SHAPE	MATERIAL	LENGTH	ELEV_IN	ELEV_OUT	SLOPE	NOTES
7V-7U	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	31.2	12.88	10.00	.0923	Downstream invert interpolated.
7U-7O	USACE Field Survey	USACE Field Survey	60	5.00	Round	Concrete	51.4	9.00	7.51	.0290	Upstream invert interpolated.
7P-7O	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	42.5	9.95	7.51	.0574	n/a
7Q-7P	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	27.9	12.81	10.95	.0667	n/a
7R-7P	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	33.0	10.01	9.95	.0018	n/a
7S-7R	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	63.0	11.34	10.09	.0198	n/a
7T-7S	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	27.0	12.85	12.67	.0067	n/a
7O-7G	USACE Field Survey	USACE Field Survey	60	5.00	Round	Concrete	153.2	7.51	4.78	.0178	n/a
7J-7G	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	18.7	6.02	6.00	.0011	n/a
7K-7J	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	159.9	8.02	6.10	.0120	n/a
7L-7K	USACE Field Survey	USACE Field Survey	8	0.67	Round	Concrete	36.2	8.97	8.35	.0171	n/a
7M-7K	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	22.9	10.04	8.18	.0812	n/a
7N-7M	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	38.8	10.58	10.04	.0139	n/a
7H-7G	USACE Field Survey	USACE Field Survey	15	1.25	Round	Corrugated Metal	65.3	10.66	9.20	.0224	n/a
7I-7H	USACE Field Survey	USACE Field Survey	12	1.00	Round	Corrugated Metal	54.6	10.71	10.66	.0009	n/a
7G-7F	USACE Field Survey	USACE Field Survey	78 x 48	6.5 x 4.0	Rectangle	Concrete	43.4	1.95	3.24	-.0297	Negative slope accurate from field measurements.
7F-7D	USACE Field Survey	USACE Field Survey	78 x 48	6.5 x 4.0	Rectangle	Concrete	69.9	3.24	1.80	.0206	Downstream invert interpolated.
23D-23C	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	148.1	5.93	4.87	.0072	n/a
23C-23B	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	72.9	4.45	3.28	.0160	n/a
23B-23A	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	137.2	3.28	1.35	.0141	Pipe starts as concrete at 23B and changes to CMP at 23A.
8Q-8P	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	38.0	7.11	6.84	.0071	n/a
8P-8O	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	64.2	6.84	5.61	.0192	n/a
8O-8N	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	71.5	5.36	4.71	.0091	n/a
8N-8M	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	22.5	4.71	4.49	.0098	n/a
8R-8M	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	20.2	4.75	4.49	.0129	n/a
8S-8R	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	25.3	4.89	4.83	.0024	n/a
8M-8L	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	107.3	4.49	3.84	.0061	n/a
8L-8K	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	68.2	3.75	3.09	.0097	n/a
8K-8J	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	48.1	2.59	2.55	.0008	n/a
8J-8E	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	15.0	2.30	1.58	.0480	n/a
8F-8E	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	36.6	2.26	1.58	.0186	Starts as concrete at 8F and changes to HDPE at 8E.
8E-8D	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	48.7	1.58	1.57	.0002	Starts as 12" concrete at 8E and changes to 15" PVC at 8D.
8D-8C	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	21.1	1.32	1.11	.0100	n/a
8C-8B	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	95.1	0.94	0.67	.0028	n/a
8B-8A	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	213.4	0.67	-0.47	.0053	n/a
8I-8H	USACE Field Survey	USACE Field Survey	4	0.33	Round	Cast Iron	98.5	6.06	4.41	.0168	n/a
8H-8G	USACE Field Survey	USACE Field Survey	8	0.67	Round	Cast Iron	81.9	4.41	4.30	.0013	n/a
8G-8E	USACE Field Survey	USACE Field Survey	8	0.67	Round	Cast Iron	278.3	4.30	1.58	.0098	n/a
8W-8U	USACE Field Survey	USACE Field Survey	10	0.83	Round	Cast Iron	28.1	7.27	7.00	.0096	Downstream invert interpolated.
8U-8T	USACE Field Survey	USACE Field Survey	10	0.83	Round	Cast Iron	72.8	7.00	4.07	.0402	Upstream invert interpolated.

EXISTING-CONDITIONS PIPE DATA

PERM_ID	LOC_SOURC	ELEV_SOURC	SIZE_IN	SIZE_FT	PIPE_SHAPE	MATERIAL	LENGTH	ELEV_IN	ELEV_OUT	SLOPE	NOTES
25C-25B	USACE Field Survey	USACE Field Survey	8	0.67	Round	Cast Iron	23.0	8.13	7.14	.0430	Pipe size assumed.
25B-25A	Assumed	USACE Field Survey	8	0.67	Round	Cast Iron	359.8	7.14	-0.50	.0212	Downstream invert from DEM. Pipe size and location assumed.
8V-8U	USACE Field Survey	USACE Field Survey	10	0.83	Round	Cast Iron	9.2	7.12	7.00	.0130	Downstream invert interpolated.
26H-26E	USACE Field Survey	USACE Field Survey	36 x 30	3.0 x 2.5	Rectangle	Stone	10.7	7.84	5.79	.1916	n/a
26G-26F	USACE Field Survey	USACE Field Survey	4	0.33	Round	PVC	2.7	10.12	7.58	.9407	n/a
26E-26D	USACE Field Survey	USACE Field Survey	60 x 42	5.0 x 3.5	Rectangle	Stone	118.9	5.79	2.06	.0314	n/a
26D-26B	USACE Field Survey	USACE Field Survey	60 x 42	5.0 x 3.5	Rectangle	Concrete	31.9	2.06	2.54	-.0150	Negative slope accurate from field measurements.
26C-26B	USACE Field Survey	USACE Field Survey	10	0.83	Round	Cast Iron	396.8	5.81	2.45	.0085	n/a
26B-26A	USACE Field Survey	USACE Field Survey	72 x 72	6.0 x 6.0	Box	Stone	213.7	2.37	-1.50	.0181	n/a
27B-27A	USACE Field Survey	USACE Field Survey	10	0.83	Round	Cast iron	286.5	5.26	-1.00	.0114	Downstream location assumed and invert from DEM.
28B-28A	USACE Field Survey	USACE Field Survey	4	0.33	Round	Cast Iron	138.2	5.94	-0.33	.0454	Downstream location assumed.
27C-27B	USACE Field Survey	USACE Field Survey	10	0.83	Round	Cast Iron	154.0	9.00	5.26	.0243	n/a
10AA-10Z	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	90.5	93.04	88.35	.0518	n/a
10Y-10W	State Highway Plans	State Highway Plans	66	5.50	Round	Concrete	79.4	81.94	79.42	.0317	n/a
10X-10Y	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	8.9	86.98	81.94	.5663	n/a
10V-10U	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	53.9	63.25	61.72	.0284	n/a
10T-10S	State Highway Plans	State Highway Plans	15	1.25	Round	Corrugated Metal	13.2	54.27	52.75	.1152	n/a
10R-10Q	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	7.1	41.84	41.81	.0042	n/a
10Q-10P	State Highway Plans	State Highway Plans	15	1.25	Round	Corrugated Metal	51.5	41.15	40.00	.0223	n/a
10O-10N	State Highway Plans	State Highway Plans	15	1.25	Round	Corrugated Metal	12.3	23.75	22.61	.0927	n/a
10M-10L	USACE Field Survey	USACE Field Survey	48	4.00	Round	Concrete	147.0	16.52	4.92	.0789	Pipe switches to 5 ft. x 3.5 ft. box culvert under roadway.
10D-10C	USACE Field Survey	USACE Field Survey	66	5.50	Round	Corrugated Metal	49.1	3.53	2.30	.0251	n/a
10B-10A	USACE Field Survey	USACE Field Survey	24 (3)	2.00 (3)	Round	Concrete	25.2	1.58	0.39	.0472	Triple concrete pipes.
10K-10J	USACE Field Survey	USACE Field Survey	15	1.25	Round	Corrugated Metal	10.7	5.13	4.59	.0505	n/a
10J-10I	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	31.8	4.59	4.52	.0022	n/a
10I-10F	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	174.0	4.61	4.57	.0002	n/a
10G-10F	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	39.8	4.74	4.49	.0063	n/a
10H-10G	USACE Field Survey	USACE Field Survey	18	1.50	Round	Corrugated Metal	11.8	6.88	5.08	.1525	n/a
10F-10E	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	102.4	4.49	4.00	.0048	n/a
6P-6N	USACE Field Survey	USACE Field Survey	4	0.33	Round	PVC	5.7	10.02	9.50	.0912	Downstream invert interpolated.

APPENDIX C

Future-Conditions Stormwater Survey Data

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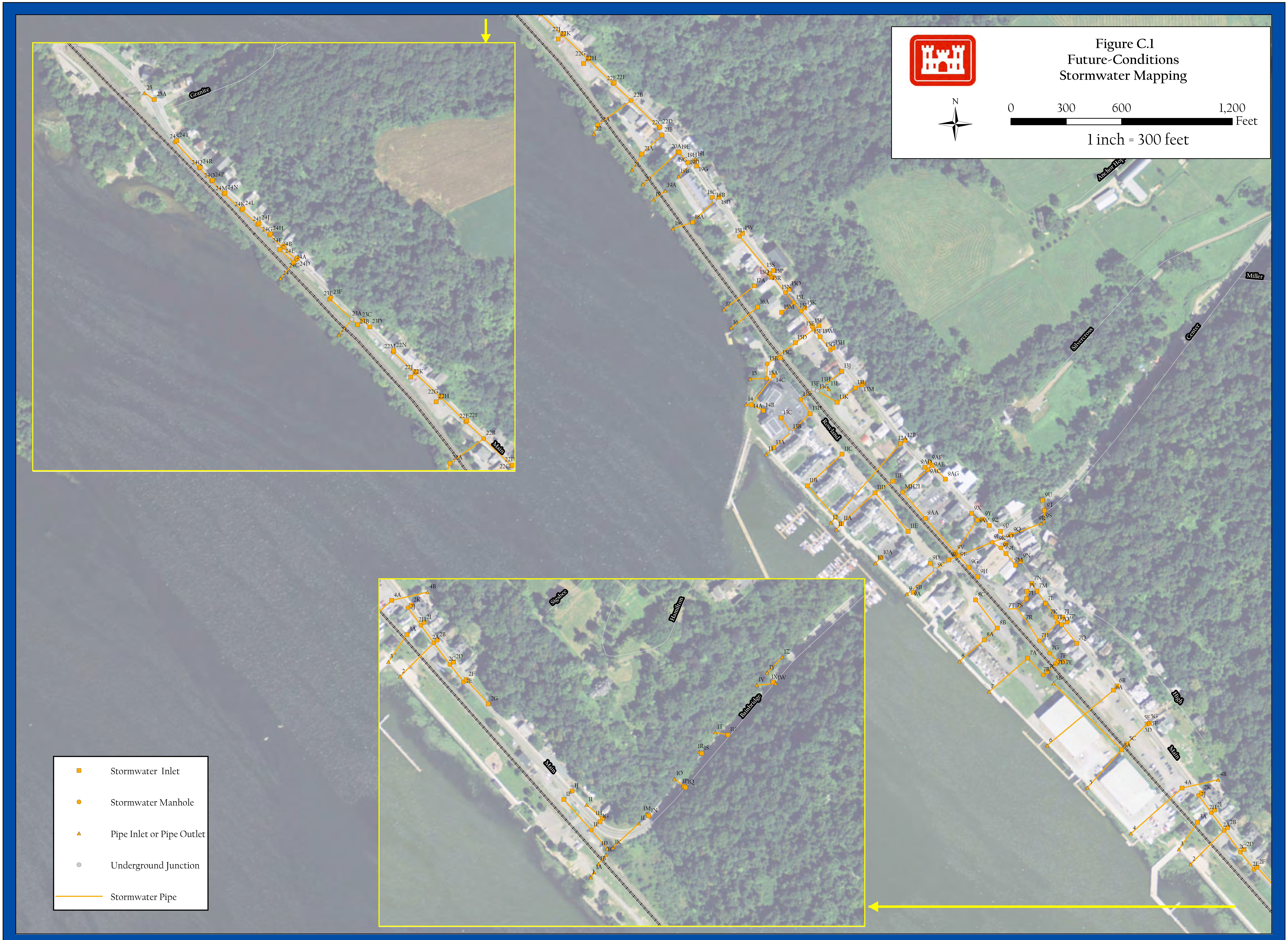
Figure C.1
Future-Conditions
Stormwater Mapping
N
0
300
600
1,200
Feet
1 inch = 300 feet
Stormwater Inlet
Stormwater Manhole
Pipe Inlet or Pipe Outlet
Underground Junction
Stormwater Pipe
Main
Granite
Rowland
Silvercross
Center
Miller
High
Hamilton
Bainbridge

FUTURE-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	LOC_SOURCE	ELEV_SOURC	TYPE	TOP_ELEV	PIPE_HW	PIPE_HW_MA	PIPE_HW_AN	PIPEA_SIZE	PIPEA_SHAP	PIPEA_MATE	PIPEA_DIST	PIPEA_INV	PIPEA_TO_F	PIPEB_SIZE	PIPEB_SHAP	PIPEB_MATE	PIPEB_DIST	PIPEB_INV	PIPEB_TO_F
1	USACE Field Survey	USACE Field Survey	Pipe Outlet	5.39	Yes	Concrete	180-deg.	24" (3)	Round	Concrete	3.00	0.39	From 1A	n/a	n/a	n/a	n/a	n/a	n/a
2	State Highway Plans	State Highway Plans	Pipe Outlet	2.00	Yes	Concrete	180-deg.	24"	Round	Concrete	2.00	0.00	From 2A	n/a	n/a	n/a	n/a	n/a	n/a
3	Assumed	DEM	Pipe Outlet	0.00	n/a	n/a	n/a	4"	Round	Cast Iron	0.33	-0.33	From 3A	n/a	n/a	n/a	n/a	n/a	n/a
4	Assumed	DEM	Pipe Outlet	-0.17	Unknown	Unknown	Unknown	10"	Round	Cast Iron	0.83	-1.00	From 4A	n/a	n/a	n/a	n/a	n/a	n/a
5	USACE Field Survey	USACE Field Survey	Pipe Outlet	6.17	Yes	Stone	180-deg.	72" x 72"	Box	Stone	7.67	-1.50	From 5A	n/a	n/a	n/a	n/a	n/a	n/a
6	Assumed	DEM	Pipe Outlet	-0.17	Unknown	Unknown	Unknown	8"	Round	Cast Iron	0.67	-0.50	From 25B	n/a	n/a	n/a	n/a	n/a	n/a
7	USACE Field Survey	USACE Field Survey	Pipe Outlet	6.36	Yes	Wood	180-deg.	24"	Round	Concrete	6.83	-0.47	From 7A	n/a	n/a	n/a	n/a	n/a	n/a
8	USACE Field Survey	USACE Field Survey	Pipe Outlet	6.36	Yes	Wood	180-deg.	15"	Round	Corrugated Metal	5.00	1.35	From 8A	n/a	n/a	n/a	n/a	n/a	n/a
9	USACE Field Survey	USACE Field Survey	Pipe Outlet	6.05	Yes	Wood	180-deg.	78" x 48"	Rectangle	Concrete	8.08	-2.03	From 9A	n/a	n/a	n/a	n/a	n/a	n/a
10	USACE Field Survey	USACE Field Survey	Pipe Outlet	2.44	Yes	Wood	180-deg.	15"	Round	Concrete	1.25	1.19	From 10A	n/a	n/a	n/a	n/a	n/a	n/a
11	USACE Field Survey	USACE Field Survey	Pipe Outlet	0.90	No	n/a	n/a	18"	Round	Concrete	1.50	-0.60	From 11A	n/a	n/a	n/a	n/a	n/a	n/a
12	USACE Field Survey	USACE Field Survey	Pipe Outlet	2.61	No	n/a	n/a	15"	Round	Cast Iron	1.25	1.36	From 12A	n/a	n/a	n/a	n/a	n/a	n/a
13	USACE Field Survey	USACE Field Survey	Pipe Outlet	1.52	No	n/a	n/a	38" x 24"	Elliptical	Concrete	2.00	-0.52	From 13A	n/a	n/a	n/a	n/a	n/a	n/a
14	USACE Field Survey	USACE Field Survey	Pipe Outlet	3.81	No	n/a	n/a	12"	Round	Concrete	1.00	2.81	From 14A	n/a	n/a	n/a	n/a	n/a	n/a
15	State Highway Plans	State Highway Plans	Pipe Outlet	3.30	Yes	Concrete	180-deg.	24"	Round	Concrete	2.00	1.30	From 15A	n/a	n/a	n/a	n/a	n/a	n/a
16	Assumed	DEM	Pipe Outlet	1.84	Unknown	Unknown	Unknown	4"	Round	Concrete	0.33	1.51	From 16A	n/a	n/a	n/a	n/a	n/a	n/a
17	USACE Field Survey	USACE Field Survey	Pipe Outlet	2.93	No	n/a	n/a	12"	Round	Cast Iron	1.00	1.93	From 17A	n/a	n/a	n/a	n/a	n/a	n/a
18	Assumed	DEM	Pipe Outlet	3.49	Unknown	Unknown	Unknown	8"	Round	Terra Cotta	0.67	2.82	From 18	n/a	n/a	n/a	n/a	n/a	n/a
19	USACE Field Survey	USACE Field Survey	Pipe Outlet	9.32	Yes	Concrete	180-deg.	96" x 60"	Rectangle	Concrete	7.50	1.82	From 19A	n/a	n/a	n/a	n/a	n/a	n/a
20	Assumed	DEM	Pipe Outlet	7.10	Unknown	Unknown	Unknown	8"	Round	PVC	0.67	6.43	From 14B	n/a	n/a	n/a	n/a	n/a	n/a
21	Assumed	DEM	Pipe Outlet	3.00	Unknown	Unknown	Unknown	12"	Round	PVC	1.00	2.00	From 21A	n/a	n/a	n/a	n/a	n/a	n/a
22	State Highway Plans	State Highway Plans	Pipe Outlet	4.70	n/a	n/a	n/a	24"	Round	Concrete	2.00	2.70	From 22A	n/a	n/a	n/a	n/a	n/a	n/a
23	Assumed	DEM	Pipe Outlet	6.26	No	n/a	n/a	12"	Round	Terra Cotta	1.00	5.26	From 23A	n/a	n/a	n/a	n/a	n/a	n/a
24	State Highway Plans	State Highway Plans	Pipe Outlet	4.00	n/a	n/a	n/a	24"	Round	Concrete	2.00	2.00	From 24A	n/a	n/a	n/a	n/a	n/a	n/a
25	USACE Field Survey	USACE Field Survey	Pipe Outlet	9.96	Yes	Concrete	180-deg.	15"	Round	Concrete	1.25	8.71	From 25A	n/a	n/a	n/a	n/a	n/a	n/a
10A	USACE Field Survey	USACE Field Survey	Grate Inlet	5.62	n/a	n/a	n/a	15"	Round	Concrete	2.75	2.87	To 10	n/a	n/a	n/a	n/a	n/a	n/a
11A	USACE Field Survey	USACE Field Survey	Grate Inlet	5.44	n/a	n/a	n/a	18"	Round	Concrete	5.92	-0.48	To 11	18"	Round	Concrete	4.17	1.27	From 11B
11B	USACE Field Survey	USACE Field Survey	Grate Inlet	4.67	n/a	n/a	n/a	15"	Round	Concrete	1.83	2.84	From 11C	18"	Round	Concrete	2.00	2.67	To 11B
11C	USACE Field Survey	USACE Field Survey	Grate Inlet	8.16	n/a	n/a	n/a	15"	Round	Concrete	2.83	5.33	To 11B	n/a	n/a	n/a	n/a	n/a	n/a
11D	USACE Field Survey	USACE Field Survey	Grate Inlet	7.86	n/a	n/a	n/a	18"	Round	Concrete	6.83	1.03	To 11A	12"	Round	Concrete	6.50	1.36	From 11E
11E	USACE Field Survey	USACE Field Survey	Grate Inlet	8.08	n/a	n/a	n/a	12"	Round	Concrete	5.33	2.75	To 11D	n/a	n/a	n/a	n/a	n/a	n/a
11F	USACE Field Survey	USACE Field Survey	Grate Inlet	5.99	n/a	n/a	n/a	15"	Round	Concrete	3.00	2.99	To 11D	8"	Round	Cast Iron	2.25	3.74	From 20H
12A	USACE Field Survey	USACE Field Survey	Combination Inlet	8.43	n/a	n/a	n/a	6"	Round	Cast Iron	4.00	4.43	From 12B	15"	Round	Cast Iron	4.00	4.43	To 12
12B	USACE Field Survey	USACE Field Survey	Grate Inlet	8.38	n/a	n/a	n/a	6"	Round	Cast Iron	3.42	4.96	To 12A	n/a	n/a	n/a	n/a	n/a	n/a
13A	USACE Field Survey	USACE Field Survey	Grate Inlet	6.16	n/a	n/a	n/a	38" x 24"	Elliptical	Concrete	6.50	-0.34	To 13	38" x 24"	Elliptical	Concrete	6.25	-0.09	From 13B
13B	Assumed	Assumed	Underground Junction	7.97	n/a	n/a	n/a	38" x 24"	Elliptical	Concrete	7.97	0.00	From 13D	38" x 24"	Elliptical	Concrete	7.97	0.00	To 13A
13C	USACE Field Survey	USACE Field Survey	Grate Inlet	7.83	n/a	n/a	n/a	12"	Round	Concrete	4.75	3.08	To 13B	n/a	n/a	n/a	n/a	n/a	n/a
13D	USACE Field Survey	USACE Field Survey	Grate Inlet	8.19	n/a	n/a	n/a	38" x 24"	Elliptical	Concrete	7.92	0.27	To 13B	38" x 24"	Elliptical	Concrete	7.92	0.27	From 13E
13E	USACE Field Survey	USACE Field Survey	Manhole	9.19	n/a	n/a	n/a	38" x 24"	Elliptical	Concrete	7.92	1.27	To 13D	42" x 42"	Box	Concrete	7.92	1.27	From 13F
13F	Assumed	DEM	Underground Junction	14.01	n/a	n/a	n/a	42" x 42"	Box	Concrete	11.01	3.00	To 13E	24"	Round	Concrete	11.01	3.00	From 13G
13G	Assumed	DEM	Underground Junction	13.92	n/a	n/a	n/a	24"	Round	Concrete	10.42	3.50	To 13F	24"	Round	Concrete	10.42	3.50	From 13K
13H	Assumed	DEM	Underground Junction	6.92	n/a	n/a	n/a	6"	Round	PVC	2.92	4.00	From 13I	6"	Round	PVC	2.92	4.00	From 13J
13I	USACE Field Survey	USACE Field Survey	Pipe Inlet	4.68	Yes	Concrete	180-deg.	4"	Round	Concrete	0.33	4.35	To 13H	n/a	n/a	n/a	n/a	n/a	n/a
13J	USACE Field Survey	USACE Field Survey	Combination Inlet	10.26	n/a	n/a	n/a	6"	Round	PVC	0.92	9.34	To 13H	n/a	n/a	n/a	n/a	n/a	n/a
13K	USACE Field Survey	USACE Field Survey	Grate Inlet	13.35	n/a	n/a	n/a	30" x 30"	Box	Concrete	7.58	5.77	From 13L	24"	Round	Concrete	7.75	5.60	To 13G
13L	USACE Field Survey	USACE Field Survey	Combination Inlet	12.34	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	30" x 30"	Box	Concrete	4.67	7.67	To 13K
13M	State Highway Plans	State Highway Plans	Type E Inlet	11.00	n/a	n/a	n/a	12"	Round	Concrete	3.41	7.59	From 13N	18"	Round	Concrete	3.51	7.49	To 13L
13N	State Highway Plans	State Highway Plans	Grate Inlet	11.40	n/a	n/a	n/a	12"	Round	Concrete	3.77	7.63	To 13M	n/a	n/a	n/a	n/a	n/a	n/a
14A	USACE Field Survey	USACE Field Survey	Grate Inlet	10.77	n/a	n/a	n/a	12"	Round	Concrete	8.25	2.52	To 14	12"	Round	PVC	8.25	2.52	From 14C
14B	USACE Field Survey	USACE Field Survey	Grate Inlet	8.01	n/a	n/a	n/a	12"	Round	PVC	2.50	5.51	To 14A	10"	Round	PVC	2.00	6.01	Building
14C	USACE Field Survey	USACE Field Survey	Grate Inlet	7.00	n/a	n/a	n/a	12"	Round	PVC	2.00	5.00	To 14A	n/a	n/a	n/a	n/a	n/a	n/a
15A	State Highway Plans	State Highway Plans	Manhole	5.80				24"	Round	Concrete	4.48	1.32	To 15	24"	Round	Concrete	4.43	1.37	From 15B
15B	State Highway Plans	State Highway Plans	Manhole	5.43				24"	Round	Concrete	3.79	1.64	To 15A	24"	Round	Concrete	3.74	1.69	From 15D
15C	USACE Field Survey	USACE Field Survey	Grate Inlet	2.90	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

FUTURE-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	LOC_SOURCE	ELEV_SOURC	TYPE	TOP_ELEV	PIPE_HW	PIPE_HW_MA	PIPE_HW_AN	PIPEA_SIZE	PIPEA_SHAP	PIPEA_MATE	PIPEA_DIST	PIPEA_INV	PIPEA_TO_F	PIPEB_SIZE	PIPEB_SHAP	PIPEB_MATE	PIPEB_DIST	PIPEB_INV	PIPEB_TO_F
15D	State Highway Plans	State Highway Plans	Grate Inlet	5.89				24"	Round	Concrete	3.53	2.36	To 15B	24"	Round	Concrete	3.48	2.41	From 15E
15E	State Highway Plans	State Highway Plans	Manhole	9.34	n/a	n/a	n/a	24"	Round	Concrete	6.50	2.84	To 15D	6"	Round	PVC	5.81	3.53	From 15F
15F	State Highway Plans	State Highway Plans	Trench Drain	9.67	n/a	n/a	n/a	6"	Round	PVC	6.14	3.53	To 15E	n/a	n/a	n/a	n/a	n/a	n/a
15G	State Highway Plans	State Highway Plans	Manhole	10.06	n/a	n/a	n/a	18"	Round	Concrete	6.51	3.55	To 15W	18"	Round	Concrete	6.41	3.65	From 15H
15H	State Highway Plans	State Highway Plans	Type E Inlet	9.91	n/a	n/a	n/a	18"	Round	Concrete	6.20	3.71	To 15G	n/a	n/a	n/a	n/a	n/a	n/a
15I	State Highway Plans	State Highway Plans	Type E Inlet	9.05				24"	Round	Concrete	6.06	2.99	To 15E	24"	Round	Concrete	5.96	3.09	From 15J
15J	State Highway Plans	State Highway Plans	Manhole	9.48	n/a	n/a	n/a	24"	Round	Concrete	6.03	3.45	To 15I	6"	Round	PVC	5.59	3.89	From 15K
15K	State Highway Plans	State Highway Plans	Trench Drain	9.42	n/a	n/a	n/a	6"	Round	PVC	5.53	3.89	To 15J	n/a	n/a	n/a	n/a	n/a	n/a
15L	State Highway Plans	State Highway Plans	Manhole	9.20				24"	Round	Concrete	5.45	3.75	To 15J	15"	Round	Concrete	5.35	3.85	From 15M
15M	State Highway Plans	State Highway Plans	Grate Inlet	9.25	n/a	n/a	n/a	15"	Round	Concrete	4.80	4.45	To 15L	n/a	n/a	n/a	n/a	n/a	n/a
15N	State Highway Plans	State Highway Plans	Manhole	9.30	n/a	n/a	n/a	24"	Round	Concrete	5.19	4.11	To 15L	6"	Round	PVC	5.14	4.16	From 15O
15O	State Highway Plans	State Highway Plans	Trench Drain	9.19	n/a	n/a	n/a	18"	Round	Concrete	5.03	4.16	To 15N	n/a	n/a	n/a	n/a	n/a	n/a
15P	State Highway Plans	State Highway Plans	Manhole	9.10				24"	Round	Concrete	4.50	4.60	To 15N	15"	Round	Concrete	4.40	4.70	From 15Q
15Q	State Highway Plans	State Highway Plans	Type E Inlet	8.95	n/a	n/a	n/a	15"	Round	Concrete	4.23	4.72	To 15P	n/a	n/a	n/a	n/a	n/a	n/a
15R	State Highway Plans	State Highway Plans	Manhole	9.23	n/a	n/a	n/a	24"	Round	Concrete	4.46	4.77	To 15P	6"	Round	PVC	3.94	5.29	From 15S
15S	State Highway Plans	State Highway Plans	Trench Drain	9.19	n/a	n/a	n/a	6"	Round	PVC	3.90	5.29	To 15R	n/a	n/a	n/a	n/a	n/a	n/a
15T	State Highway Plans	State Highway Plans	Type E Inlet	8.95	n/a	n/a	n/a	15"	Round	Concrete	4.12	4.83	To 15R	n/a	n/a	n/a	n/a	n/a	n/a
15U	State Highway Plans	State Highway Plans	Manhole	10.50				24"	Round	Concrete	4.66	5.84	To 15R	15"	Round	Concrete	4.56	5.94	From 15V
15V	State Highway Plans	State Highway Plans	Type E Inlet	10.80				15"	Round	Concrete	4.80	6.00	To 15U	n/a	n/a	n/a	n/a	n/a	n/a
15W	State Highway Plans	State Highway Plans	Type E Inlet	9.50				18"	Round	Concrete	6.39	3.11	To 15E	18"	Round	Concrete	6.29	3.21	From 15G
16A	USACE Field Survey	USACE Field Survey	Grate Inlet	7.36	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	4"	Round	Concrete	1.67	5.69	To 16
17A	USACE Field Survey	USACE Field Survey	Grate Inlet	7.75	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	12"	Round	Cast Iron	2.00	5.75	To 5A
18A	USACE Field Survey	USACE Field Survey	Grate Inlet	6.90	n/a	n/a	n/a	8"	Round	Terra Cotta	2.42	4.48	From 18B	8"	Round	Terra Cotta	2.42	4.48	To 18
18B	Assumed	DEM	Underground Junction	12.17	n/a	n/a	n/a	6"	Round	PVC	2.17	10.00	From 18C	6"	Round	Terra Cotta	2.17	10.00	From 18D
18C	USACE Field Survey	USACE Field Survey	Grate Inlet	12.65	n/a	n/a	n/a	6"	Round	PVC	1.75	10.90	To 18B	n/a	n/a	n/a	n/a	n/a	n/a
18D	USACE Field Survey	USACE Field Survey	Grate Inlet	12.25	n/a	n/a	n/a	6"	Round	Terra Cotta	1.17	11.08	To 18B	n/a	n/a	n/a	n/a	n/a	n/a
19A	USACE Field Survey	USACE Field Survey	Pipe Inlet	9.71	Yes	Stone	180-deg.	96" x 60"	Rectangle	Concrete	7.50	2.21	To 19	n/a	n/a	n/a	n/a	n/a	n/a
19B	USACE Field Survey	USACE Field Survey	Pipe Outlet	9.20	Yes	Concrete	180-deg.	60" x 60"	Box	Concrete	5.00	4.20	From 19C	n/a	n/a	n/a	n/a	n/a	n/a
19C	Assumed	DEM	Underground Junction	13.91	n/a	n/a	n/a	60" x 60"	Box	Concrete	7.00	6.91	From 19F	60" x 60"	Box	Concrete	7.00	6.91	To 19B
19D	USACE Field Survey	USACE Field Survey	Grate Inlet	13.71	n/a	n/a	n/a	8"	Round	Concrete	1.50	12.21	From 19E	8"	Round	Concrete	1.50	12.21	To 19C
19E	USACE Field Survey	USACE Field Survey	Grate Inlet	13.49	n/a	n/a	n/a	8"	Round	Concrete	1.25	12.24	To 19D	n/a	n/a	n/a	n/a	n/a	n/a
19F	State Highway Plans	State Highway Plans	Underground Junction	15.00	n/a	n/a	n/a	15"	Round	Concrete	4.30	10.70	From 19G	60" x 60"	Box	Stone	4.40	10.60	From 19H
19G	State Highway Plans	State Highway Plans	Type S Inlet	15.00	n/a	n/a	n/a	15"	Round	Concrete	3.79	11.21	To 19F	n/a	n/a	n/a	n/a	n/a	n/a
19H	USACE Field Survey	USACE Field Survey	Curb Inlet	15.84	n/a	n/a	n/a	72" x 36"	Rectangle	Stone	5.00	10.84	From 19I	60" x 60"	Box	Stone	5.00	10.84	To 19F
19I	USACE Field Survey	USACE Field Survey	Pipe Inlet	16.67	Yes	Stone	180-deg.	72" x 36"	Rectangle	Stone	4.33	12.34	To 19H	n/a	n/a	n/a	n/a	n/a	n/a
1A	USACE Field Survey	USACE Field Survey	Pipe Inlet	6.83	Yes	Concrete	180-deg.	24" (3)	Round	Concrete	5.25	1.58	To 1	n/a	n/a	n/a	n/a	n/a	n/a
1B	USACE Field Survey	USACE Field Survey	Pipe Outlet	7.80	No	n/a	n/a	66"	Round	Corrugated Metal	5.50	2.30	From 1C	n/a	n/a	n/a	n/a	n/a	n/a
1C	USACE Field Survey	USACE Field Survey	Pipe Inlet	11.20	Yes	Concrete	180-deg.	66"	Round	Corrugated Metal	7.67	3.53	To 1B	n/a	n/a	n/a	n/a	n/a	n/a
1D	State Highway Plans	State Highway Plans	Pipe Outlet	6.00	Yes	Concrete	180-deg.	24"	Round	Concrete	2.00	4.00	From 1E	n/a	n/a	n/a	n/a	n/a	n/a
1E	State Highway Plans	State Highway Plans	Manhole	9.80	n/a	n/a	n/a	24"	Round	Concrete	5.29	4.51	To 1D	24"	Round	Concrete	5.19	4.61	From 1G
1F	State Highway Plans	State Highway Plans	Grate Inlet	7.00	n/a	n/a	n/a	14" x 23"	Ellipse	Concrete	2.00	5.00	To 1E	n/a	n/a	n/a	n/a	n/a	n/a
1G	State Highway Plans	State Highway Plans	Type S Combination Inlet	9.72	n/a	n/a	n/a	24"	Round	Concrete	4.90	4.82	To 1E	18"	Round	Concrete	4.80	4.92	From 1H
1H	State Highway Plans	State Highway Plans	Type K Inlet	8.00	n/a	n/a	n/a	18"	Round	Concrete	3.03	4.97	To 1G	15"	Round	Concrete	2.93	5.07	From 1I
1I	State Highway Plans	State Highway Plans	Pipe Inlet	6.75	No	n/a	n/a	15"	Round	Concrete	1.25	5.50	To 1H	n/a	n/a	n/a	n/a	n/a	n/a
1J	State Highway Plans	State Highway Plans	Curb Inlet	7.39	n/a	n/a	n/a	10' x 0.5'	Rectangle	Concrete	0.89	6.50	To Ditch	n/a	n/a	n/a	n/a	n/a	n/a
1K	USACE Field Survey	USACE Field Survey	Pipe Outlet	10.92	Yes	Concrete	180-deg.	70" x 42"	Rectangle	Concrete	6.00	4.92	From 1L	n/a	n/a	n/a	n/a	n/a	n/a
1L	USACE Field Survey	USACE Field Survey	Pipe Inlet	23.60	Yes	Concrete	90-deg.	48"	Round	Concrete	7.08	16.52	To 1K	n/a	n/a	n/a	n/a	n/a	n/a
1M	State Highway Plans	State Highway Plans	Pipe Outlet	23.86	No	n/a	n/a	15"	Round	Corrugated Metal	1.25	22.61	From 1N	n/a	n/a	n/a	n/a	n/a	n/a
1N	State Highway Plans	State Highway Plans	Grate Inlet	25.75	n/a	n/a	n/a	15"	Round	Corrugated Metal	2.00	23.75	To 1M	n/a	n/a	n/a	n/a	n/a	n/a
1O	USACE Field Survey	USACE Field Survey	Pipe Outlet	41.25	No	n/a	n/a	15"	Round	Corrugated Metal	1.25	40.00	From 1P	n/a	n/a	n/a	n/a	n/a	n/a
1P	State Highway Plans	State Highway Plans	Grate Inlet	43.81	n/a	n/a	n/a	15"	Round	Concrete	2.00	41.81	From 1Q	15"	Round	Corrugated Metal	2.53	41.15	To 1O
1Q	State Highway Plans	State Highway Plans	Drop Inlet	43.84	n/a	n/a	n/a	15"	Round	Concrete	2.00	41.84	To 1P	n/a	n/a	n/a	n/a	n/a	n/a
1R	State Highway Plans	State Highway Plans	Pipe Outlet	54.00	No	n/a	n/a	15"	Round	Corrugated Metal	1.25	52.75	From 1S	n/a	n/a	n/a	n/a	n/a	n/a
1S	State Highway Plans	State Highway Plans	Grate Inlet	56.27	n/a	n/a	n/a	15"	Round	Corrugated Metal	2.00	54.27	To 1R	n/a	n/a	n/a	n/a	n/a	n/a

FUTURE-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	LOC_SOURCE	ELEV_SOURC	TYPE	TOP_ELEV	PIPE_HW	PIPE_HW_MA	PIPE_HW_AN	PIPEA_SIZE	PIPEA_SHAP	PIPEA_MATE	PIPEA_DIST	PIPEA_INV	PIPEA_TO_F	PIPEB_SIZE	PIPEB_SHAP	PIPEB_MATE	PIPEB_DIST	PIPEB_INV	PIPEB_TO_F
1T	State Highway Plans	State Highway Plans	Pipe Outlet	62.97	No	n/a	n/a	15"	Round	Concrete	1.25	61.72	From 1U	n/a	n/a	n/a	n/a	n/a	n/a
1U	State Highway Plans	State Highway Plans	Grate Inlet	65.25	n/a	n/a	n/a	15"	Round	Concrete	2.00	63.25	To 1T	n/a	n/a	n/a	n/a	n/a	n/a
1V	State Highway Plans	State Highway Plans	Pipe Outlet	87.42	Yes	Concrete	90-deg.	66"	Round	Concrete	8.00	79.42	From 1W	n/a	n/a	n/a	n/a	n/a	n/a
1W	State Highway Plans	State Highway Plans	Pipe Inlet	89.94	Yes	Concrete	90-deg.	66"	Round	Concrete	8.00	81.94	To 1V	n/a	n/a	n/a	n/a	n/a	n/a
1X	State Highway Plans	State Highway Plans	Grate Inlet	88.98	n/a	n/a	n/a	15"	Round	Concrete	2.00	86.98	To 1Y	n/a	n/a	n/a	n/a	n/a	n/a
1Y	State Highway Plans	State Highway Plans	Pipe Outlet	91.35	Yes	Concrete	180-deg.	24"	Round	Concrete	3.00	88.35	From 1Z	n/a	n/a	n/a	n/a	n/a	n/a
1Z	State Highway Plans	State Highway Plans	Pipe Inlet	95.04	No	n/a	n/a	24"	Round	Concrete	2.00	93.04	To 1Y	n/a	n/a	n/a	n/a	n/a	n/a
20A	USACE Field Survey	USACE Field Survey	Grate Inlet	12.58	n/a	n/a	n/a	8"	Round	PVC	1.00	11.58	Building	8"	Round	PVC	1.50	11.08	To 20
21A	USACE Field Survey	USACE Field Survey	Grate Inlet	5.92	n/a	n/a	n/a	12"	Round	Terra Cotta	3.50	2.42	From 21B	12"	Round	PVC	3.67	2.25	To 21
21B	USACE Field Survey	USACE Field Survey	Grate Inlet	13.60	n/a	n/a	n/a	6"	Round	HDPE	1.58	12.02	To 21A	n/a	n/a	n/a	n/a	n/a	n/a
22A	State Highway Plans	State Highway Plans	Type S Inlet	6.00	n/a	n/a	n/a	24"	Round	Concrete	3.10	2.90	To 22	24"	Round	Concrete	3.00	3.00	From 22B
22B	State Highway Plans	State Highway Plans	Manhole	13.57	n/a	n/a	n/a	18"	Round	Concrete	8.56	5.01	To 22A	24"	Round	Concrete	8.46	5.11	From 22C
22C	State Highway Plans	State Highway Plans	Manhole	13.90	n/a	n/a	n/a	24"	Round	Concrete	7.19	6.71	To 22B	15"	Round	Concrete	7.09	6.81	From 22D
22D	State Highway Plans	State Highway Plans	Type E Inlet	13.90	n/a	n/a	n/a	15"	Round	Concrete	7.06	6.84	To 22C	n/a	n/a	n/a	n/a	n/a	n/a
22E	State Highway Plans	State Highway Plans	Manhole	13.24	n/a	n/a	n/a	24"	Round	Concrete	7.63	5.61	To 22B	24"	Round	Concrete	7.53	5.71	From 22G
22F	State Highway Plans	State Highway Plans	Type E Inlet	13.00	n/a	n/a	n/a	18"	Round	Concrete	7.21	5.79	To 22E	n/a	n/a	n/a	n/a	n/a	n/a
22G	State Highway Plans	State Highway Plans	Manhole	12.96	n/a	n/a	n/a	24"	Round	Concrete	6.54	6.42	To 22E	24"	Round	Concrete	6.44	6.52	From 22J
22H	State Highway Plans	State Highway Plans	Type S Inlet	12.55	n/a	n/a	n/a	18"	Round	Concrete	5.59	6.96	To 22G	n/a	n/a	n/a	n/a	n/a	n/a
22I	State Highway Plans	State Highway Plans	Type E Inlet	12.85	n/a	n/a	n/a	18"	Round	Concrete	6.25	6.60	To 22G	n/a	n/a	n/a	n/a	n/a	n/a
22J	State Highway Plans	State Highway Plans	Manhole	12.74	n/a	n/a	n/a	24"	Round	Concrete	5.50	7.24	To 22G	24"	Round	Concrete	5.40	7.34	From 22M
22K	State Highway Plans	State Highway Plans	Type S Inlet	12.60	n/a	n/a	n/a	18"	Round	Concrete	5.04	7.56	To 22J	n/a	n/a	n/a	n/a	n/a	n/a
22L	State Highway Plans	State Highway Plans	Type E Inlet	12.53	n/a	n/a	n/a	18"	Round	Concrete	5.10	7.43	To 22J	n/a	n/a	n/a	n/a	n/a	n/a
22M	State Highway Plans	State Highway Plans	Manhole	12.10				24"	Round	Concrete	4.15	7.95	To 22J	15"	Round	Concrete	4.05	8.05	From 22N
22N	State Highway Plans	State Highway Plans	Type E Inlet	12.05				15"	Round	Concrete	3.98	8.07	To 22M	n/a	n/a	n/a	n/a	n/a	n/a
23A	Assumed	DEM	Underground Junction	11.32	n/a	n/a	n/a	12"	Round	Terra Cotta	4.32	7.00	From 23E	12"	Round	Terra Cotta	4.32	7.00	From 23B
23B	USACE Field Survey	USACE Field Survey	Grate Inlet	10.82	n/a	n/a	n/a	6"	Round	Terra Cotta	2.58	8.24	From 23C	12"	Round	Terra Cotta	2.58	8.24	To 23A
23C	USACE Field Survey	USACE Field Survey	Grate Inlet	11.21	No	n/a	n/a	6"	Round	Terra Cotta	1.67	9.54	From 23D	6"	Round	Terra Cotta	2.00	9.21	To 23B
23D	USACE Field Survey	USACE Field Survey	Grate Inlet	11.18	No	n/a	n/a	4"	Round	PVC	1.33	9.85	To 23C	n/a	n/a	n/a	n/a	n/a	n/a
23E	USACE Field Survey	USACE Field Survey	Grate Inlet	10.46	n/a	n/a	n/a	12"	Round	Corrugated Metal	3.25	7.21	From 23F	12"	Round	Terra Cotta	3.25	7.21	To 23A
23F	USACE Field Survey	USACE Field Survey	Manhole	10.30	n/a	n/a	n/a	12"	Round	Corrugated Metal	3.50	6.80	To 23E	8"	Round	Terra Cotta	4.00	6.30	Abandoned
24A	State Highway Plans	State Highway Plans	Grate Inlet	9.57	n/a	n/a	n/a	18"	Round	Concrete	5.54	3.93	From 24C	24"	Round	Concrete	5.69	3.88	To 24
24B	USACE Field Survey	USACE Field Survey	Curb Inlet	9.54	n/a	n/a	n/a	6"	Round	Terra Cotta	1.00	8.54	To 24A	n/a	n/a	n/a	n/a	n/a	n/a
24C	State Highway Plans	State Highway Plans	Manhole	9.89	n/a	n/a	n/a	24"	Round	Concrete	5.87	4.02	To 24A	18"	Round	Concrete	5.82	4.07	From 24E
24D	State Highway Plans	State Highway Plans	Trench Drain	9.57	n/a	n/a	n/a	6"	Round	PVC	2.11	7.46	To 24C	n/a	n/a	n/a	n/a	n/a	n/a
24E	State Highway Plans	State Highway Plans	Manhole	9.96	n/a	n/a	n/a	18"	Round	Concrete	5.53	4.42	To 24C	18"	Round	Concrete	5.48	4.47	From 24G
24F	State Highway Plans	State Highway Plans	Trench Drain	9.78	n/a	n/a	n/a	6"	Round	PVC	2.40	7.38	To24E	n/a	n/a	n/a	n/a	n/a	n/a
24G	State Highway Plans	State Highway Plans	Manhole	10.11	n/a	n/a	n/a	18"	Round	Concrete	5.27	4.83	To 24E	18"	Round	Concrete	5.22	4.88	From 24I
24H	State Highway Plans	State Highway Plans	Trench Drain	9.75	n/a	n/a	n/a	6"	Round	PVC	1.96	7.79	To 24G	n/a	n/a	n/a	n/a	n/a	n/a
24I	State Highway Plans	State Highway Plans	Manhole	10.12	n/a	n/a	n/a	18"	Round	Concrete	4.94	5.18	To 24G	18"	Round	Concrete	4.89	5.23	From 24K
24J	State Highway Plans	State Highway Plans	Trench Drain	9.91	n/a	n/a	n/a	6"	Round	PVC	2.16	7.75	To 24I	n/a	n/a	n/a	n/a	n/a	n/a
24K	State Highway Plans	State Highway Plans	Manhole	10.24	n/a	n/a	n/a	18"	Round	Concrete	4.58	5.66	To 24I	18"	Round	Concrete	4.53	5.71	From 24M
24L	State Highway Plans	State Highway Plans	Trench Drain	10.02	n/a	n/a	n/a	6"	Round	PVC	1.85	8.17	To 24K	n/a	n/a	n/a	n/a	n/a	n/a
24M	State Highway Plans	State Highway Plans	Manhole	10.51	n/a	n/a	n/a	18"	Round	Concrete	4.32	6.19	To 24K	18"	Round	Concrete	4.27	6.24	From 24O
24N	State Highway Plans	State Highway Plans	Type E Inlet	10.30	n/a	n/a	n/a	18"	Round	Concrete	4.03	6.27	To 24M	n/a	n/a	n/a	n/a	n/a	n/a
24O	State Highway Plans	State Highway Plans	Manhole	10.63	n/a	n/a	n/a	18"	Round	Concrete	4.04	6.59	To 24M	18"	Round	Concrete	3.99	6.64	From 24Q
24P	State Highway Plans	State Highway Plans	Type E Inlet	10.41	n/a	n/a	n/a	18"	Round	Concrete	3.74	6.67	To 24O	n/a	n/a	n/a	n/a	n/a	n/a
24Q	State Highway Plans	State Highway Plans	Manhole	10.75	n/a	n/a	n/a	18"	Round	Concrete	3.75	7.00	To 24O	18"	Round	Concrete	3.70	7.05	From 24S
24R	State Highway Plans	State Highway Plans	Type E Inlet	10.54	n/a	n/a	n/a	18"	Round	Concrete	3.48	7.06	To 24Q	n/a	n/a	n/a	n/a	n/a	n/a
24S	State Highway Plans	State Highway Plans	Manhole	11.85	n/a	n/a	n/a	18"	Round	Concrete	4.08	7.77	To 24Q	18"	Round	Concrete	4.03	7.82	From 24T
24T	State Highway Plans	State Highway Plans	Type E Inlet	11.90	n/a	n/a	n/a	18"	Round	Concrete	4.05	7.85	To 24S	n/a	n/a	n/a	n/a	n/a	n/a
25A	USACE Field Survey	USACE Field Survey	Grate Inlet	15.50	n/a	n/a	n/a	15"	Round	Concrete	3.83	11.67	To 25	15"	Round	Concrete	3.75	11.75	Abandoned
2A	State Highway Plans	State Highway Plans	Manhole	9.60	n/a	n/a	n/a	24"	Round	Concrete	7.70	1.90	To 2	18"	Round	Concrete	7.60	2.00	From 2B
2B	State Highway Plans	State Highway Plans	Type S Inlet	9.43	n/a	n/a	n/a	18"	Round	Concrete	7.29	2.14	To 2A	n/a	n/a	n/a	n/a	n/a	n/a
2C	State Highway Plans	State Highway Plans	Manhole	8.99	n/a	n/a	n/a	18"	Round	Concrete	6.79	3.20	From 2D	24"	Round	Concrete	6.79	3.20	From 2E

FUTURE-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	LOC_SOURCE	ELEV_SOURC	TYPE	TOP_ELEV	PIPE_HW	PIPE_HW_MA	PIPE_HW_AN	PIPEA_SIZE	PIPEA_SHAP	PIPEA_MATE	PIPEA_DIST	PIPEA_INV	PIPEA_TO_F	PIPEB_SIZE	PIPEB_SHAP	PIPEB_MATE	PIPEB_DIST	PIPEB_INV	PIPEB_TO_F
2D	State Highway Plans	State Highway Plans	Yard Inlet	8.87	n/a	n/a	n/a	18"	Round	Concrete	5.52	3.35	To 2C	n/a	n/a	n/a	n/a	n/a	n/a
2E	State Highway Plans	State Highway Plans	Manhole	8.80	n/a	n/a	n/a	18"	Round	Concrete	4.39	4.41	From 2F	24"	Round	Concrete	4.49	4.31	To 2C
2F	State Highway Plans	State Highway Plans	Type S Inlet	8.80	n/a	n/a	n/a	18"	Round	Concrete	4.28	4.52	To 2E	15"	Round	Concrete	4.18	4.62	From 2G
2G	State Highway Plans	State Highway Plans	Yard Inlet	8.50				15"	Round	Concrete	2.93	5.57	To 2F	n/a	n/a	n/a	n/a	n/a	n/a
2H	State Highway Plans	State Highway Plans	Manhole	9.88	n/a	n/a	n/a	18"	Round	Concrete	7.13	2.75	From 2I	24"	Round	Concrete	7.13	2.75	From 2J
2I	State Highway Plans	State Highway Plans	Type S Inlet	9.44	n/a	n/a	n/a	18"	Round	Concrete	6.55	2.89	To 2H	n/a	n/a	n/a	n/a	n/a	n/a
2J	State Highway Plans	State Highway Plans	Manhole	9.96	n/a	n/a	n/a	18"	Round	Concrete	6.46	3.50	From 2K	24"	Round	Concrete	6.56	3.40	To 2H
2K	State Highway Plans	State Highway Plans	Type S Inlet	9.76	n/a	n/a	n/a	18"	Round	Concrete	6.16	3.60	To 2J	n/a	n/a	n/a	n/a	n/a	n/a
3A	USACE Field Survey	USACE Field Survey	Grate Inlet	6.94	n/a	n/a	n/a	4"	Round	Cast Iron	1.00	5.94	To 3	n/a	n/a	n/a	n/a	n/a	n/a
4A	USACE Field Survey	USACE Field Survey	Grate Inlet	8.26	n/a	n/a	n/a	10"	Round	Cast Iron	3.00	5.26	To 4	10"	Round	Cast Iron	3.00	5.26	From 4B
4B	USACE Field Survey	USACE Field Survey	Pipe Inlet	9.83	Yes	Concrete	90-deg.	10"	Round	Cast Iron	0.83	9.00	To 4A	n/a	n/a	n/a	n/a	n/a	n/a
5A	USACE Field Survey	USACE Field Survey	Drop Inlet	9.87	n/a	n/a	n/a	72" x 72"	Rectangle	Stone	7.50	2.37	To 5	60" x 42"	Rectangle	Concrete	7.33	2.54	From 5C
5B	USACE Field Survey	USACE Field Survey	Pipe Inlet	8.57	No	n/a	n/a	10"	Round	Cast Iron	2.75	5.81	To 5A	n/a	n/a	n/a	n/a	n/a	n/a
5C	USACE Field Survey	USACE Field Survey	Grate Inlet	8.48	n/a	n/a	n/a	60" x 42"	Rectangle	Concrete	6.42	2.06	To 5A	60" x 42"	Rectangle	Stone	6.42	2.06	From 5D
5D	USACE Field Survey	USACE Field Survey	Grate Inlet	10.79	n/a	n/a	n/a	36" x 30"	Rectangle	Stone	5.00	5.79	From 5G	60" x 42"	Box	Stone	5.00	5.79	To 5C
5E	USACE Field Survey	USACE Field Survey	Pipe Outlet	14.58	Yes	Stone	180-deg.	4"	Round	PVC	7.00	7.58	From 5F	n/a	n/a	n/a	n/a	n/a	n/a
5F	USACE Field Survey	USACE Field Survey	Slotted Inlet	11.12	n/a	n/a	n/a	4"	Round	PVC	1.00	10.12	To 5E	n/a	n/a	n/a	n/a	n/a	n/a
5G	USACE Field Survey	USACE Field Survey	Pipe Inlet	14.58	Yes	Stone	90-deg.	36" x 30"	Rectangle	Stone	6.75	7.84	To 5D	n/a	n/a	n/a	n/a	n/a	n/a
6A	USACE Field Survey	USACE Field Survey	Grate Inlet	10.97	n/a	n/a	n/a	8"	Round	Cast Iron	3.83	7.14	To 25A	8"	Round	Cast Iron	3.83	7.14	From 25C
6B	USACE Field Survey	USACE Field Survey	Grate Inlet	11.21	n/a	n/a	n/a	8"	Round	Cast Iron	3.08	8.13	To 25B	n/a	n/a	n/a	n/a	n/a	n/a
7A	USACE Field Survey	USACE Field Survey	Grate Inlet	7.34	n/a	n/a	n/a	24"	Round	Concrete	6.67	0.67	To 7	24"	Round	Concrete	6.67	0.67	From 7B
7B	USACE Field Survey	USACE Field Survey	Manhole	9.36	n/a	n/a	n/a	24"	Round	Concrete	8.42	0.94	To 7A	24"	Round	Concrete	8.25	1.11	From 7C
7C	USACE Field Survey	USACE Field Survey	Grate Inlet	7.40	n/a	n/a	n/a	24"	Round	Concrete	6.08	1.32	To 7B	15"	Round	PVC	5.83	1.57	From 7D
7D	USACE Field Survey	USACE Field Survey	Drop Inlet	3.08	n/a	n/a	n/a	12"	Round	Concrete	2.00	1.58	To 7C	18"	Round	Concrete	2.00	1.58	From 8J
7E	USACE Field Survey	USACE Field Survey	Grate Inlet	3.34	n/a	n/a	n/a	12"	Round	Concrete	1.08	2.26	To 7D	n/a	n/a	n/a	n/a	n/a	n/a
7F	USACE Field Survey	USACE Field Survey	Manhole	5.97	n/a	n/a	n/a	18"	Round	Concrete	3.67	2.30	To 7D	18"	Round	Concrete	3.42	2.55	From 7G
7G	USACE Field Survey	USACE Field Survey	Manhole	6.76	n/a	n/a	n/a	18"	Round	Concrete	4.17	2.59	To 7F	6"	Round	Concrete	4.17	2.59	Building
7H	USACE Field Survey	USACE Field Survey	Manhole	7.67	n/a	n/a	n/a	18"	Round	Concrete	3.92	3.75	To 7G	18"	Round	Concrete	3.83	3.84	From 7I
7I	USACE Field Survey	USACE Field Survey	Manhole	9.57	n/a	n/a	n/a	18"	Round	Concrete	5.08	4.49	To 7H	18"	Round	Concrete	5.08	4.49	From 7K
7J	State Highway Plans	State Highway Plans	Type E Inlet	10.56	n/a	n/a	n/a	15"	Round	Concrete	3.56	7.00	To 7I	n/a	n/a	n/a	n/a	n/a	n/a
7K	USACE Field Survey	USACE Field Survey	Combination Inlet	10.38	n/a	n/a	n/a	18"	Round	Concrete	5.67	4.71	To 7I	18"	Round	Concrete	5.67	4.71	From 7L
7L	USACE Field Survey	USACE Field Survey	Combination Inlet	11.94	n/a	n/a	n/a	18"	Round	Concrete	6.58	5.36	To 7K	18"	Round	Concrete	6.33	5.61	From 7M
7M	USACE Field Survey	USACE Field Survey	Combination Inlet	13.84	n/a	n/a	n/a	18"	Round	Concrete	7.00	6.84	To 7L	18"	Round	Concrete	7.00	6.84	From 7N
7N	USACE Field Survey	USACE Field Survey	Combination Inlet	15.28	n/a	n/a	n/a	18"	Round	Concrete	8.17	7.11	To 7M	n/a	n/a	n/a	n/a	n/a	n/a
7O	USACE Field Survey	USACE Field Survey	Combination Inlet	9.75	n/a	n/a	n/a	18"	Round	Concrete	5.00	4.75	To 7I	15"	Round	Concrete	4.92	4.83	From 7P
7P	USACE Field Survey	USACE Field Survey	Combination Inlet	10.14	n/a	n/a	n/a	15"	Round	Concrete	5.25	4.89	To 7O	n/a	n/a	n/a	n/a	n/a	n/a
7Q	State Highway Plans	State Highway Plans	Type E Inlet	9.34	n/a	n/a	n/a	15"	Round	Concrete	3.40	5.94	To 7O	n/a	n/a	n/a	n/a	n/a	n/a
7R	State Highway Plans	State Highway Plans	Type S Double Grate	7.50				23" x 14"	Ellipse	Concrete	2.97	4.53	From 7S	23" X 14"	Ellipse	Concrete	4.63	4.43	To 7H
7S	State Highway Plans	State Highway Plans	Type S Double Grate	8.00				23" x 14"	Ellipse	Concrete	3.08	4.92	From 7U	23" x 14"	Ellipse	Concrete	3.08	4.92	From 7T
7T	State Highway Plans	State Highway Plans	Type S Double Grate	8.50				23" x 14"	Ellipse	Concrete	3.43	5.07	To 7S	n/a	n/a	n/a	n/a	n/a	n/a
7U	State Highway Plans	State Highway Plans	Type E Inlet	9.00				15"	Round	Concrete	3.72	5.28	From 7V	15"	Round	Concrete	3.82	5.18	To 7S
7V	State Highway Plans	State Highway Plans	Type E Inlet	10.60				15"	Round	Concrete	5.17	5.43	To 7U	n/a	n/a	n/a	n/a	n/a	n/a
8A	USACE Field Survey	USACE Field Survey	Grate Inlet	9.70	n/a	n/a	n/a	15"	Round	Concrete	6.42	3.28	To 8	15"	Round	Concrete	6.42	3.28	From 23C
8B	USACE Field Survey	USACE Field Survey	Grate Inlet	8.62	n/a	n/a	n/a	15"	Round	Concrete	4.17	4.45	To 8A	15"	Round	Concrete	3.75	4.87	From 8C
8C	USACE Field Survey	USACE Field Survey	Grate Inlet	8.68	n/a	n/a	n/a	15"	Round	Concrete	2.75	5.93	To 8B	n/a	n/a	n/a	n/a	n/a	n/a
9A	USACE Field Survey	USACE Field Survey	Underground Junction	6.53	n/a	n/a	n/a	78" x 48"	Rectangle	Concrete	7.96	-1.43	From 9C	78" x 48"	Rectangle	Concrete	7.96	-1.43	To 9
9AA	State Highway Plans	State Highway Plans	Type S Inlet	7.80				24"	Round	Concrete	4.54	3.26	To 9V	24"	Round	Concrete	4.49	3.31	From 9AB
9AC	State Highway Plans	State Highway Plans	Type E Inlet	8.50	n/a	n/a	n/a	18"	Round	Concrete	3.79	4.71	To 9AB	18"	Round	Concrete	3.74	4.76	9AE
9AD	State Highway Plans	State Highway Plans	Type E Inlet	8.25	n/a	n/a	n/a	15"	Round	Concrete	3.38	4.87	To 9AC	n/a	n/a	n/a	n/a	n/a	n/a
9AE	State Highway Plans	State Highway Plans	Type S Combination Inlet	8.75	n/a	n/a	n/a	18"	Round	Concrete	3.88	4.87	To 9AC	15"	Round	Concrete	3.83	4.92	From 9AF
9AF	State Highway Plans	State Highway Plans	Type S Combination Inlet	8.75	n/a	n/a	n/a	15"	Round	Concrete	3.78	4.97	To 9AE	n/a	n/a	n/a	n/a	n/a	n/a
9AG	State Highway Plans	State Highway Plans	Type E Inlet	8.95				15"	Round	Concrete	3.38	5.57	To 9AE	n/a	n/a	n/a	n/a	n/a	n/a
9B	USACE Field Survey	USACE Field Survey	Grate Inlet	5.79	n/a	n/a	n/a	15"	Round	Concrete	2.25	3.54	To 9A	n/a	n/a	n/a	n/a	n/a	n/a
9C	USACE Field Survey	USACE Field Survey	Underground Junction	10.07	n/a	n/a	n/a	78" x 48"	Rectangle	Concrete	8.27	1.80	From 9E	78" x 48"	Rectangle	Concrete	8.27	1.80	To 9A

FUTURE-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	LOC_SOURCE	ELEV_SOURC	TYPE	TOP_ELEV	PIPE_HW	PIPE_HW_MA	PIPE_HW_AN	PIPEA_SIZE	PIPEA_SHAP	PIPEA_MATE	PIPEA_DIST	PIPEA_INV	PIPEA_TO_F	PIPEB_SIZE	PIPEB_SHAP	PIPEB_MATE	PIPEB_DIST	PIPEB_INV	PIPEB_TO_F
9D	USACE Field Survey	USACE Field Survey	Grate Inlet	9.01	n/a	n/a	n/a	6"	Round	PVC	1.42	7.59	To 9C	n/a	n/a	n/a	n/a	n/a	n/a
9E	USACE Field Survey	USACE Field Survey	Grate Inlet	11.41	n/a	n/a	n/a	78" x 48"	Rectangle	Concrete	8.17	3.24	To 9C	78" x 48"	Rectangle	Concrete	8.17	3.24	From 9F
9F	USACE Field Survey	USACE Field Survey	Grate Inlet	11.20	n/a	n/a	n/a	78" x 48"	Rectangle	Concrete	9.25	1.95	To 9E	60"	Round	Concrete	6.42	4.78	From 9I
9G	USACE Field Survey	USACE Field Survey	Grate Inlet	11.91	n/a	n/a	n/a	15"	Round	Corrugated Metal	1.25	10.66	To 9F	12"	Round	Corrugated Metal	1.25	10.66	From 9H
9H	USACE Field Survey	USACE Field Survey	Grate Inlet	11.71	n/a	n/a	n/a	12"	Round	Corrugated Metal	1.00	10.71	To 9G	n/a	n/a	n/a	n/a	n/a	n/a
9I	USACE Field Survey	USACE Field Survey	Manhole	14.84	n/a	n/a	n/a	60"	Round	Concrete	7.33	7.51	To 9F	18"	Round	Concrete	7.33	7.51	From 9J
9J	USACE Field Survey	USACE Field Survey	Manhole	15.95	n/a	n/a	n/a	18"	Round	Concrete	6.00	9.95	To 9I	18"	Round	Concrete	5.00	10.95	From 9K
9K	USACE Field Survey	USACE Field Survey	Combination Inlet	15.64	n/a	n/a	n/a	18"	Round	Concrete	2.83	12.81	To 9J	n/a	n/a	n/a	n/a	n/a	n/a
9L	USACE Field Survey	USACE Field Survey	Combination Inlet	15.51	n/a	n/a	n/a	18"	Round	Concrete	5.50	10.01	To 9J	18"	Round	Concrete	5.42	10.09	From 9M
9M	USACE Field Survey	USACE Field Survey	Combination Inlet	16.09	n/a	n/a	n/a	18"	Round	Concrete	4.75	11.34	To 9L	15"	Round	Concrete	3.42	12.67	From 9N
9N	USACE Field Survey	USACE Field Survey	Combination Inlet	15.85	n/a	n/a	n/a	15"	Round	Concrete	3.00	12.85	To 9M	n/a	n/a	n/a	n/a	n/a	n/a
9O	Assumed	DEM	Underground Junction	16.21	n/a	n/a	n/a	96" x 72"	Rectangle	Concrete	7.21	9.00	From 9Q	60"	Round	Concrete	7.21	9.00	To 9I
9P	USACE Field Survey	USACE Field Survey	Combination Inlet	15.96	n/a	n/a	n/a	18"	Round	Concrete	3.08	12.88	To 9O	n/a	n/a	n/a	n/a	n/a	n/a
9Q	USACE Field Survey	USACE Field Survey	Combination Inlet	18.51	n/a	n/a	n/a	96" x 72"	Rectangle	Concrete	7.67	10.84	To 9O	96" x 72"	Rectangle	Concrete	7.67	10.84	From 9R
9R	USACE Field Survey	USACE Field Survey	Pipe Inlet	28.85	Yes	Stone	90-deg.	96" x 72"	Rectangle	Concrete	11.00	17.85	To 9Q	n/a	n/a	n/a	n/a	n/a	n/a
9S	USACE Field Survey	USACE Field Survey	Pipe Outlet	24.35	Yes	Stone	180-deg.	18"	Round	Concrete	1.50	22.85	From 9T	n/a	n/a	n/a	n/a	n/a	n/a
9T	USACE Field Survey	USACE Field Survey	Combination Inlet	33.54	n/a	n/a	n/a	18"	Round	Concrete	6.92	26.62	To 9S	18"	Round	Concrete	6.33	27.21	From 9U
9U	USACE Field Survey	USACE Field Survey	Combination Inlet	35.66	n/a	n/a	n/a	18"	Round	Concrete	4.00	31.66	To 9T	n/a	n/a	n/a	n/a	n/a	n/a
9V	USACE Field Survey	USACE Field Survey	Grate Inlet	10.35	n/a	n/a	n/a	18"	Round	Concrete	4.33	6.02	To 9F	18"	Round	Concrete	4.25	6.10	From 9W
9W	USACE Field Survey	USACE Field Survey	Combination Inlet	11.85	n/a	n/a	n/a	18"	Round	Concrete	3.83	8.02	To 9V	8"	Round	Concrete	3.50	8.35	From 9X
9X	USACE Field Survey	USACE Field Survey	Combination Inlet	10.97	n/a	n/a	n/a	8"	Round	Concrete	2.00	8.97	To 9W	n/a	n/a	n/a	n/a	n/a	n/a
9Y	USACE Field Survey	USACE Field Survey	Combination Inlet	12.71	n/a	n/a	n/a	15"	Round	Concrete	2.67	10.04	To 9W	15"	Round	Concrete	2.67	10.04	From 9Z
9Z	USACE Field Survey	USACE Field Survey	Combination Inlet	13.66	n/a	n/a	n/a	15"	Round	Concrete	3.08	10.58	To 9Y	n/a	n/a	n/a	n/a	n/a	n/a
9AB	State Highway Plans	State Highway Plans	Manhole	8.00	n/a	n/a	n/a	24"	Round	Concrete	4.00	4.00	To 9AA	18"	Round	Concrete	3.95	4.05	From 9AC

FUTURE-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	PIPEC_SIZE	PIPEC_SHAP	PIPEC_MATE	PIPEC_DIST	PIPEC_INV	PIPEC_TO_F	PIPED_SIZE	PIPED_SHAP	PIPED_MATE	PIPED_DIST	PIPED_INV	PIPED_TO_F	PLAN_NO	PLAN_ID	NOTES	X	Y
1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Triple 24" concrete pipes.	1563215.63060516	704924.212224935
2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	EW-3	Data from SHA 90-perc. plans dated December 2011.	1562409.82274022	705752.960525563
3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1562360.3978928	705814.285259916
4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1562158.74068967	705878.530032595
5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561975.19658413	706067.637197913
6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561805.90580285	706241.920361505
7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe outfalls in seawall.	1561560.62053543	706463.372062577
8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure outfalls into wood seawall.	1561435.59519746	706588.742965193
9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Concrete box culvert.	1561213.55008846	706867.212436187
10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561080.36779815	706994.580250651
11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure has Duckbill Checkvalve.	1560914.9877017	707132.901377599
12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure contains Duckbill Checkvalve.	1560891.40376512	707160.782891085
13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure contains Duckbill Checkvalve.	1560620.11008636	707443.282306173
14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Flared concrete end section. Sediment in pipe.	1560532.66005736	707650.113934624
15	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	EW-2	Tideflex check valve proposed	1560548.42185839	707757.10904524
16	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560467.66795012	707968.929371388
17	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure contains Duckbill Check Valve.	1560436.30246864	708045.467804247
18	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560220.19280028	708379.142785076
19	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Concrete box culvert.	1560138.10521191	708499.711626522
20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560093.92457855	708563.070001551
21	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560046.38904285	708622.209800383
22	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	EW-1	Data from SHA 90-perc. plans dated December 2011.	1559884.96652042	708769.937999588
23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1559429.93831659	709336.963724178
24	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Existing pipe to be replaced.	1559184.44944361	709571.042423518
25	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Outfalls in bridge abutment.	1558606.85513678	710336.882683265
10A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561102.67907489	707017.268572359
11A	18"	Round	Concrete	5.92	-0.48	From 11D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipes submerged at time of survey.	1560935.97086018	707157.727340213
11B	6"	Round	HDPE	1.75	2.92	From BLDG	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe C from building.	1560792.18525506	707313.599176017
11C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560935.93038927	707446.879748282
11D	15"	Round	Concrete	6.33	1.53	From 11F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561075.2974063	707287.733191878
11E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561215.3928196	707128.187373303
11F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561149.33380434	707337.291296539
12A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561179.77585943	707493.816114413
12B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561199.38043393	707506.529239164
13A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipes submerged at time of survey.	1560650.4044935	707471.123899797
13B	12"	Round	Concrete	7.97	0.00	From 13C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560720.65219609	707536.43061008
13C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560679.56880603	707596.035193697
13D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure submerged at time of survey.	1560801.2208804	707614.523021262
13E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560761.00684985	707673.124330068
13F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560814.00531673	707716.60597461
13G	6"	Round	PVC	10.42	3.50	From 13H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560830.1601349	707709.007617589
13H	6"	Round	PVC	2.92	4.00	To 6H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560859.19892202	707733.444490314
13I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560878.80967545	707717.195969324
13J	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560931.6721489	707792.370312207
13K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	pipe a 30 h x30w	1560913.25877212	707662.545107626
13L	18"	Round	Concrete	4.34	7.35	From 13M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	FC-2	Water enters at curb at elevation 11.34.	1560987.88643629	707723.64760821
13M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-24	Data from SHA 90-perc. plans dated December 2011.	1561014.80252946	707736.463735739
13N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-23	Data from SHA 90-perc. plans dated December 2011.	1561020.52255408	707741.95495937
14A	12"	Round	PVC	8.08	2.69	From 14B	12"	Round	PVC	7.08	3.69	n/a	n/a	n/a	Pipe D from building.	1560553.45255563	707648.641136691
14B	10"	Round	PVC	1.67	6.34	n/a	5"	Round	PVC	1.58	6.43	n/a	n/a	n/a	Pips B, C, and D from building.	1560605.77637038	707625.397204639
14C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Non functional. Entire inlet filled with stone.	1560647.79093541	707772.297779627
15A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-33	Data from SHA 90-perc. plans dated December 2011.	1560618.00378572	707758.893279122
15B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-34	Data from SHA 90-perc. plans dated December 2011.	1560619.51155399	707820.146365077
15C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	With proposed conditions, no pipe out.	1560674.41508861	707845.040430983

FUTURE-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	PIPEC_SIZE	PIPEC_SHAP	PIPEC_MATE	PIPEC_DIST	PIPEC_INV	PIPEC_TO_F	PIPED_SIZE	PIPED_SHAP	PIPED_MATE	PIPED_DIST	PIPED_INV	PIPED_TO_F	PLAN_NO	PLAN_ID	NOTES	X	Y
15D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I48	Data from SHA 90-perc. plans dated December 2011.	1560736.36359489	707909.29316402
15E	18"	Round	Concrete	6.40	2.94	From 15W	24"	Round	Concrete	6.40	2.94	From 15I	SHA-CE448A21	MH-19	Data from SHA 90-perc. plans dated December 2011.	1560812.5079909	707966.063568789
15F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-21	Data from SHA 90-perc. plans dated December 2011.	1560834.44516128	707981.215316324
15G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-20	Data from SHA 90-perc. plans dated December 2011.	1560882.92059673	707880.382015443
15H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-22	Data from SHA 90-perc. plans dated December 2011.	1560894.02771665	707889.096680654
15I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I49	Data from SHA 90-perc. plans dated December 2011.	1560807.04023253	707978.838975458
15J	24"	Round	Concrete	5.93	3.55	From 15L	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-18	Data from SHA 90-perc. plans dated December 2011.	1560759.37705144	708041.538153504
15K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-20	Data from SHA 90-perc. plans dated December 2011.	1560773.99291868	708053.877369124
15L	24"	Round	Concrete	5.35	3.85	From 15N	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH23	Data from SHA 90-perc. plans dated December 2011.	1560729.01322458	708076.09002885
15M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I47	Data from SHA 90-perc. plans dated December 2011.	1560677.77726545	708035.263861069
15N	24"	Round	Concrete	4.01	4.21	From 15P	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-17	Data from SHA 90-perc. plans dated December 2011.	1560692.69073114	708118.332035455
15O	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-19	Data from SHA 90-perc. plans dated December 2011.	1560708.41750506	708132.253442127
15P	24"	Round	Concrete	4.40	4.70	From 15R	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH24	Data from SHA 90-perc. plans dated December 2011.	1560639.25357815	708183.789156316
15Q	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-17	Data from SHA 90-perc. plans dated December 2011.	1560634.21147528	708180.511552283
15R	15"	Round	Concrete	4.41	4.82	From 15T	24"	Round	Concrete	4.36	4.87	From 15U	SHA-CE448A21	MH-16	Data from SHA 90-perc. plans dated December 2011.	1560627.12387548	708197.094384248
15S	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-18	Data from SHA 90-perc. plans dated December 2011.	1560641.86695641	708208.965475231
15T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-16	Data from SHA 90-perc. plans dated December 2011.	1560622.39122201	708193.857517584
15U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH22	Data from SHA 90-perc. plans dated December 2011.	1560498.68333012	708350.123083252
15V	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I45	Data from SHA 90-perc. plans dated December 2011.	1560510.43518365	708362.929590308
15W	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I50	Data from SHA 90-perc. plans dated December 2011.	1560839.46101157	707935.204986546
16A	4"	Round	Concrete	1.67	5.69	From BLDG	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe C from building. Pipe A disconnected prop con	1560577.33912348	708056.128837361
17A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe A disconnected in future cond	1560562.45505539	708144.364328662
18A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Cracked and filled with debris.	1560302.04612523	708406.774830395
18B	8"	Round	Terra Cotta	2.17	10.00	To 18A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Location assumed. Invert elevations interpolated.	1560391.97623805	708497.629896608
18C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560383.66790881	708510.599904637
18D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560410.94064849	708512.283536033
19A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Concrete box culvert.	1560186.66008447	708537.541252196
19B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Box culvert under building.	1560241.835259	708597.346662397
19C	8"	Round	Concrete	3.00	10.91	From 19D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Assumed location and inverts interpolated.	1560286.49790356	708644.021137793
19D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560279.36426646	708655.390664073
19E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560242.65465788	708697.677672816
19F	60" x 60"	Box	Stone	4.40	10.60	To 19C	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	FC-1	Data from SHA 90-perc. plans dated December 2011.	1560301.18426867	708658.103953645
19G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-15	Data from SHA 90-perc. plans dated December 2011.	1560316.43382403	708641.508322809
19H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Stone box culvert in and out.	1560307.57543328	708664.05515665
19I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Stone box culvert.	1560311.09494236	708669.802669285
1A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Triple 24" concrete pipes.	1563229.52569421	704945.206737294
1B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563247.21774603	704980.536017679
1C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563278.41825705	705018.49761047
1D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	EW-7	Proposed Check Valve	1563282.96657155	705044.47072639
1E	14" x 23"	Ellipse	Concrete	5.19	4.61	From 1F	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-31	Data from SHA 90-perc. plans dated December 2011.	1563215.50884272	705121.581587507
1F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I39	Data from SHA 90-perc. plans dated December 2011.	1563099.653629	705248.172043002
1G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-40	Data from SHA 90-perc. plans dated December 2011.	1563253.03220438	705157.587150281
1H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-41	Data from SHA 90-perc. plans dated December 2011.	1563262.36914726	705169.998341718
1I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	ES-5	Data from SHA 90-perc. plans dated December 2011.	1563195.46474055	705226.529292717
1J	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-38	Data from SHA 90-perc. plans dated December 2011.	1563134.3487627	705283.648781052
1K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563307.63080367	705050.076394907
1L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Changes to box culvert prior to 10L.	1563414.32059475	705151.129715207
1M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563446.72296281	705191.371923332
1N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563455.66516523	705182.926509934
1O	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563561.72962172	705338.173079733
1P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563602.96311066	705307.372160285
1Q	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563608.42778991	705302.901059074
1R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563664.06816053	705452.682949616
1S	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563675.24591355	705445.727903289

FUTURE-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	PIPEC_SIZE	PIPEC_SHAP	PIPEC_MATE	PIPEC_DIST	PIPEC_INV	PIPEC_TO_F	PIPED_SIZE	PIPED_SHAP	PIPED_MATE	PIPED_DIST	PIPED_INV	PIPED_TO_F	PLAN_NO	PLAN_ID	NOTES	X	Y
1T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563730.88628417	705534.156349446
1U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563783.79431516	705523.723779955
1V	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563902.15429997	705732.623564275
1W	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563981.14375468	705740.323794137
1X	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Inlet goes to underground connection.	1563970.46279068	705745.043289859
1Y	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1563945.374945	705784.289622704
1Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1564007.47357292	705850.114168298
20A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe A from building.	1560237.9000317	708699.734204083
21A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe C removed in Proposed Conditions.	1560087.07951338	708689.337051097
21B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1560170.27801764	708768.88854763
22A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-14	Data from SHA 90-perc. plans dated December 2011.	1559900.12062461	708808.121148699
22B	24"	Round	Concrete	8.46	5.11	From 22E	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-14	Data from SHA 90-perc. plans dated December 2011.	1560039.76832069	708911.635173853
22C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH15	Data from SHA 90-perc. plans dated December 2011.	1560157.62405494	708798.435202726
22D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	I46	n/a	1560161.46651944	708802.385611955
22E	18"	Round	Concrete	7.53	5.71	From 22F	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-13	Data from SHA 90-perc. plans dated December 2011.	1559963.93350043	708980.600368719
22F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-13	Data from SHA 90-perc. plans dated December 2011.	1559968.2622874	708985.169643851
22G	18"	Round	Concrete	6.44	6.52	From 22H	18"	Round	Concrete	6.44	6.52	From 22I	SHA-CE448A21	MH-12	Data from SHA 90-perc. plans dated December 2011.	1559856.91626706	709081.605397969
22H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-12	Data from SHA 90-perc. plans dated December 2011.	1559839.36063102	709063.087809273
22I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-11	Data from SHA 90-perc. plans dated December 2011.	1559861.24505403	709086.655649431
22J	18"	Round	Concrete	5.40	7.34	From 22K	18"	Round	Concrete	5.40	7.34	From 22L	SHA-CE448A21	MH-11	Data from SHA 90-perc. plans dated December 2011.	1559749.65854552	709182.129450889
22K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-10	Data from SHA 90-perc. plans dated December 2011.	1559732.10290948	709164.814303018
22L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-9	Data from SHA 90-perc. plans dated December 2011.	1559754.70879698	709187.660678682
22M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH10	Data from SHA 90-perc. plans dated December 2011.	1559657.3817436	709268.202965022
22N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I44	Data from SHA 90-perc. plans dated December 2011.	1559659.67590055	709274.167773094
23A	12"	Round	Terra Cotta	4.32	7.00	To 23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1559483.54878525	709403.169423425
23B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1559507.95590128	709381.000286158
23C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Sump at elevation 8.96.	1559528.45484986	709400.020002853
23D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1559559.17659105	709372.172061135
23E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe B assumed to underground junction.	1559390.66250015	709487.16209406
23F	8"	Round	Terra Cotta	4.00	6.30	Abandoned	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Metal square top. Pipes B and C abaondoned.	1559395.11813098	709492.869945518
24A	6"	Round	Terra Cotta	1.50	8.07	From 24B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe D removed in Proposed Conditions.	1559238.4128562	709637.034247197
24B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1559180.27444341	709690.914790916
24C	6"	Round	PVC	2.43	7.46	From 24D	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-9	Data from SHA 90-perc. plans dated December 2011.	1559249.34106889	709649.755521803
24D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-37	Data from SHA 90-perc. plans dated December 2011.	1559253.12744169	709655.205050371
24E	6"	Round	PVC	2.58	7.38	From 24F	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-8	Data from SHA 90-perc. plans dated December 2011.	1559191.72417895	709700.338456905
24F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-8	Data from SHA 90-perc. plans dated December 2011.	1559197.23150498	709705.815276078
24G	6"	Round	PVC	2.32	7.79	From 24H	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-7	Data from SHA 90-perc. plans dated December 2011.	1559134.99654354	709750.782984027
24H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-7	Data from SHA 90-perc. plans dated December 2011.	1559140.04838426	709756.016475534
24I	6"	Round	PVC	2.17	7.95	From 24J	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-6	Data from SHA 90-perc. plans dated December 2011.	1559085.88457278	709794.25890844
24J	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-6	Data from SHA 90-perc. plans dated December 2011.	1559091.24570702	709799.391761236
24K	6"	Round	PVC	2.07	8.17	From 24L	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-5	Data from SHA 90-perc. plans dated December 2011.	1559017.55199963	709854.473709619
24L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-5	Data from SHA 90-perc. plans dated December 2011.	1559022.87732741	709859.559716542
24M	18"	Round	Concrete	4.27	6.24	From 24N	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-4	Data from SHA 90-perc. plans dated December 2011.	1558943.81653342	709920.037395807
24N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-4	Data from SHA 90-perc. plans dated December 2011.	1558947.9945016	709924.370010756
24O	18"	Round	Concrete	3.99	6.64	From 24P	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-3	Data from SHA 90-perc. plans dated December 2011.	1558891.567363	709972.991037201
24P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-3	Data from SHA 90-perc. plans dated December 2011.	1558895.84596989	709976.987354595
24Q	18"	Round	Concrete	3.70	7.05	From 24R	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-2	Data from SHA 90-perc. plans dated December 2011.	1558839.34519661	710026.443000309
24R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-2	Data from SHA 90-perc. plans dated December 2011.	1558843.59679948	710030.748611231
24S	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-1	Data from SHA 90-perc. plans dated December 2011.	1558736.71556252	710134.283993721
24T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-1	Data from SHA 90-perc. plans dated December 2011.	1558744.14849014	710140.14344968
25A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe B in from across road, assumed abondoned.	1558648.52342321	710309.977275335
2A	24"	Round	Concrete	7.60	2.00	From 2H	24"	Round	Concrete	7.60	2.00	From 2C	SHA-CE448A21	MH-27	Data from SHA 90-perc. plans dated December 2011.	1562549.81991342	705895.474467933
2B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-33	Data from SHA 90-perc. plans dated December 2011.	1562563.36503564	705907.121088122
2C	24"	Round	Concrete	6.89	3.10	To 2A	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-28	Data from SHA 90-perc. plans dated December 2011.	1562617.6671391	705805.269855655

FUTURE-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	PIPEC_SIZE	PIPEC_SHAP	PIPEC_MATE	PIPEC_DIST	PIPEC_INV	PIPEC_TO_F	PIPED_SIZE	PIPED_SHAP	PIPED_MATE	PIPED_DIST	PIPED_INV	PIPED_TO_F	PLAN_NO	PLAN_ID	NOTES	X	Y
2D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-34	Data from SHA 90-perc. plans dated December 2011.	1562633.04205177	705816.404573952
2E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-29	Data from SHA 90-perc. plans dated December 2011.	1562675.29831975	705733.724572273
2F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-35	Data from SHA 90-perc. plans dated December 2011.	1562686.71406856	705743.941303275
2G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-57	Data from SHA 90-perc. plans dated December 2011.	1562780.58367394	705642.662565305
2H	24"	Round	Concrete	7.23	2.65	To 2A	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-26	Data from SHA 90-perc. plans dated December 2011.	1562494.88153913	705968.273740513
2I	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-32	Data from SHA 90-perc. plans dated December 2011.	1562508.28305402	705979.845464961
2J	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH-25	Data from SHA 90-perc. plans dated December 2011.	1562440.3678027	706040.791982575
2K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-31	Data from SHA 90-perc. plans dated December 2011.	1562453.91292492	706051.227216651
3A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure breaking.	1562437.52225533	705928.940250254
4A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1562371.63204219	706070.252225469
4B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1562521.30597697	706106.367714212
5A	10"	Round	Cast Iron	7.42	2.45	From 5B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1562117.04412362	706227.52679382
5B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Drop inlet pipe.	1561829.38123327	706500.804078426
5C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1562138.02021091	706251.561432638
5D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1562222.64050738	706335.095807307
5E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe outfalls into stone wall.	1562229.5046383	706338.575823465
5F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1562232.21053704	706338.378238362
5G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1562228.84220234	706343.837117045
6A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1562080.21888156	706474.780157305
6B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure full of sediment, Pipe size assumed.	1562094.74052217	706492.66473038
7A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561720.68568955	706604.555848829
7B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561786.09238317	706535.516739046
7C	5"	Round	PVC	5.83	1.57	Abandoned	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe C assumed abandoned or from nearby building.	1561802.87422789	706548.349485174
7D	12"	Round	HDPE	2.00	1.58	From 8F	8"	Round	Cast Iron	2.00	1.58	From 8G	n/a	n/a	n/a	1561837.7818097	706582.336216719
7E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561872.88822684	706592.616074685
7F	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561847.93168595	706593.397894204
7G	18"	Round	Concrete	3.67	3.09	From 7H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe B from building.	1561812.53277885	706625.889051264
7H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561767.8917827	706677.438847872
7I	18"	Round	Concrete	5.08	4.49	From 7O	15"	Round	Concrete	3.47	6.10	From 7J	SHA-CE448A21	FC-5	Pipe D from proposed connection.	1561842.72407122	706754.357383021
7J	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-36	Data from SHA 90-perc. plans dated December 2011.	1561865.18409531	706777.155611685
7K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561837.61015813	706776.217884638
7L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561794.08223699	706832.92871109
7M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561756.33521987	706884.811212572
7N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561735.24401226	706916.420934172
7O	15"	Round	Concrete	4.75	5.00	From 7Q	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	FC-4	Pipe C proposed connection.	1561861.11168192	706745.940922078
7P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561883.67684628	706757.359101413
7Q	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-30	Data from SHA 90-perc. plans dated December 2011.	1561924.85242735	706668.516457325
7R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I54	Data from SHA 90-perc. plans dated December 2011.	1561711.82005938	706761.023645857
7S	23" x 14"	Ellipse	Concrete	3.18	4.82	To 7R	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I53	Data from SHA 90-perc. plans dated December 2011.	1561673.54055262	706810.546084673
7T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I55	Data from SHA 90-perc. plans dated December 2011.	1561638.20562331	706808.939951522
7U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I52	Data from SHA 90-perc. plans dated December 2011.	1561713.42619253	706852.037857735
7V	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I51	Data from SHA 90-perc. plans dated December 2011.	1561714.76463683	706883.892831892
8A	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Pipe A changes to CMP prior to Structure 23A.	1561538.54793139	706679.436615091
8B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561592.20531741	706728.833779221
8C	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Inlet 80-percent covered with debris.	1561500.79577433	706845.392108387
9A	15"	Round	Concrete	3.53	3.00	From 9B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No manhole. Invert elevations interpolated.	1561232.29289501	706882.241502344
9AA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I43	Data from SHA 90-perc. plans dated December 2011.	1561286.17268782	707183.151434925
9AC	15"	Round	Concrete	3.74	4.76	From 9AD	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I28	Data from SHA 90-perc. plans dated December 2011.	1561294.40730121	707386.322693224
9AD	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-27	Data from SHA 90-perc. plans dated December 2011.	1561282.69878598	707396.158303902
9AE	15"	Round	Concrete	3.83	4.92	From 9AG	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-26	Data from SHA 90-perc. plans dated December 2011.	1561312.70612419	707404.04673282
9AF	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I-25	Data from SHA 90-perc. plans dated December 2011.	1561302.22145292	707414.43170221
9AG	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	I56	Data from SHA 90-perc. plans dated December 2011.	1561369.13437432	707346.601695314
9B	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	to underground connection b4 170	1561239.42124052	706873.678476921
9C	6"	Round	PVC	4.07	6.00	From 9D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	No manhole. Invert elevations interpolated.	1561330.30104363	706969.215620988

FUTURE-CONDITIONS STORMWATER STRUCTURE DATA

PERM_ID	PIPEC_SIZE	PIPEC_SHAP	PIPEC_MATE	PIPEC_DIST	PIPEC_INV	PIPEC_TO_F	PIPED_SIZE	PIPED_SHAP	PIPED_MATE	PIPED_DIST	PIPED_INV	PIPED_TO_F	PLAN_NO	PLAN_ID	NOTES	X	Y
9D	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561309.31228567	706996.745840492
9E	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561386.12025411	707011.339653078
9F	15"	Round	Corrugated Metal	2.00	9.20	From 9G	18"	Round	Concrete	5.20	6.00	From 9V	n/a	n/a	n/a	1561425.92421269	707028.730379672
9G	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Structure filled with stone.	1561470.95721784	706981.510138456
9H	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561508.50808787	706941.845257505
9I	60"	Round	Concrete	7.33	7.51	From 9O	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561567.75446816	707086.706226702
9J	18"	Round	Concrete	6.00	9.95	From 9L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561603.38285425	707063.544152572
9K	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561625.52373036	707080.487314821
9L	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561625.76948792	707039.289493685
9M	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561666.661063	706991.425828171
9N	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561687.44126337	707008.671054332
9O	18"	Round	Concrete	6.21	10.00	From 9P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561615.83709604	707104.922566692
9P	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561601.74971216	707132.740043603
9Q	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561646.04460361	707117.826402604
9R	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561771.42406624	707166.113294954
9S	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	In stone channel wall.	1561782.61497688	707175.808602097
9T	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561784.57154402	707220.449330053
9U	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561776.74404757	707263.220216308
9V	24"	Round	Concrete	8.02	2.33	From 9AA	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561412.84181712	707041.195114266
9W	15"	Round	Concrete	3.67	8.18	From 9Y	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561503.64206824	707178.124870993
9X	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561480.1140065	707205.603060161
9Y	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561526.1395031	707182.144926636
9Z	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1561554.68161928	707155.888996194
9AB	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	SHA-CE448A21	MH21	Data from SHA 90-perc. plans dated December 2011.	1561190.39578146	707291.518732734

FUTURE-CONDITIONS STORMWATER PIPE DATA

PERM_ID	LOC_SOURC	ELEV_SOURC	SIZE_IN	SIZE_FT	PIPE_SHAPE	MATERIAL	LENGTH	ELEV_IN	ELEV_OUT	SLOPE	NOTES
1E-1D	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	101.0	4.51	4.00	.0050	Data from SHA 90-perc. plans dated December 2011.
1F-1E	State Highway Plans	State Highway Plans	14 x 23	0.9 x 1.9	Ellipse	Concrete	169.0	5.00	4.51	.0029	Data from SHA 90-perc. plans dated December 2011.
1G-1E	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	44.0	4.82	4.61	.0047	Data from SHA 90-perc. plans dated December 2011.
1I-1H	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	85.0	5.50	5.07	.0051	Data from SHA 90-perc. plans dated December 2011.
1H-1G	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	9.00	4.97	4.92	.0056	Data from SHA 90-perc. plans dated December 2011.
2K-2J	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	14.0	3.60	3.50	.0071	Data from SHA 90-perc. plans dated December 2011.
2J-2H	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	86.0	3.40	2.75	.0076	Data from SHA 90-perc. plans dated December 2011.
2I-2H	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	13.0	2.89	2.75	.0108	Data from SHA 90-perc. plans dated December 2011.
2H-2A	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	87.0	2.65	2.00	.0075	Data from SHA 90-perc. plans dated December 2011.
2C-2A	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	110.0	3.10	2.00	.0100	Data from SHA 90-perc. plans dated December 2011.
2D-2C	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	15.0	3.35	3.20	.0100	Data from SHA 90-perc. plans dated December 2011.
2E-2C	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	111.0	4.31	3.20	.0100	Data from SHA 90-perc. plans dated December 2011.
2F-2E	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	11.0	4.52	4.41	.0100	Data from SHA 90-perc. plans dated December 2011.
2A-2	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	190.0	1.90	0.00	.0100	Data from SHA 90-perc. plans dated December 2011.
7J-7I	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	30.0	7.00	6.10	.0300	Data from SHA 90-perc. plans dated December 2011.
7Q-7O	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	94.0	5.94	5.00	.0100	Data from SHA 90-perc. plans dated December 2011.
9E-9C	State Highway Plans	State Highway Plans	78" x 48"	6.5 x 4.0	Rectangle	Concrete	70.0	3.24	1.80	.0205	n/a
13N-13M	State Highway Plans	State Highway Plans	12	1.00	Round	Concrete	4.0	7.63	7.59	.0100	Data from SHA 90-perc. plans dated December 2011.
13M-13L	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	27.0	7.49	7.35	.0052	Data from SHA 90-perc. plans dated December 2011.
19G-19F	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	17.0	11.21	10.70	.0300	Data from SHA 90-perc. plans dated December 2011.
22K-22J	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	22.0	7.56	7.34	.0100	Data from SHA 90-perc. plans dated December 2011.
22L-22J	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	4.0	7.43	7.34	.0225	Data from SHA 90-perc. plans dated December 2011.
22J-22G	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	143.0	7.24	6.52	.0050	Data from SHA 90-perc. plans dated December 2011.
22I-22G	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	4.0	6.60	6.52	.0050	Data from SHA 90-perc. plans dated December 2011.
22H-22G	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	22.0	6.96	6.52	.0050	Data from SHA 90-perc. plans dated December 2011.
22G-22E	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	143.0	6.42	5.71	.0050	Data from SHA 90-perc. plans dated December 2011.
22F-22E	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	4.0	5.79	5.71	.0050	Data from SHA 90-perc. plans dated December 2011.
22E-22B	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	100.0	5.61	5.11	.0050	Data from SHA 90-perc. plans dated December 2011.
22B-22A	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	167.0	5.01	3.00	.0120	Data from SHA 90-perc. plans dated December 2011.
22A-22	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	40.0	2.90	2.70	.0050	Data from SHA 90-perc. plans dated December 2011.
1Z-1Y	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	90.5	93.04	88.35	.0518	n/a
1W-1V	State Highway Plans	State Highway Plans	66	5.50	Round	Concrete	79.4	81.94	79.42	.0317	n/a
1X-1V	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	8.9	86.98	81.94	.5663	n/a
1U-1T	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	53.9	63.25	61.72	.0284	n/a
1S-1R	State Highway Plans	State Highway Plans	15	1.25	Round	Corrugated Metal	13.2	54.27	52.75	.1152	n/a
1Q-1P	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	7.1	41.84	41.81	.0042	n/a
1P-1O	State Highway Plans	State Highway Plans	15	1.25	Round	Corrugated Metal	51.5	41.15	40.00	.0223	n/a
1N-1M	State Highway Plans	State Highway Plans	15	1.25	Round	Corrugated Metal	12.3	23.75	22.61	.0927	n/a
1L-1K	USACE Field Survey	USACE Field Survey	48	4.00	Round	Concrete	147.0	16.52	4.92	.0789	Pipe switches to 5 ft. x 3.5 ft. box culvert under roadway.
1C-1C	USACE Field Survey	USACE Field Survey	66	5.50	Round	Corrugated Metal	49.1	3.53	2.30	.0251	n/a

FUTURE-CONDITIONS STORMWATER PIPE DATA

PERM_ID	LOC_SOURC	ELEV_SOURC	SIZE_IN	SIZE_FT	PIPE_SHAPE	MATERIAL	LENGTH	ELEV_IN	ELEV_OUT	SLOPE	NOTES
1A-1	USACE Field Survey	USACE Field Survey	24 (3)	2.00 (3)	Round	Concrete	25.2	1.58	0.39	.0472	Triple concrete pipes.
6B-6A	USACE Field Survey	USACE Field Survey	8	0.67	Round	Cast Iron	23.0	8.13	7.14	.0430	Pipe size assumed.
6A-6	Assumed	USACE Field Survey	8	0.67	Round	Cast Iron	359.8	7.14	-0.50	.0212	Downstream invert from DEM. Pipe size and location assumed.
5G-5D	USACE Field Survey	USACE Field Survey	36 x 30	3.0 x 2.5	Rectangle	Stone	10.7	7.84	5.79	.1916	n/a
5F-5E	USACE Field Survey	USACE Field Survey	4	0.33	Round	PVC	2.7	10.12	7.58	.9407	n/a
5D-5C	USACE Field Survey	USACE Field Survey	60 x 42	5.0 x 3.5	Rectangle	Stone	118.9	5.79	2.06	.0314	n/a
5C-5A	USACE Field Survey	USACE Field Survey	60 x 42	5.0 x 3.5	Rectangle	Concrete	31.9	2.06	2.54	-.0150	Negative slope accurate from field measurements.
5B-5A	USACE Field Survey	USACE Field Survey	10	0.83	Round	Cast Iron	396.8	5.81	2.45	.0085	n/a
5A-5	USACE Field Survey	USACE Field Survey	72 x 72	6.0 x 6.0	Box	Stone	213.7	2.37	-1.50	.0181	n/a
4A-4	USACE Field Survey	USACE Field Survey	10	0.83	Round	Cast iron	286.5	5.26	-1.00	.0114	Downstream location assumed and invert from DEM.
3A-3	USACE Field Survey	USACE Field Survey	4	0.33	Round	Cast Iron	138.2	5.94	-0.33	.0454	Downstream location assumed.
4B-4A	USACE Field Survey	USACE Field Survey	10	0.83	Round	Cast Iron	154.0	9.00	5.26	.0243	n/a
8C-8B	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	148.1	5.93	4.87	.0072	n/a
8B-8A	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	72.9	4.45	3.28	.0160	n/a
8A-8	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	137.2	3.28	1.35	.0141	Pipe starts as concrete at 23B and changes to CMP at 23A.
7N-7M	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	38.0	7.11	6.84	.0071	n/a
7M-7L	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	64.2	6.84	5.61	.0192	n/a
7L-7K	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	71.5	5.36	4.71	.0091	n/a
7K-7I	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	22.5	4.71	4.49	.0098	n/a
7O-7I	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	20.2	4.75	4.49	.0129	n/a
7P-7O	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	25.3	4.89	4.83	.0024	n/a
7I-7H	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	107.3	4.49	3.84	.0061	n/a
7H-7G	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	68.2	3.75	3.09	.0097	n/a
7G-7F	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	48.1	2.59	2.55	.0008	n/a
8J-8E	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	15.0	2.30	1.58	.0480	n/a
7E-7D	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	36.6	2.26	1.58	.0186	Starts as concrete at 8F and changes to HDPE at 8E.
7D-7C	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	48.7	1.58	1.57	.0002	Starts as 12" concrete at 8E and changes to 15" PVC at 8D.
7C-7B	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	21.1	1.32	1.11	.0100	n/a
7B-7A	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	95.1	0.94	0.67	.0028	n/a
7A-7	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	213.4	0.67	-0.47	.0053	n/a
9Q-9O	USACE Field Survey	USACE Field Survey	96 x 72	8.0 x 6.0	Rectangle	Concrete	32.8	10.84	9.00	.0561	Downstream invert interpolated.
9D-9C	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	34.6	7.59	6.00	.0460	Downstream invert interpolated.
9C-9A	USACE Field Survey	USACE Field Survey	78 x 48	6.5 x 4.0	Rectangle	Concrete	131.0	1.80	-1.43	.0247	Upstream and downstream inverts interpolated.
9B-9A	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	11.1	3.54	3.00	.0486	Downstream invert interpolated.
9A-9	USACE Field Survey	USACE Field Survey	78 x 48	6.5 x 4.0	Rectangle	Concrete	24.0	-1.43	-2.03	.0250	Upstream invert interpolated.
9U-9T	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	43.5	31.66	27.21	.1023	n/a
9T-9S	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	44.7	26.62	22.85	.0843	n/a
9R-9Q	USACE Field Survey	USACE Field Survey	96 x 72	8.0 x 6.0	Rectangle	Concrete	134.4	17.85	10.84	.0522	Pipe starts as 8' x 8' at 7X and tapers to 8' x 6'.
9P-9O	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	31.2	12.88	10.00	.0923	Downstream invert interpolated.
9O-9I	USACE Field Survey	USACE Field Survey	60	5.00	Round	Concrete	51.4	9.00	7.51	.0290	Upstream invert interpolated.

FUTURE-CONDITIONS STORMWATER PIPE DATA

PERM_ID	LOC_SOURC	ELEV_SOURC	SIZE_IN	SIZE_FT	PIPE_SHAPE	MATERIAL	LENGTH	ELEV_IN	ELEV_OUT	SLOPE	NOTES
9J-9I	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	42.5	9.95	7.51	.0574	n/a
9K-9J	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	27.9	12.81	10.95	.0667	n/a
9L-9J	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	33.0	10.01	9.95	.0018	n/a
9M-9L	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	63.0	11.34	10.09	.0198	n/a
9N-9M	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	27.0	12.85	12.67	.0067	n/a
9I-9F	USACE Field Survey	USACE Field Survey	60	5.00	Round	Concrete	153.2	7.51	4.78	.0178	n/a
9V-9F	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	11.0	2.28	2.23	.0050	n/a
9W-9V	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	159.9	8.02	6.10	.0120	n/a
9X-9W	USACE Field Survey	USACE Field Survey	8	0.67	Round	Concrete	36.2	8.97	8.35	.0171	n/a
9Y-9W	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	22.9	10.04	8.18	.0812	n/a
9Z-9Y	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	38.8	10.58	10.04	.0139	n/a
9G-9F	USACE Field Survey	USACE Field Survey	15	1.25	Round	Corrugated Metal	65.3	10.66	9.20	.0224	n/a
9H-9G	USACE Field Survey	USACE Field Survey	12	1.00	Round	Corrugated Metal	54.6	10.71	10.66	.0009	n/a
9F-9E	USACE Field Survey	USACE Field Survey	78 x 48	6.5 x 4.0	Rectangle	Concrete	43.4	1.95	3.24	-.0297	Negative slope accurate from field measurements.
10A-10	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	31.8	2.87	1.19	.0528	n/a
12B-12A	USACE Field Survey	USACE Field Survey	6	0.50	Round	Cast Iron	23.4	4.96	4.43	.0269	n/a
12A-12	USACE Field Survey	USACE Field Survey	15	1.25	Round	Cast Iron	440.5	4.43	1.36	.0070	Location assumed.
11F-11D	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	89.1	2.99	1.53	.0164	Upstream end of pipe at 11F blocked with stone preventing flow.
11E-11D	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	212.3	2.75	1.36	.0065	n/a
11D-11A	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	190.6	1.03	-0.48	.0079	n/a
20B-20A	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	32.5	-0.48	-0.60	.0037	n/a
11B-11A	USACE Field Survey	USACE Field Survey	18	1.50	Round	Concrete	212.1	2.67	1.27	.0066	n/a
11C-11B	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	196.0	5.33	2.84	.0127	n/a
13L-13K	USACE Field Survey	USACE Field Survey	30 x 30	2.5 x 2.5	Box	Concrete	96.5	7.67	5.77	.0197	n/a
13K-13G	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	95.2	5.60	3.50	.0221	Downstream invert interpolated.
13I-13H	USACE Field Survey	USACE Field Survey	4	0.33	Round	Concrete	28.5	4.35	4.00	.0123	Downstream invert interpolated.
13J-13H	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	93.4	9.34	4.00	.0572	Downstream invert interpolated.
13H-13G	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	38.0	4.00	3.50	.0132	Upstream and downstream inverts interpolated.
13G-13F	USACE Field Survey	USACE Field Survey	24	2.00	Round	Concrete	17.9	3.50	3.00	.0279	Upstream and downstream inverts interpolated.
13F-13E	USACE Field Survey	USACE Field Survey	42 x 42	3.5 x 3.5	Box	Concrete	68.6	3.00	1.27	.0252	Upstream invert interpolated.
13E-13D	USACE Field Survey	USACE Field Survey	38 x 24	3.17 x 2.0	Elliptical	Concrete	71.1	1.27	0.27	.0141	n/a
13D-13B	USACE Field Survey	USACE Field Survey	38 x 24	3.17 x 2.0	Elliptical	Concrete	112.2	0.27	0.00	.0024	Downstream invert interpolated.
13C-13B	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	72.4	3.08	0.00	.0425	Downstream invert interpolated.
13B-13A	USACE Field Survey	USACE Field Survey	38 x 24	3.17 x 2.0	Elliptical	Concrete	95.9	0.00	-0.09	.0009	Upstream invert interpolated.
13A-13	USACE Field Survey	USACE Field Survey	38 x 24	3.17 x 2.0	Elliptical	Concrete	41.1	-0.34	-0.52	.0044	n/a
16A-16	USACE Field Survey	USACE Field Survey	4	0.33	Round	Concrete	140.1	5.69	1.51	.0298	Downstream location assumed.
14C-14A	USACE Field Survey	USACE Field Survey	12	1.00	Round	PVC	155.5	5.00	2.52	.0159	n/a
14B-14A	USACE Field Survey	USACE Field Survey	12	1.00	Round	PVC	57.3	5.51	2.69	.0492	n/a
14A-14	USACE Field Survey	USACE Field Survey	12	1.00	Round	Concrete	20.8	2.52	2.81	-.0139	Negative slope due to sedimentation at 18A.
21B-21A	USACE Field Survey	USACE Field Survey	6	0.50	Round	HDPE	115.1	12.02	2.42	.0834	Pipe switches to a 12" terra cotta prior to 13B.

FUTURE-CONDITIONS STORMWATER PIPE DATA

PERM_ID	LOC_SOURC	ELEV_SOURC	SIZE_IN	SIZE_FT	PIPE_SHAPE	MATERIAL	LENGTH	ELEV_IN	ELEV_OUT	SLOPE	NOTES
21A-21	USACE Field Survey	USACE Field Survey	12	1.00	Round	PVC	78.5	2.25	2.00	.0032	Downstream invert interpolated and location assumed.
20A-20	USACE Field Survey	USACE Field Survey	8	0.67	Round	PVC	198.5	11.08	6.43	.0234	Downstream location assumed and elevation from DEM.
19D-19C	USACE Field Survey	USACE Field Survey	8	0.67	Round	Concrete	13.4	12.21	10.91	.0970	n/a
19E-19D	USACE Field Survey	USACE Field Survey	8	0.67	Round	Concrete	56.0	12.24	12.21	.0005	n/a
19C-19B	USACE Field Survey	USACE Field Survey	60 x 60	5.0 x 5.0	Box	Concrete	64.6	6.91	4.20	.0420	n/a
19A-19	USACE Field Survey	USACE Field Survey	96 x 60	8.0 x 5.0	Rectangle	Concrete	61.5	2.21	1.82	.0063	n/a
19I-19H	USACE Field Survey	USACE Field Survey	72 x 36	6.0 x 3.0	Rectangle	Stone	6.7	12.34	10.84	.2239	n/a
19F-19C	USACE Field Survey	USACE Field Survey	60 x 60	5.0 x 5.0	Box	Concrete	20.3	10.70	6.91	.1867	n/a
18D-18B	USACE Field Survey	USACE Field Survey	6	0.50	Round	Terra Cotta	24.0	11.08	10.00	.0450	Downstream invert interpolated.
18C-18B	USACE Field Survey	USACE Field Survey	6	0.50	Round	PVC	15.4	10.90	10.00	.0584	Downstream invert interpolated.
18B-18A	USACE Field Survey	USACE Field Survey	8	0.67	Round	Terra Cotta	127.8	10.00	4.48	.0432	Upstream invert interpolated.
18A-18	USACE Field Survey	USACE Field Survey	8	0.67	Round	Terra Cotta	86.4	4.48	2.82	.0192	Downstream invert from DEM and location assumed.
23F-23E	USACE Field Survey	USACE Field Survey	12	1.00	Round	Corrugated Metal	7.2	6.80	7.21	-.0569	Negative slope accurate from field measurements.
23E-23A	USACE Field Survey	USACE Field Survey	12	1.00	Round	Terra Cotta	125.2	7.21	7.00	.0017	Downstream invert interpolated. Location assumed.
23B-23A	Assumed	USACE Field Survey	12	1.00	Round	Terra Cotta	33.0	8.24	7.00	.0376	Downstream invert interpolated. Location assumed.
23C-23B	USACE Field Survey	USACE Field Survey	6	0.50	Round	Terra Cotta	28.0	9.21	8.24	.0346	n/a
23D-23C	USACE Field Survey	USACE Field Survey	6	0.50	Round	Terra Cotta	41.5	9.85	9.54	.0075	Pipe switches from 4" PVC to 6" Terra Cotta.
23A-23	Assumed	DEM	12	1.00	Round	Terra Cotta	85.2	7.00	5.26	.0204	Elevations interpolated. Size and location assumed.
24B-24A	USACE Field Survey	USACE Field Survey	6	0.50	Round	Cast Iron	79.3	8.54	8.07	.0059	Upstream invert estimated due to sedimentation.
24A-24	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	85.0	3.88	2.00	.0221	n/a
25A-25	USACE Field Survey	USACE Field Survey	15	1.25	Round	Concrete	49.6	11.67	8.71	.0597	n/a
2B-2A	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	14.0	2.14	2.00	.0100	Data from SHA 90-perc. plans dated December 2011.
19H-19F	USACE Field Survey	USACE Field Survey	60 x 60	5.0 x 5.0	Box	Concrete	8.7	10.84	10.70	.0161	n/a
2G-2F	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	132.0	5.95	4.62	.0100	Data from SHA 90-perc. plans dated December 2011.
7V-7U	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	31.0	5.43	5.28	.0048	Data from SHA 90-perc. plans dated December 2011.
7U-7S	State Highway Plans	State Highway Plans	23 x 14	1. 9 x 1.2	Ellipse	Concrete	51.0	5.18	4.92	.0051	Data from SHA 90-perc. plans dated December 2011.
7T-7S	State Highway Plans	State Highway Plans	23 x 14	1.9 x 1.2	Ellipse	Concrete	29.0	5.07	4.92	.0052	Data from SHA 90-perc. plans dated December 2011.
7S-7R	State Highway Plans	State Highway Plans	23 x 14	1.9 x 1.2	Ellipse	Concrete	58.0	4.82	4.53	.0050	Data from SHA 90-perc. plans dated December 2011.
7R-7H	State Highway Plans	State Highway Plans	23 x 14	1.9 x 1.2	Ellipse	Concrete	96.0	4.43	3.95	.0050	Data from SHA 90-perc. plans dated December 2011.
9AG-9AE	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	76.0	5.57	4.92	.0086	Data from SHA 90-perc. plans dated December 2011.
9AF-9AE	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	9.0	4.97	4.92	.0056	Data from SHA 90-perc. plans dated December 2011.
9AE-9AC	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	22.0	4.87	4.76	.0050	Data from SHA 90-perc. plans dated December 2011.
9AD-9AC	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	11.0	4.87	4.76	.0050	Data from SHA 90-perc. plans dated December 2011.
9AC-9AB	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	133.0	4.71	4.05	.0050	Data from SHA 90-perc. plans dated December 2011.
9AB-9AA	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	141.0	4.00	3.31	.0049	Data from SHA 90-perc. plans dated December 2011.
9AA-I42	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	188.0	3.26	2.33	.0050	Data from SHA 90-perc. plans dated December 2011.
17A-17	USACE Field Survey	USACE Field Survey	12	1.00	Round	Cast Iron	160.3	5.75	1.93	.0238	n/a
15V-15U	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	14	6.00	5.94	.0043	Data from SHA 90-perc. plans dated December 2011.
15U-15R	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	193.0	5.84	4.87	.0050	Data from SHA 90-perc. plans dated December 2011.
15S-15R	State Highway Plans	State Highway Plans	6	0.50	Round	PVC	15.0	5.29	5.29	.0000	Data from SHA 90-perc. plans dated December 2011.

FUTURE-CONDITIONS STORMWATER PIPE DATA

PERM_ID	LOC_SOURC	ELEV_SOURC	SIZE_IN	SIZE_FT	PIPE_SHAPE	MATERIAL	LENGTH	ELEV_IN	ELEV_OUT	SLOPE	NOTES
15T-15R	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	3.0	4.83	4.82	.0033	Data from SHA 90-perc. plans dated December 2011.
15R-15P	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	13.0	4.77	4.70	.0054	Data from SHA 90-perc. plans dated December 2011.
15Q-15P	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	3.0	4.72	4.70	.0067	Data from SHA 90-perc. plans dated December 2011.
15P-15N	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	79.0	4.60	4.21	.0049	Data from SHA 90-perc. plans dated December 2011.
15O-15N	State Highway Plans	State Highway Plans	6	0.50	Round	PVC	16.0	4.16	4.16	.0000	Data from SHA 90-perc. plans dated December 2011.
15N-15L	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	52.0	4.11	3.85	.0050	Data from SHA 90-perc. plans dated December 2011.
15M-15L	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	60.0	4.45	3.85	.0100	Data from SHA 90-perc. plans dated December 2011.
15L-15J	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	40.0	3.75	3.55	.0050	Data from SHA 90-perc. plans dated December 2011.
15K-15J	State Highway Plans	State Highway Plans	6	0.50	Round	PVC	16.0	3.89	3.89	.0000	Data from SHA 90-perc. plans dated December 2011.
15J-15I	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	72.0	3.45	3.09	.0050	Data from SHA 90-perc. plans dated December 2011.
15I-15E	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	9.0	2.99	2.94	.0056	Data from SHA 90-perc. plans dated December 2011.
15F-15E	State Highway Plans	State Highway Plans	6	0.50	Round	PVC	22.0	3.53	3.53	.0000	Data from SHA 90-perc. plans dated December 2011.
15G-15E	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	34.0	3.11	2.94	.0050	Data from SHA 90-perc. plans dated December 2011.
15G-15W	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	67.0	3.55	3.21	.0050	Data from SHA 90-perc. plans dated December 2011.
15H-15G	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	13.0	3.71	3.65	.0050	Data from SHA 90-perc. plans dated December 2011.
15E-15D	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	86.0	2.84	2.41	.0050	Data from SHA 90-perc. plans dated December 2011.
15D-15B	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	135.0	2.36	1.69	.0050	Data from SHA 90-perc. plans dated December 2011.
15B-15A	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	54.0	1.64	1.37	.0050	Data from SHA 90-perc. plans dated December 2011.
15A-15	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	64.0	1.32	1.00	.0050	Data from SHA 90-perc. plans dated December 2011.
22N-22M	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	4.0	8.07	8.05	.0050	Data from SHA 90-perc. plans dated December 2011.
22M-22J	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	120.0	7.95	7.34	.0051	Data from SHA 90-perc. plans dated December 2011.
22C-22B	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	160.0	6.71	5.11	.0100	Data from SHA 90-perc. plans dated December 2011.
22D-22C	State Highway Plans	State Highway Plans	15	1.25	Round	Concrete	5.0	6.85	6.81	.0080	Data from SHA 90-perc. plans dated December 2011.
24T-24S	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	6.0	7.85	7.81	.0050	Data from SHA 90-perc. plans dated December 2011.
24S-24Q	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	145.0	7.77	7.05	.0050	Data from SHA 90-perc. plans dated December 2011.
24R-24Q	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	3.0	7.06	7.05	.0033	Data from SHA 90-perc. plans dated December 2011.
24Q-24O	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	71.0	7.00	6.64	.0050	Data from SHA 90-perc. plans dated December 2011.
24P-24O	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	3.0	6.67	6.64	.0010	Data from SHA 90-perc. plans dated December 2011.
24O-24M	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	71.0	6.59	6.24	.0050	Data from SHA 90-perc. plans dated December 2011.
24N-24M	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	3.0	6.27	6.24	.0010	Data from SHA 90-perc. plans dated December 2011.
24M-24K	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	95.0	6.19	5.71	.0051	Data from SHA 90-perc. plans dated December 2011.
24L-24K	State Highway Plans	State Highway Plans	6	0.50	Round	PVC	4.0	8.17	8.17	.0000	Data from SHA 90-perc. plans dated December 2011.
24K-24I	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	86.0	5.66	5.23	.0050	Data from SHA 90-perc. plans dated December 2011.
24J-24I	State Highway Plans	State Highway Plans	6	0.50	Round	PVC	4.0	7.95	7.95	.0000	Data from SHA 90-perc. plans dated December 2011.
24I-24G	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	61.0	5.18	4.88	.0050	Data from SHA 90-perc. plans dated December 2011.
24H-24G	State Highway Plans	State Highway Plans	6	0.50	Round	PVC	3.0	7.79	7.79	.0000	Data from SHA 90-perc. plans dated December 2011.
24G-24E	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	71.0	4.83	4.47	.0050	Data from SHA 90-perc. plans dated December 2011.
24F-24E	State Highway Plans	State Highway Plans	6	.050	Round	PVC	3.0	7.38	7.38	.0000	Data from SHA 90-perc. plans dated December 2011.
24E-24C	State Highway Plans	State Highway Plans	18	1.50	Round	Concrete	71.0	4.42	4.07	.0050	Data from SHA 90-perc. plans dated December 2011.
24D-24C	State Highway Plans	State Highway Plans	6	0.50	Round	PVC	3.0	7.46	7.46	.0000	Data from SHA 90-perc. plans dated December 2011.

FUTURE-CONDITIONS STORMWATER PIPE DATA

PERM_ID	LOC_SOURC	ELEV_SOURC	SIZE_IN	SIZE_FT	PIPE_SHAPE	MATERIAL	LENGTH	ELEV_IN	ELEV_OUT	SLOPE	NOTES
24C-24A	State Highway Plans	State Highway Plans	24	2.00	Round	Concrete	18.0	4.02	3.93	.0050	Data from SHA 90-perc. plans dated December 2011.

APPENDIX D

XPStorm Modeling Methodology

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The stormwater mapping was used to complete an analysis of the capacity of both the existing and the future stormwater system to convey localized heavy rainfalls, given normal tidal conditions. The stormwater analysis was completed for both the existing and future conditions using XPStorm 2014 to identify areas in the Town of Port Deposit that are susceptible to stormwater-related flooding. XPStorm is a link-node model that performs hydrologic, hydraulic and quality analysis of stormwater drainage systems. It utilizes sophisticated graphical tools together with associated GIS data, and can be used to model the full hydrologic cycle from stormwater flow to simulation of the hydraulics in any combined system of open and/or closed conduits with any boundary condition. The two-dimensional hydrodynamic engine XP2D was used in addition to XPStorm to enable a complete model of one-dimensional pipe flow and two-dimensional overland flow once the pipe network has reached capacity. This two-dimensional modeling results in more accurate results that are more readily accepted and understood (Reference 5).

One of the most widely used and accepted methods of modeling the hydrology of watersheds is using the SCS 24-hour design storm. This method for hydrologic computations was used in this study because it is simple, widely used, and a component of XPStorm. For this method, the development of hydrologic data is required. This data includes drainage area, runoff curve number (CN), percent impervious area, and time of concentration. 24-hour precipitation data and control specifications are also required for a successful simulation.

HYDROLOGIC INPUT

Drainage Basins

Drainage areas to each stormwater inlet were delineated using a DEM developed by Maryland MDNR. This DEM was created at a resolution of 2.0 meters and is dated 2005. Field reconnaissance during heavy rainfall events was completed to better define the drainage basins to confirm the accuracy of the DEM.

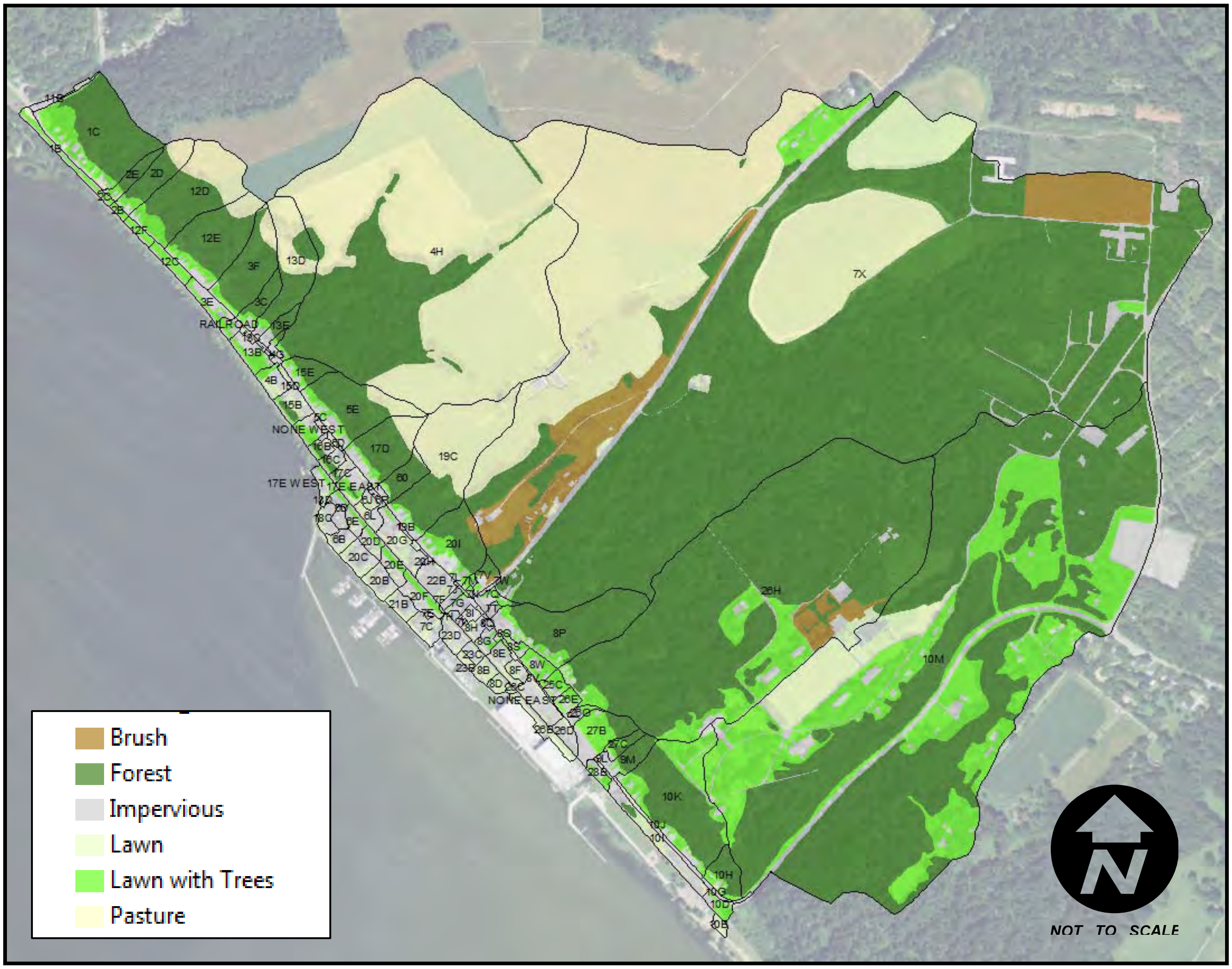
Land Use

Recent aerial photography was used in order to create a GIS shapefile of the existing land use within the contributing drainage basins to the stormwater inlets. The land use categories used include: brush, forest, impervious, lawn, lawn with trees, and pasture. A map showing the drainage basins and the existing-conditions land use is shown in Figure D.1, with GIS shapefiles provided on the attached project disc.

Soils

A hydrologic soil group classification was developed by the NRCS to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The hydrologic soil groups are named A, B, C, and D, with Group A soils having low runoff potential and Group D soils having high runoff potential. Spatial soil data for Cecil County, Maryland, was obtained directly from the NRCS Soil Data Mart. The majority of soils in the study area are Group B and D soils (Figure D.2).

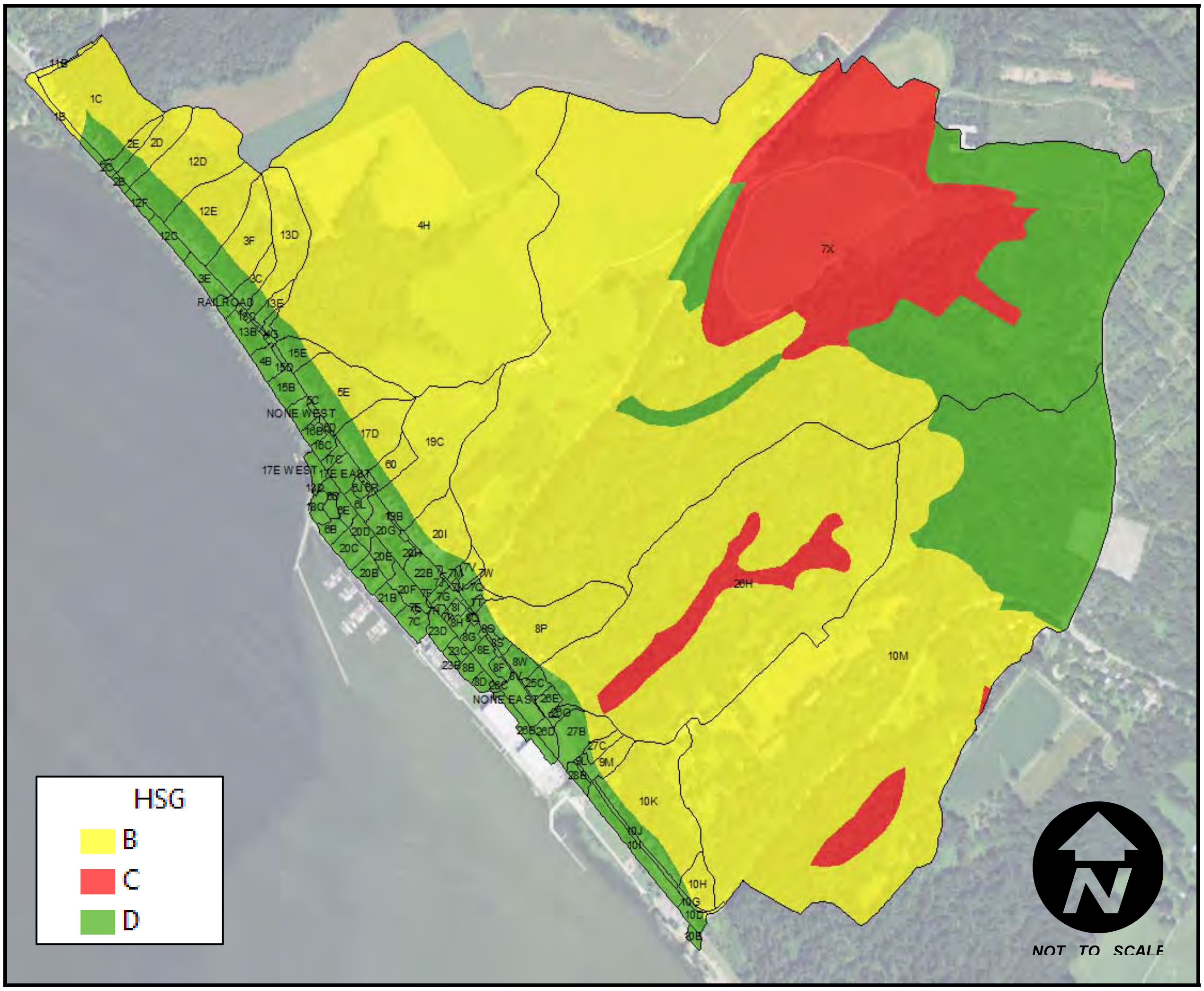
Figure D.1: Existing Drainage Basins and Land Use in Port Deposit



Runoff Curve Numbers (CN)

CNs are used in modeling applications to convert mass rainfall into mass runoff. CN is based upon soils, plant cover, amount of impervious area, interception, and surface storage. CNs generally range from 30 to 98, with 30 having the least amount of runoff and 98 being impervious surfaces, with the most amount of runoff. CN values were calculated without the impervious areas included, as the XPStorm model requires an input of percent imperviousness. CN values for the drainage basins in the Town of Port Deposit existing stormwater system range from 59 to 98.

Figure D.2: Existing Drainage Basins and Soils in Port Deposit



Travel Time, Time of Concentration, and SCS Lag Time

Travel time (Tt) is the time it takes water to travel from one location to another in the drainage basin. Tt is a component of the time of concentration (Tc), which is the time for runoff to travel from the most hydrologically remote point in the drainage basin to the point of interest. Tc is calculated by summing the travel time for consecutive flow components within each drainage basin.

Methods outlined in the NRCS Technical Release 55 (TR-55) were used to calculate the Tt and Tc for each drainage basin. The DEM, field reconnaissance, and stormwater mapping was used to determine the flow paths and hydraulic characteristics of the flow paths. A minimum value of 5 minutes was used for drainage basins where the computed value was less than 5 minutes or for drainage basins with a relatively small or completely impervious area. A list of the CN value and Tc value used for each drainage basin is shown in Table D.1.

Table D.1: Existing-Conditions CN and Tc Values

Inlet/ Basin	Drainage Area (acres)	CN	Tc	Inlet/ Basin	Drainage Area (acres)	CN	Tc
10B	0.21	86	5.00	20D	0.49	94	5.00
10D	0.48	88	5.00	20E	0.60	92	5.00
10G	0.19	97	5.00	20F	0.89	92	5.00
10H	1.28	60	10.81	20G	1.41	92	5.00
10I	1.59	92	13.19	20H	0.14	96	5.00
10J	0.48	96	11.94	20I	3.32	67	15.24
10K	8.46	63	5.00	21B	0.57	94	5.00
10M	116.14	67	24.13	22B	1.01	95	5.00
11B	0.30	95	5.00	23B	0.18	87	5.00
12C	0.58	86	6.21	23C	0.30	94	5.00
12D	6.13	63	12.52	23D	0.71	95	5.00
12E	4.85	65	10.20	25B	0.04	95	5.00
12F	0.33	88	9.44	25C	0.52	87	5.00
13B	0.91	90	5.00	26B	0.73	89	36.95
13C	0.18	97	5.20	26C	0.09	88	5.00
13D	4.12	60	7.82	26D	0.57	97	5.00
13E	0.58	70	12.43	26E	0.53	90	5.00
14B	0.02	98	5.00	26G	0.22	89	13.46
15B	0.88	89	5.00	26H	58.75	59	36.64
15D	0.13	93	5.00	27B	2.01	77	9.55
15E	0.99	76	13.04	27C	0.53	62	9.14
16B	0.36	87	5.00	28B	0.36	90	10.10
16C	0.43	88	5.00	2B	0.16	89	5.00
17C	0.32	92	5.00	2C	0.13	90	5.00
17D	3.27	66	6.93	2D	2.10	64	7.02
17E EAST	0.76	91	5.00	2E	0.77	67	11.61
17E WEST	0.51	90	5.00	3C	0.99	68	14.98
18C	0.48	93	5.00	3F	3.67	62	15.49
18D	0.23	94	5.00	3E	0.80	94	6.60
19B	0.06	92	5.00	4B	0.71	89	5.00
19C	8.47	62	11.23	4F	0.03	98	5.00
1B	0.76	86	5.00	4G	0.28	90	10.26
1C	7.59	62	5.18	4H	71.64	60	16.52
20B	0.75	94	5.00	5B	0.05	98	5.00
20C	0.81	94	5.00	5C	0.09	98	5.00

Table D.1: Existing-Conditions CN and Tc Values (Continued)

Inlet/ Basin	Drainage Area (acres)	CN	Tc	Inlet/ Basin	Drainage Area (acres)	CN	Tc
5D	0.09	95	5.00	7S	0.02	98	5.00
5E	4.53	67	7.22	7T	0.15	96	5.00
6B	0.47	94	5.00	7V	0.59	75	11.03
6D	0.27	98	5.00	7W	0.08	98	5.00
6E	0.43	94	5.00	7X	222.20	67	64.53
6J	0.24	88	5.00	8B	0.43	87	5.00
6K	0.07	98	5.00	8D	0.28	85	5.00
6L	0.43	93	9.85	8E	0.63	93	5.00
6M	0.07	98	5.00	8F	0.34	89	5.00
6O	1.14	62	5.00	8G	0.38	93	5.00
6P	0.12	98	5.00	8H	0.37	95	5.00
7C	0.73	94	5.00	8I	0.22	97	5.00
7E	0.05	93	5.00	8N	0.03	97	5.00
7F	0.03	93	5.00	8O	0.06	95	5.00
7G	0.32	96	5.00	8P	6.52	60	29.92
7H	0.08	98	5.00	8Q	0.09	98	5.00
7I	0.07	98	5.00	8R	0.06	96	5.00
7J	0.21	97	5.00	8S	0.27	91	5.00
7K	0.05	94	5.00	8V	0.03	95	5.00
7L	0.02	98	5.00	8W	0.65	87	5.00
7M	0.14	86	11.51	9L	0.06	95	5.00
7N	0.07	92	5.00	9M	1.10	67	14.85
7Q	0.47	87	11.34	NONE WEST	0.57	89	5.00
7R	0.04	98	5.00	NONE EAST	1.00	93	5.00

Precipitation Data

For this investigation, precipitation data was taken from NOAA Atlas 14, Volume 2, Version 3, for the location of the Town of Port Deposit. The precipitation data used is shown in Table D.2.

Table D.2: Precipitation Data

Storm Event	Rainfall (Inches)
2-year, 24-hour	3.27
10-year, 24-hour	4.99
100-year, 24-hour	8.47

Stormwater systems are typically designed to convey runoff generated from a 10-year storm event, and that storm event is the primary focus of this investigation. The 100-year storm event, which are less frequent events which are typically not conveyed in the stormwater system, were run for reference purposes only. The 2-year storm, a more frequent event, was run in order to determine locations where conveyance issues are more critical.

Control Specifications

For the XPStorm model, a 1-second time step was used for the simulation. The start date and end date of the simulation was randomly set.

HYDRAULIC INPUT

XPStorm models both hydrology and hydraulics simultaneously. The hydraulic input required for the XPStorm model is the stormwater system mapping. This data is uploaded into the XPStorm hydraulic model. In order to complete the two-dimensional portion of the model, the DEM (Grid) is uploaded into the model and linked to the one-dimensional model.

Pipe and open channel Manning's roughness (n) values were assigned based upon engineering judgment. An overland n value must be assigned to the corresponding land use to determine resistance to overland flow. Overland n values were obtained from the XPStorm user's manual, which was derived from the USACE *Flood Runoff Analysis Engineering Design Manual, EM 1110-2-1417*. N values used for the XPStorm model are shown in Table D.3.

Table D.3: Roughness Values used for XPStorm Model

Flow Type	Material/Land Use	n
Piped	HDPE	.014
	RCP	.013
	PVC	.011
	CMP	.024
	Cast Iron	.014
	Terra Cotta	.014
	Vitrified Clay	.014
	Stone	.018
Open Channel	Grass	.030
	Concrete	.013
	Rip-Rap	.024
Overland Flow	Paved Surfaces	.10
	Grass	.30
	Woods	.40

Model Runs

The downstream boundary condition for the simulation must also be set. For the existing-conditions run the tailwater condition was assumed to be a free outfall, meaning no backwater was present.

All data for the existing-conditions XPStorm model is located on the attached project disc. This includes GIS shapefiles of all input data (stormwater mapping, land use, drainage areas, soils, time of concentration flow paths), XPStorm modeling files, and output GIS shapefiles (flood inundation areas).

Other Runs

Due to the nuisance flooding along Main Street (MD Route 222), as witnessed and confirmed in the existing-conditions XPStorm model, SHA is in the process of completing a drainage improvement project along in Port Deposit from Granite Avenue to the southern town limits. The SHA design proposes the replacement of the majority of old stormwater infrastructure within the Town of Port Deposit. The improvements are reflected in the future-conditions stormwater mapping described above.

The existing-conditions XPStorm model and input data was revised to account for the proposed improvements. The drainage areas, CN values, and times of concentration were recalculated based upon the future-conditions mapping. For the purposes of calculating CN, the existing land use data was used as there are no major developments planned for the project area that would change land use considerably.

The future-conditions mapping and revised data were input into the future-conditions XPStorm model and the same storm events were run.

The results showed, as expected, that the nuisance flooding along Main Street (MD Route 222) during a 10-year, 24-hour rainfall would essentially be eliminated as a result of the SHA improvements during a normal tidal tailwater condition. Minor flooding would occur during a 100-year, 24-hour rainfall, as the stormwater system is not designed to convey such a rainfall. The future-conditions XPStorm modeling files are located on the attached project disc.

Because the majority of flooding issues would be eliminated during normal tidal conditions with the SHA improvements, the input data and results are not summarized in this document. However, the future-conditions model was run with a submerged tailwater condition to determine any interior drainage flooding issues with the developed flood risk management plan. The summary of the input data, model development, and the results of this future-conditions model are included in Appendix E.

APPENDIX E

Future-Conditions XPStorm Modeling Data
(Interior Drainage Analysis)

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According to *USACE Engineering Manual (EM) 1110-2-1413, dated January 1987*, an interior area is defined as the area protected from direct riverine, lake, or tidal flooding by levees, floodwalls or seawalls and low depressions or natural sinks. The actions in the flood risk management plan will convert the existing Norfolk Southern railroad embankment into a levee system (line of protection) to protect the landside flood areas. The line of protection blocks riverine flooding, but does not prevent, and sometimes aggravates, localized flooding in the interior areas from heavy rainfall events because the drainage outlets are now blocked (valves, flap gates, and closure structures). Thus, protected interior areas, formerly flooded by the river by slowly rising, less frequent regional storms may now be subject to flooding by more frequent, localized rainfall events, especially if the river is at a high level.

With this flood risk management plan, an analysis of the risk of flooding from interior drainage was necessary to ensure that if a heavy rainfall were to occur during a flooding event on the Susquehanna River when all drainage outlets are blocked, that interior flooding from the heavy rainfall event would not cause damages to buildings. Therefore, the interior drainage analysis involved (1) determining interior flood areas for several scenarios (riverine flood level vs. interior rainfall) with the actions outlined in the flood risk management in place and (2) if the flooding is significant (i.e. causing damages to buildings), developing a plan for locating and sizing pump stations to alleviate the interior flooding.

SCENARIOS

The interior drainage analysis uses the results of the HEC-RAS modeling outlined in Appendix A (riverine flooding) with the future-conditions XPStorm modeling described in this appendix (interior flooding). The probability of a significant riverine or coastal flood on the Susquehanna River occurring at the same time as a significant rainfall event in Port Deposit is low. These events can be considered independent, because the rainfall that would produce a high riverine flood on the Susquehanna River would occur in New York and Pennsylvania days or even a week prior in to the localized, heavy rainfall event in Port Deposit.

EM 1110-2-1413 recommends the use of “coincident frequency methods” in areas where occurrence of the exterior and interior flooding are independent, such as areas like Port Deposit with relatively small interior areas located along large rivers or coast lines. The recommended computation procedure includes the computation of a series of hypothetical single event hydrographs for the interior analysis and stage-duration curves for the exterior stages. For this concept level study, it was determined that inundation areas of interior flooding would be determined for four scenarios only, with a pumping plan developed for the scenario (s) that would cause flooding to buildings but would also have a reasonable probability of occurring.

Establishing these two events as independent allows simple calculation of the joint probability of these occurring simultaneously. When two events are independent, the probability of them both occurring together is the product of their probabilities. For example, the annual exceedence probability of a 10-year flood event occurring on the Susquehanna River is .10 (i.e., a 10% chance of this flood occurring in any given year). The annual exceedence probability of a 10-year rainfall occurring in Port Deposit is also .10. The annual exceedence probability of these two events occurring together (i.e. joint probability) is .10 x .10, which equals .01, or a 100-year flood event (1% chance of occurring in any given year). The four events that were analyzed in this interior drainage analysis are shown in Table E.1. The scenarios include the 10-percent (10-year) and 1.35-percent annual chance flood (80-year, 50-gate open) on the Susquehanna River and the 50-percenct (2-year) and 10-percent (10-year) annual chance rainfall on the interior areas.

Table E.1: Joint Probability Scenarios in Interior Drainage Analysis

Scenario	River Flood Annual Exceedance Probability (Flood Frequency)	Interior Rainfall Annual Exceedance Probability (Flood Frequency)	Joint Probability (Flood Frequency)
1	.10 (10-year, @ 3 1Gates Open)	.50 (2-year)	.05 (20-year)
2	.10 (10-year, @ 31 Gates Open)	.10 (10-year)	.01 (100-year)
3	.0135* (80-year, 50 Gates Open)	.50 (2-year)	.00675 (148-year)
4	0135* (80-year, 50 Gates Open)	.10 (10-year)	.00135 (740-year)

The 1-percent annual chance rainfall was not used in the interior drainage analysis for several reasons. First, the existing (and future) stormwater infrastructure in the Town of Port Deposit is not designed to handle this rainfall with no backwater at the outfalls, with nuisance flooding occurring on the streets. In addition, it is an extremely low probability that this rainfall would occur at the same time as high flood stages on the Susquehanna River. For example, the joint probability of a 1-percent annual rainfall (100-year) occurring at the same time as a 10-percent annual flood (10-year) on the Susquehanna River is .001, or the .1-percent annual chance event (1000-year). The same rainfall occurring when the flooding on the Susquehanna River is at 50-gate opening has an annual exceedance probability of .000135, or a frequency of 7,400 years. Planning to implement a pump station to handle these types of conditions is not feasible.

XPStorm 2014 was used to determine inundation areas from stormwater flooding during the joint probability scenarios listed in Table E.1. XPStorm is a link-node model that performs hydrologic, hydraulic and quality analysis of stormwater drainage systems. It utilizes sophisticated graphical tools together with associated GIS data, and can be used to model the full hydrologic cycle from stormwater flow to simulation of the hydraulics in any combined system of open and/or closed conduits with any boundary condition. The two-dimensional hydrodynamic engine XP2D was used in addition to XPStorm to enable a complete model of one-dimensional pipe flow and two-dimensional overland flow once the pipe network has reached capacity. This two-dimensional modeling results in more accurate results that are more readily accepted and understood.

HEC-RAS MODELING SUMMARY (RIVERINE FLOODING)

The outfall condition can be set in the XPStorm model. During normal tidal conditions, the outfall would be set as "free", meaning stormwater from the interior areas can flow freely to the Susquehanna River. During conditions where the flap-gates are preventing backwater from entering the interior areas, the outfall can be set as constant backwater with tide gate. This option was used to model the outfall conditions included in this interior drainage analysis.

The HEC-RAS modeling discussed in Section 2 and Appendix A was used to determine the 10-percent annual flood elevation and 50-gate open flood elevation at each outfall. These elevations are shown in Table E.2. Based upon historical observations, the flooding in the Town of Port Deposit from the Susquehanna River typically last for more that 24-hours. Therefore, for the purposes of this analysis, it was assumed that the backwater elevation at the outfalls is present at the constant elevation listed in Table E.2 for the duration of the interior rainfall storm (24-hours).

Table E.2: Backwater Elevations at Outfalls

Outfall	HEC-RAS XS	10-Percent Annual Chance Flood Elevation (feet NAVD88) *@ 31 Gates Open 478,600 cfs*	50-Gate Open Flood Elevation (feet NAVD88) *50 Gates Open 775,000 cfs*
1D	23377	7.2	10.4
2	24356	7.2	10.4
3	24356	7.2	10.4
4	24522	7.2	10.4
5	24785	7.3	10.4
6	25063	7.3	10.4
7	25343	7.3	10.4
8	25343	7.3	10.4
9	25808	7.4	10.5
10	25969	7.4	10.5
11	26285	7.7	10.8
12	26285	7.7	10.8
13	26612	8.0	11.2
14	26914	8.3	11.8
15	27068	8.5	12.1
16	27254	8.7	12.3
17	27468	9.0	12.7

Table E.2: Backwater Elevations at Outfalls (Continued)

Outfall	HEC-RAS XS	10-Percent Annual Chance Flood Elevation (feet NAVD88) *@ 31 Gates Open 478,600 cfs*	50-Gate Open Flood Elevation (feet NAVD88) *50 Gates Open 775,000 cfs*
18	27710	9.2	12.9
19	27935	9.4	13.2
20	27935	9.4	13.2
21	27935	9.4	13.2
22	28192	9.7	13.5
23	28727	10.0	13.7
24	29003	10.2	13.8

FUTURE-CONDITIONS XPSTORM MODELING (INTERIOR FLOODING)

One of the most widely used and accepted methods of modeling the hydrology of watersheds is using the SCS 24-hour design storm. This method for hydrologic computations was used in this study because it is simple, widely used, and a component of XPStorm. For this method, the development of hydrologic data is required. This data includes drainage area, runoff curve number (CN), percent impervious area, and time of concentration. 24-hour precipitation data and control specifications are also required for a successful simulation. Below is a description of the future-conditions input data

Drainage Basins

Drainage areas to each future-conditions stormwater inlet were delineated using a DEM developed by Maryland MDNR. This DEM was created at a resolution of 2.0 meters and is dated 2005. There were numerous differences between the future-conditions drainage areas and the existing-conditions drainage areas due to the SHA re-alignment of the stormwater system.

Land Use

Recent aerial photography was used in order to create a GIS shapefile of the existing land use within the contributing drainage basins to the stormwater inlets. The land use categories used include: brush, forest, impervious, lawn, lawn with trees, and pasture. The future-conditions land use was the same as the existing-conditions land use.

Soils

A hydrologic soil group classification was developed by the NRCS to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The hydrologic soil groups are named A, B, C, and D, with Group A soils having low runoff potential and Group D soils having high runoff potential. Spatial soil data for Cecil County, Maryland, was obtained directly from the NRCS Soil Data Mart. The majority of the soil in the study area are Group B and D soils, and were the same as the existing-conditions soils.

Runoff Curve Numbers (CN)

CNs are used in modeling applications to convert mass rainfall into mass runoff. CN is based upon soils, plant cover, amount of impervious area, interception, and surface storage. CNs generally range from 30 to 98, with 30 having the least amount of runoff and 98 being impervious surfaces, with the most amount of runoff. CN values were calculated without the impervious areas included, as the XPStorm model requires an input of percent imperviousness. CN values for the drainage basins in the Town of Port Deposit future-conditions stormwater system range from 59 to 98.

Travel Time, Time of Concentration, and SCS Lag Time

Travel time (Tt) is the time it takes water to travel from one location to another in the drainage basin. Tt is a component of the time of concentration (Tc), which is the time for runoff to travel from the most hydrologically remote point in the drainage basin to the point of interest. Tc is calculated by summing the travel time for consecutive flow components within each drainage basin.

Methods outlined in the NRCS Technical Release 55 (TR-55) were used to calculate the Tt and Tc for each drainage basin. The DEM and future-conditions stormwater mapping were used to determine the flow paths and hydraulic characteristics of the flow paths. A minimum value of 5 minutes was used for drainage basins where the computed value was less than 5 minutes or for drainage basins with a relatively small or completely impervious area. A list of the CN value and Tc value used for each future-condition drainage basin is shown in Table E.3.

Table E.3: Future-Conditions CN and Tc Values

Inlet/ Basin	Drainage Area (acres)	CN	Tc	Inlet/ Basin	Drainage Area (acres)	CN	Tc
10A	0.57	94	5.00	18C	0.13	93	5.00
11A	0.75	94	5.00	18D	0.44	71	13.04
11B	0.81	94	5.00	19A	0.71	89	5.00
11C	0.49	94	5.00	19D	0.04	98	5.00
11D	0.60	92	5.00	19E	0.03	98	5.00
11E	0.89	92	5.00	19G	0.54	80	12.88
11F	1.11	91	5.00	19H	0.83	76	16.28
12A	0.06	92	5.00	19I	71.7	60	16.52
12B	8.47	62	11.23	1A	0.21	86	5.00
13A	0.47	94	5.00	1C	0.48	88	5.00

Table E.3: Future-Conditions CN and Tc Values (Continued)

Inlet/ Basin	Drainage Area (acres)	CN	Tc	Inlet/ Basin	Drainage Area (acres)	CN	Tc
13C	0.27	98	5.00	1F	1.42	92	26.08
13D	0.43	94	5.00	1G	0.19	97	5.00
13I	0.24	88	5.00	1H	0.57	60	9.87
13J	0.07	98	5.00	1I	9.36	61	5.69
13K	0.43	93	9.83	1L	116.21	67	24.13
13L	0.07	98	5.00	20A	0.02	98	5.00
13M	0.12	98	5.00	21A	0.91	90	5.00
13N	1.15	62	5.00	21B	0.18	97	5.20
14B	0.48	93	5.00	22A-RR	0.36	91	5.00
14C	0.23	94	5.00	22D	4.13	60	7.82
15C	0.76	91	5.00	22F	2.58	65	17.45
15D	0.32	92	5.00	22H	0.55	94	5.00
15F	0.84	63	7.00	22I	2.09	62	6.36
15H	0.93	66	6.31	22K	0.25	92	5.00
15I	0.20	72	8.00	22L	2.09	64	11.50
15K	0.91	67	5.00	22N	1.63	64	12.00
15M	0.43	88	5.00	23B	0.58	86	6.21
15O	1.97	64	6.76	23C	6.14	63	12.50
15Q	0.09	95	5.00	23D	1.12	70	11.41
15S	1.59	69	7.03	23E	0.33	88	9.44
15V	0.97	68	8.00	24A	0.16	89	5.00
15W	0.40	67	8.00	24B	0.13	90	5.00
16A	0.36	87	5.00	24D	2.10	64	7.02
17A	0.71	89	5.00	18C	0.13	93	5.00
24F	0.46	65	11.79	7P	0.15	89	5.00
24F	0.46	65	11.79	7P	0.15	89	5.00
24H	0.32	69	9.14	7Q	0.68	84	5.00
24J	1.44	66	15.40	7R	0.15	89	5.00
24L	1.08	66	10.09	7S	0.10	94	5.00
24N	0.99	66	16.33	7T	0.62	96	5.00
24P	0.92	64	31.73	7U	0.04	90	5.00
24R	1.12	61	15.96	7V	0.05	98	5.00
24T	2.81	64	5.00	8A	0.18	87	5.00
25A	0.30	95	5.00	8B	0.30	94	5.00

Table E.3: Future-Conditions CN and Tc Values (Continued)

Inlet/ Basin	Drainage Area (acres)	CN	Tc	Inlet/ Basin	Drainage Area (acres)	CN	Tc
2B	0.11	97	5.00	8C	0.71	95	5.00
2D	0.08	95	5.00	9AA	1.30	95	5.00
2F	0.11	93	5.00	9AC	0.06	98	5.00
2G	0.17	96	5.00	9AD	0.08	95	5.00
2I	1.02	62	13.75	9AE	1.09	59	15.00
2K	0.14	98	5.00	9AF	1.01	64	15.15
3A	0.36	90	10.10	9AG	1.22	73	12.10
4A	2.02	77	9.55	9B	0.73	94	5.00
4B	0.53	62	9.12	9D	0.05	93	5.00
5A	0.73	89	36.95	9E	0.03	93	5.00
5B	0.09	88	5.00	9F	0.32	96	5.00
5C	0.57	97	5.00	9G	0.08	98	5.00
5D	0.53	90	5.00	9H	0.07	98	5.00
5F	0.22	89	13.46	9K	0.47	87	11.34
5G	58.78	59	36.64	9L	0.04	98	5.00
6A	0.04	95	5.00	9M	0.02	98	5.00
6B	0.52	87	5.00	9N	0.15	96	5.00
7A	0.43	87	5.00	9P	0.59	75	11.03
7B	0.28	85	5.00	9Q	0.08	98	5.00
7D	0.63	93	5.00	9R	222.3	67	64.52
7E	0.34	89	5.00	9V	0.21	97	5.00
7J	0.12	94	5.00	9W	0.05	94	5.00
7K	0.03	97	5.00	9X	0.02	98	5.00
7L	0.06	95	5.00	9Y	0.14	86	11.51
7M	6.53	60	29.92	9Z	0.07	92	5.00
7N	0.09	98	5.00	NONE EAST	1.00	93	5.00
7O	0.06	96	5.00				

Precipitation Data

For this investigation, precipitation data was taken from NOAA Atlas 14, Volume 2, Version 3, for the location of the Town of Port Deposit. The precipitation data used is shown in Table E.4.

Control Specifications

For the XPStorm model, a 1-second time step was used for the simulation. The start date and end date of the simulation was randomly set.

Table E.4: Precipitation Data

Storm Event	Rainfall (Inches)
2-year, 24-hour	3.27
10-year, 24-hour	4.99

<u>HYDRAULIC INPUT</u>

XPStorm models both hydrology and hydraulics simultaneously. The hydraulic input required for the XPStorm model is the future-conditions stormwater system mapping. This data is uploaded into the XPStorm hydraulic model. In order to complete the two-dimensional portion of the model, the DEM (Grid) is uploaded into the model and linked to the one-dimensional model.

Pipe and open channel Manning's roughness (n) values were assigned based upon engineering judgment. In order to complete the two-dimensional portion of the model, the DEM (Grid) is uploaded into the model and linked to the one-dimensional model. An overland n value must be assigned to the corresponding land use to determine resistance to overland flow. Overland n values were obtained from the XPStorm user's manual, which was derived from the USACE *Flood Runoff Analysis Engineering Design Manual, EM 1110-2-1417*. N values used for the XPStorm model are shown in Table E.5.

Table E.5: Roughness Values used for Future-Conditions XPStorm Model

Flow Type	Material/Land Use	n
Piped	HDPE	.014
	RCP	.013
	PVC	.011
	CMP	.024
	Cast Iron	.014
	Terra Cotta	.014
	Vitrified Clay	.014
	Stone	.018

Table E.5: Roughness Values used for Future-Conditions XPStorm Model (Continued)

Flow Type	Material/Land Use	n
Open Channel	Grass	.030
	Concrete	.013
	Rip-Rap	.024
Overland Flow	Paved Surfaces	.10
	Grass	.30
	Woods	.40

RESULTS

The results of the XPStorm model scenarios show ten distinct areas of interior flooding, named "interior flood areas" for the purposes of this study.

Area A

This area is at the southern end of the Town and includes Main Street (MD Route 222) near Marina Park. Interior flooding is from the back-up of the stormwater system to Outfall 1D.

Area B

Area B is the backyards of two residential properties located between Tomes Landing Marina and Main Street (MD Route 222). Interior flooding is from the back-up of stormwater to Structure 3A.

Area C

This area is located directly across the street from Town Hall in a parking area. There is no stormwater infrastructure present at this location. It is a low lying area that actually ponds with water during normal rainfalls.

Area D

The back-up of stormwater through Structure 7E is the cause of the interior flooding in this area, which is located behind several residences along Main Street.

Area E

This area is located between Main Street and the railroad near a park by the old municipal building and the Bees Nest. The main contribution to the flooding is from Structure 11F.

Area F

Area F is localized interior flooding from Structure 13I in the low-lying backyard of a residential property on Main Street.

Area G

Area G is the interior flooding behind the Vannort Drive closure structure. The majority of interior flooding is from the localized drainage area behind the closure structure, with some contributions from Structure 15D. This area also includes interior flooding behind Outfalls 16 and 17.

Area H

This area includes all the low-lying areas near the railroad tracks by the Sunset North development. It includes interior flooding from Outfalls 18, 19, 20 and 21.

Area I

This area is located behind the Netters Alley closure structure.

Area J

Area J is North Main Street (MD Route 222) at Outfalls 23 and 24, between Granite Avenue and Netters Alley.

The results of the four scenarios modeled in this interior drainage analysis are shown in Figure E.1 through Figure E.4. Table E.6 shows the maximum depth for each scenario at each interior flood area along with whether or not buildings are impacted by the flooding. For the purposes of this analysis, it was assumed a building would be impacted if flooding at a depth of greater than 0.5 ft. touched the building on the map.

All data for the future-conditions XPStorm model and interior drainage analysis is located on the attached project disc. This includes GIS shapefiles of all input data (stormwater mapping, land use, drainage areas, soils, time of concentration flow paths), XPStorm modeling files, and output GIS shapefiles (flood inundation areas).

Figure E.1
Interior Drainage Analysis-
Scenario 1 Flood Areas

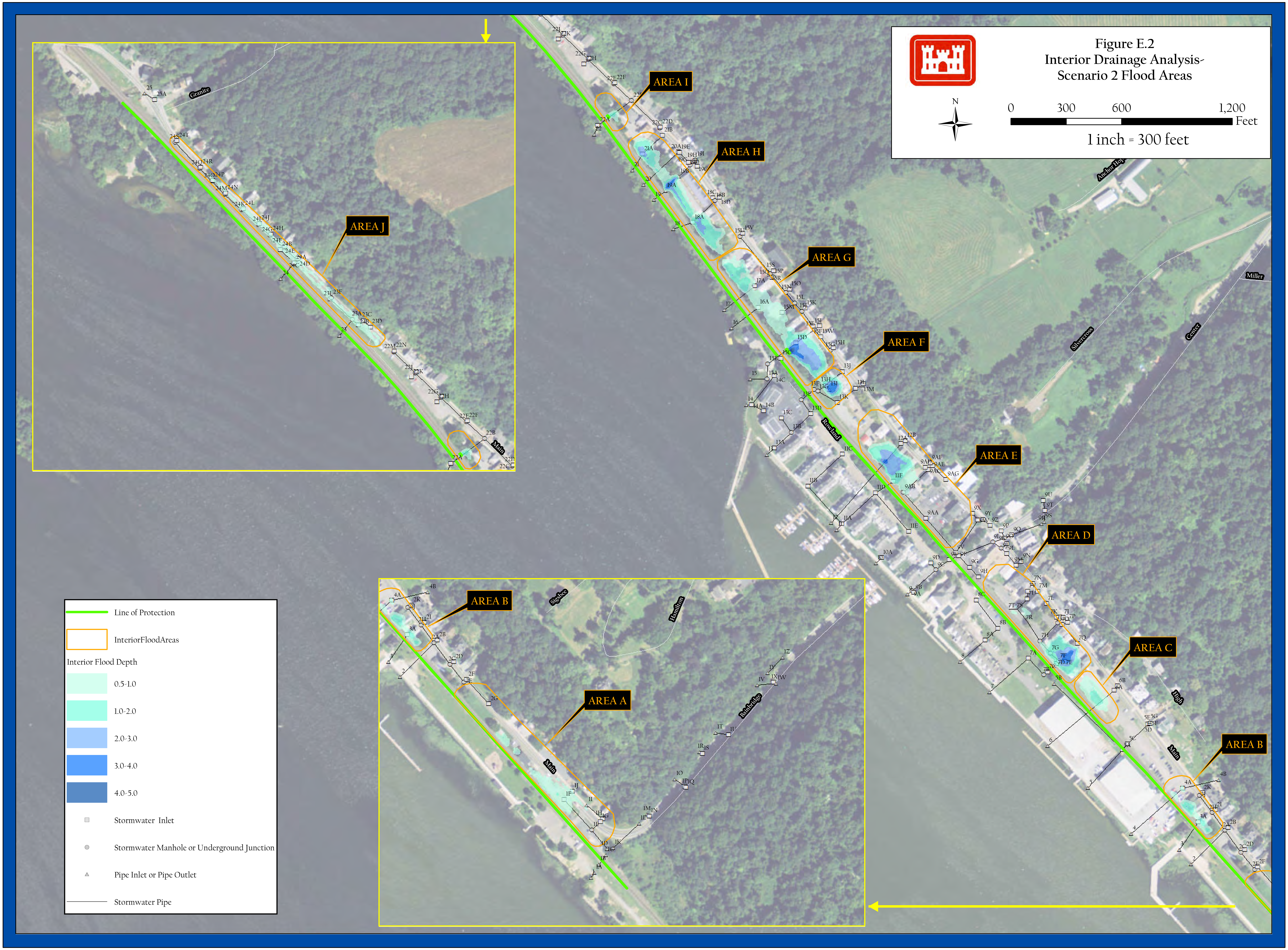
Figure E.2
Interior Drainage Analysis-
Scenario 2 Flood Areas
N
0
300
600
1,200
Feet
1 inch = 300 feet
AREA A
AREA B
AREA C
AREA D
AREA E
AREA F
AREA G
AREA H
AREA I
AREA J
Main
Rowland
Granite
Hamilton
Bainbridge
Silvercross
Center
Miller
High
Line of Protection
InteriorFloodAreas
Interior Flood Depth
0.5-1.0
1.0-2.0
2.0-3.0
3.0-4.0
4.0-5.0
Stormwater Inlet
Stormwater Manhole or Underground Junction
Pipe Inlet or Pipe Outlet
Stormwater Pipe

Figure E.3
Interior Drainage Analysis-
Scenario 3 Flood Areas


Figure E.4
Interior Drainage Analysis-
Scenario 4 Flood Areas
N
0
300
600
1,200
Feet
1 inch = 300 feet
AREA A
AREA B
AREA C
AREA D
AREA E
AREA F
AREA G
AREA H
AREA I
AREA J
Main
Rowland
Granite
Anchor Hoc
Silvercross
Center
Miller
High
Sigsbee
Hamilton
Bainbridge
Line of Protection
InteriorFloodAreas
Interior Flood Depth
0.5-1.0
1.0-2.0
2.0-3.0
3.0-4.0
4.0-5.0
5.0-6.0
Stormwater Inlet
Stormwater Manhole or Underground Junction
Pipe Inlet or Pipe Outlet
Stormwater Pipe

Table E.6: Interior Drainage Analysis Results

Interior Flood Area	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
	Max. Depth (ft)	Building Damage	Max. Depth (ft)	Building Damage	Max. Depth (ft)	Building Damage	Max. Depth (ft)	Building Damage
A	1.0	No	1.5	No	1.5	No	3.0	Yes
B	1.5	Yes	2..5	Yes	2.5	Yes	3.0	Yes
C	1.5	No	2.0	No	3.0	No	4.0	No
D	3.0	Yes	3.5	Yes	4.5	Yes	6.0	Yes
E	3.0	Yes	3.5	Yes	5.5	Yes	6.0	Yes
F	4.0	Yes	4.5	Yes	5.0	Yes	5.5	Yes
G	5.0	Yes	5.0	Yes	6.0	Yes	6.0	Yes
H	5.0	No	5.5	No	5.5	Yes	6.0	Yes
I	2.0	No	2.5	No	3.0	No	3.0	No
J	0.0	No	1.0	No	2.5	No	2.5	No

PUMPING REQUIREMENTS

The goal of the pumping plan is simply to prevent damages to buildings as a result of interior flooding. Ponding of floodwaters on roadways is deemed acceptable. After reviewing the results for the scenarios modeled in this analysis, it is logical to develop a pumping plan that would keep buildings dry for Scenarios 2 and/or 3. This would also assure that buildings would remain dry during a more frequency Scenario 1, and would reduce the risk of interior flood damages for Scenario 4.

Based upon the results in Table E.6, pumping would be required in order to keep buildings dry during Scenario 2 from interior flooding in Areas B, D, E, F, G, and the same for Scenario 3 with the addition of Area H. The approximate pumping rate required to meet the goal of this plan was determined by (1) calculating the amount of surface area available for ponding of water before potential damages to buildings occur; (2) calculating the surface area of the ground above the potential damage area and multiplying by the average depth to obtain the volume in acre-feet; and (3) using a pump rate chart from a manufacturer of portable pumps to determine the maximum rate required (Table E.7).

Table E.7: Estimated Performance for Crisafulli Portable Pumps

Estimated Pump Rate (Gallons per Minute)	Acre-feet of Volume
20	.04
60	.11
100	.22
160	.33
220	.50
300	.66
400	.08
700	1.5
900	2.0
1200	2.7
3000	6.6
10000	22.1

**Chart assumes twelve hours of pumping*
***Chart modified from* *http://www.crisafullipumps.com/pumping-world-news*

The maximum pump rate determined in this analysis should be considered planning level and a conservative estimate of the ideal pump rate for an interior flood area. Many factors not included in the analysis should be considered when choosing a pump, including physical site constraints (access) and dynamic head. The estimated pump rates required for the interior flood areas for Scenario 2 and Scenario 3 are shown in Table E.8 and Table E.9, respectively.

Based upon the capacities listed in Tables E.8 and E.9, it would take numerous small capacity portable pumps to be mobilized in the Town of Port Deposit to prevent damages from interior drainage. The pumping required could be handled by portable trash pumps or mobile trash pumps. No permanent pump station is required. The value in this analysis is to identify where in the Town emergency responders should mobilize for potential pumping rather than the rate of the pump. It is assumed that these pumps would be readily available through local fire departments, the County Emergency Management Department, or State and/or Federal disaster preparedness teams. The results of this analysis show that the Town of Port Deposit should be prepared to mobilize numerous, small capacity portable pumps to interior flood areas B, D, E, F, G, and H to keep buildings dry during a heavy rainfall that occurs simultaneously with high flood stages on the Susquehanna River.

Table E.8: Estimated Pump Rate Required-Scenario 2

Interior Flood Area	Pond Area Available before Potentially Damaging Buildings (acres)	Pond Volume Above Area Available (acre-feet)	Estimated Maximum Pump Rate Required[4] (gallons per minute)
B	.02	.19	100
D	.002	1.18	700
E	.061	1.03	700
F	.018	.31	160
G	0.24	1.61	700
H	n/a	n/a	n/a

Table E.9: Estimated Pump Rate Required-Scenario 3

Interior Flood Area	Pond Area Available before Potentially Damaging Buildings (acres)	Pond Volume Above Area Available (acre-feet)	Estimated Maximum Pump Rate Required[4] (gallons per minute)
B	.02	.32	160
D	.002	2.78	1,200
E	.061	6.12	3,000
F	.018	.065	300
G	.24	4.48	2,500
H	.67	1.97	900