8. WATER RESOURCES: SUPPLY AND PROTECTION

As one of three municipalities within Harford County, Havre de Grace is an independent jurisdiction that provides its own system for safe drinking water as well as operating its own wastewater treatment facility. This Water Resources chapter focuses on the issues relating to water for use, distribution, and consumption, wastewater collection and treatment, and management of stormwater run-off. This chapter also includes sections related to the City's role in the Chesapeake Clean Water Blueprint, shoreline projects that include water quality improvements, coastal and urban flooding, and issues of climate change and sea level rise. As a coastal community located at the upper reaches of the Chesapeake Bay tidal waters, Havre de Grace is directly affected by these issues. This chapter is a legislative requirement of the State of Maryland to insure that adequate public facilities are achieved by all jurisdictions in their development to protect our valuable water resources for consumption and recreation and to enhance our regional efforts in improving the health of the Chesapeake Bay.

WATER RESOURCES focuses on:

1. Interjurisdictional collaboration
2. Provision of safe drinking water
3. Wastewater collection and treatment
4. Management of stormwater runoff
5. Chesapeake Clean Water Blueprint
6. Shoreline projects
7. Coastal and urban flooding
8. Sea level rise and climate change impacts
9. List of technical resources

The ability to serve properties with public utilities, particularly water and sewer service, is a primary factor in determining existing land uses and future growth opportunities for any given jurisdiction. Public water and sewer are provided by the City of Havre de Grace through the Department of Public Works (DPW) and includes raw water intake, its treatment, and distribution and wastewater collection and treatment. Additionally, stormwater management – for both the older portions of the City and in newer neighborhoods – is extremely important for the health of our surface water sources and, ultimately, the health of the Bay. One major goal of this Water Resources chapter is to ensure sufficient water supply and capacity and to identify suitable receiving waters for wastewater and stormwater impacts to support the City's planned land use. With the adoption of additional standards by the Maryland Department of Planning in 2022, recognition of climate change impacts, urban and coastal flooding, and the status of receiving water are more recent requirements from the State of Maryland to be included in this chapter on water resource protection.

Interjurisdictional Collaboration for Water and Sewer within Harford County

The City functions within a cooperative framework within Harford County for water and sewer planning. All municipalities coordinate with Harford County for determining growth areas and new service areas through the urban growth boundary of the Development Envelope. Havre de Grace – as well as the municipalities of Aberdeen and Bel Air – fall under the Harford County Water and Sewer Master Plan, which is updated biannually in the fall and spring. Treatment systems, major capital improvements, and future demand areas are all described in this plan and shows existing service areas and planned short-term (0-5 years), mid-term (6-10 years), and long-term (11-20 years) service areas for both water and sewer. This arrangement was established in the 1970's in mutual agreement for expediency as opposed to having separate plans for each Harford County jurisdiction.

Limited inter-operability exists between Harford County, Havre de Grace, and Aberdeen for water distribution. The County has a sister plant adjacent to the City's water treatment plant on St. John Street for their own direct withdrawal from the Susquehanna River and can provide mutual redundancy. In June 2020, the Cities of Havre de Grace and Aberdeen created a partnership for the sale of finished water to Aberdeen and are in the process of installing a shared water line to serve Aberdeen and their growth needs on a limited basis. Because of the vast surface water source of the Susquehanna River, multiple water systems traverse this region for the purposes of redundancy serving the greater Baltimore metropolitan area.

Continued cooperation and good working relationships among jurisdictions are critical to the provision of water distribution and sewer collection services to the public. These are basic requirements to meet the needs of the more densely populated areas of the county identified as the Development Envelope. In addition, the jurisdictions also coordinate on large stormwater management projects, sharing credits at times for mutual benefit and, at times, purchasing of property like that on Water Street for shoreline enhancement. The City will continue to engage with Harford County and neighboring jurisdictions for mutual benefit and resource sharing.

Provision of Safe Drinking Water

The City of Havre de Grace owns and operates a water treatment plant located in the downtown adjacent to the waterfront. It withdraws and treats surface water from the Susquehanna River and distributes it to its customers through a series of pipes and strategically located storage tanks throughout the City. In its planning for growth, the City must ensure water capacity is available for development projects as they are built through guaranteed capacity when developments are recorded but also must provide long-range planning projections for overall development to be phased and constructed. The plant is rated to withdraw 4.0 million gallons per day (mgd) with a safe yield of 3.7 mgd. Current average day usage is 1.875 mgd with a maximum day withdrawal rate of 2.3 mgd for calendar year 2022.

Public water service started in Havre de Grace as early as 1885 for fire suppression and public drinking water through a private plant located at the end of Warren Street near the shoreline. The City Water Works as it was called was a frame-constructed facility which was purchased by the City in 1926 and was operated under a Municipal Utilities Commission. The current brick masonry building on St. John Street was constructed in 1955 and has undergone upgrades over the years to keep up with maintenance requirements, technology, and capacity. Most recently, the City has completed a 3-year project to modernize all operations.

Havre de Grace is in a unique position to be located on such a large surface water source as the Susquehanna River. Its water treatment plant is located on the City's waterfront at the north end of the downtown business district on St. Johns Street. Immediately adjacent is the Harford County water treatment plant. The sister plants operate independently but share some facilities such as a sludge handling facility located closest to the waterfront in the rear of the building complex.

Both water treatment plants have their own raw water intakes located south of the Amtrak Railroad at the mouth of the Susquehanna River and are regulated by MDE. Other water intakes located to the north of the railroad are regulated by the Susquehanna River Basin Commission headquartered in Pennsylvania as well as by MDE, affecting regional water systems such as Baltimore City. This is important to the regional water systems that supply Harford County which uses water from the

Susquehanna directly from its own plant, the Havre de Grace treatment plant, and the Baltimore City water system.

The City's water treatment facility is a conventional mixed-media filtration plant with chemical addition, flocculation, and sedimentation as the initial processes for treating the raw water. The water then passes through mixed-media filters, is disinfected, fluoridated, and sent into the distribution system for consumer use. As a surface water source, the raw water from the Susquehanna River is expensive and highly-treated due to the water's turbidity, requiring advanced technology for plant operations. Licensed operators run the plant 24 hours a day, supplying potable water to City customers. Residual sediment is processed in the shared, three-story sludge handling facility and collected for land application. Major upgrades to the water treatment plant were completed between 2020 and 2022.

The water distribution system is currently divided into 4 pressure zones (2 of which are smaller drop zones) and the system is being studied by engineering consultant GHD for operations related to the contracted sale of water to the City of Aberdeen. In June 2020, Havre de Grace signed a Memorandum of Agreement (MOA) with the City of Aberdeen to sell anywhere from 300, 000 to 900,000 gallons per day of finished water to Aberdeen to serve its growth. The construction of a transmission line between the municipalities, timelines for construction, and water rates based on gallons per day are enumerated in the MOA. The GHD study, which is entitled *Havre de Grace Citywide Water System Hydraulic Model Update and Hydraulic Analysis*, outlines capital projects associated with the sale of water to Aberdeen and full build-out of Havre de Grace and its identified growth areas[1].

The City's distribution system consists of 2", 4", 6", 8", and 12" water mains throughout the older portions of town, with primarily 8" and 12" lines in the newer subdivisions. In addition, 3 large storage towers work in tandem to supply reserve water storage for the system as well as provide necessary pressure for fire suppression within the water system. With the GHD study as a guide, the City is determining capital improvement priorities within an ongoing 6-year budget program to plan and fund needed long-term improvements. The City is continuing to work with GHD for refinements related to capital budget planning for necessary water infrastructure improvements to serve the planned growth, specifically in those areas annexed near the I-95 interchange where there are limiting height and system factors that need to be addressed. Smaller system capital improvements include older waterline replacements, relining of water lines, and valve replacements to ensure upgraded facilities in an aging system.

[1] Please see the full study by GHD, Havre de Grace Citywide Water System Hydraulic Model Update and Hydraulic Analysis, January 29, 2021 for more information. Additional hydraulic model/hydraulic analysis studies are ongoing to refine capital budgeting and timelines for implementation priorities.

As part of the Harford County Development Envelope, the City is identified as part of the County's growth area and it is necessary to estimate water capacity needs for planned development projects. Table 1 shows anticipated future demand and includes current use requirements, potential infill projects, and known areas for development. The methodology for calculating daily water needs is based on an allowance of 250 gallons per day per the GHD study for estimated dwelling units (EDU) for residential projects. The GHD study includes allowances for commercial retail, office, and institutional based on square footage. These residential and commercial water requirements are consistent with design guidelines used by the City in their Water Supply Capacity Management Plans required by MDE. The information in this table is based on residential development capacity calculated in the Municipal Growth Element as of January 2023 as well as estimates for all identified future demand areas, including non-residential areas such as the MOE and US 40 Commercial growth areas. Most projects are already incorporated in the City, such as Bulle Rock Planned Adult Community and Greenway Farm. However, several residential communities located outside of City limits, such as Shawnee Brooke, Havre de Grace Heights, and Susquehanna River Hills, are included for future water capacity only in the event that they have reduced well yields that require public water in the future.

Based on a current usage amount of 2.3 mgd maximum day demand and future build-out of this plan as identified in Table 1, the City has sufficient capacity to serve future growth. Currently, the City of Havre de Grace plant serves a population of 14,807[2] people as well as serving local commercial businesses, institutional uses, and industry. Careful monitoring of water usage as development occurs will be ongoing and initiatives for conserving water should be explored to maximize resources in drought conditions. At such a time that the use requirements for the water treatment plant is greater than 80%, MDE requires Water Supply Capacity Management Plans to ensure adequate supply and the plant capacity is even more closely monitored thereafter.

The City has an adequate water supply that will continue to serve the City's growth. Because the Susquehanna River is such a reliable source of raw water, the potential to expand plant capacity is possible. The City will continue to work directly with Harford County Government for biannual updates of the Harford County Water and Sewer Master Plan to ensure continued cooperation and long-range facilities planning as required by law.

Protection of the Susquehanna River as a water source is extremely important for all who utilize it – for human consumption, recreation, habitat, and fisheries. The quality of the Susquehanna River is dependent on many states and local jurisdictions, requiring a regional, interstate approach to its long-term viability. Nowhere is the importance of this more evident than in communities like Havre de Grace, where the public's drinking water comes from the surface water of the Susquehanna. Aggressive efforts to curb pollution at the state and federal levels are part of the Chesapeake Bay Clean Water Blueprint, which is described later in this chapter. This effort ensures that everyone shares in the responsibility for cleaning up waterways of the Chesapeake by setting 2-year milestones for incremental pollution reduction with enforcement at the federal level to impose consequences if states and localities fail to meet their commitments[3].

[2] Based on 2020 Census information.

[3] From Chesapeake Bay Foundation, Chesapeake Clean Water Blueprint page; https://www.cbf.org/how-we-save-the-bay/chesapeake-clean-water-blueprint/what-is-the-chesapeake-clean-water-blueprint.html

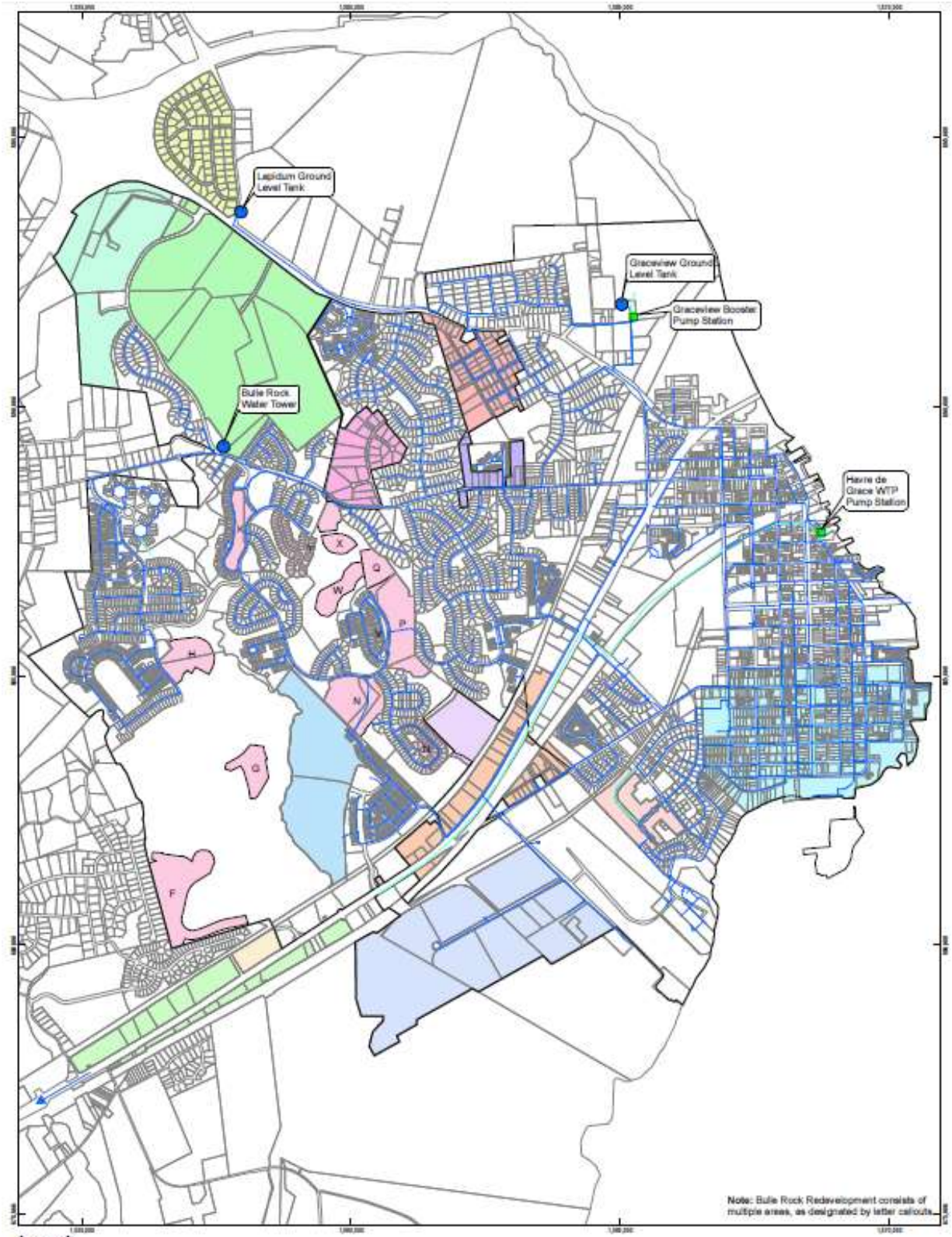
TABLE 1, COMPREHENSIVE PLAN ESTIMATED WATER DEMAND

	Average Day (Gallon/Day)	Subtotals by Area
Current Use Requirements[4]	*1,875,000*	*1,875,000*
Developing Areas		
Blenheim Run; 111 units and mixed-use commercial	*30,450*	
Bulle Rock; 569 units remaining, January 2023	*142,250*	
Green/Ianniello/Patrone annexed properties; estimated 500 units and mixed-use commercial[5]	*190,000*	
Greenway Farm; 284 units remaining	*71,000*	
Lampson Property; 40 units	*10,000*	
Mixed Office Employment; MOE/I-95 interchange	*187,500*	
Old Bay Lane; Industrial redevelopment	*100,000*	
Old Town; In-fill estimated at 75 units	*18,750*	
Tranquility homes; Redevelopment 150 units	*37,500*	*787,450*
Future Growth Areas		
US 40 Section 1; Commercial (66,000 SF)	*11,880*	
US 40 Section 2; Commercial (38,000 SF)	*6,840*	*18,720*
Future Service Areas Based on Need		
Chapel Road; 12 units	*3,000*	
Havre de Grace Heights; 22 units	*5,500*	
Shawnee Brooke; 24 units	*6,000*	
Susquehanna Hills; 95 units	*23,750*	*38,250*
Total Estimated Water Demand		***2,719,420***[6]

[4] Calculations are based on estimated units known as of January 1, 2023 and coincide with the residential estimates from the Municipal Growth Element: A Strategy for Growth chapter. These calculations may be modified in future water demand analyses and technical studies performed by engineering consultants GHD, which are ongoing.

[5] Estimated 500 equivalent dwelling units used as a factor at 125, 000 gpd with additional 65,000 gpd for commercial mixed-use.

[6] This estimated water demand does not reflect the sale of water to the City of Aberdeen (300,000 to 900,000 gpd).



Legend

- Pumps
- Tanks
- Water Pipe (Active)
- Water Pipe (Inactive)
- Municipal Boundary
- Cadastral
- Aberdeen Interconnection

Future Demand Areas

- Blenheim Run
- Bulle Rock Redevelop.
- Chapel Road Properties
- Green-Iannello-Patrone Prop.
- Greenway Farms Phase 2 & 3
- Havre de Grace Heights
- Lampson Property
- MDE
- Old Bay Lane Indust. Redevelop.
- Old Town Infill
- Shawnee Brooke
- Susquehanna Hills
- Tranquility Homes Redevelop.
- US Route 40 - Section 1
- US Route 40 - Section 2

Paper Size ANSI B

0 400 800 1,600 2,400 3,200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Maryland FIPS 1900 Feet

City of Havre de Grace
Water System Hydraulic Model Update

Future Demand Areas

Job Number 11201039
Revision A
Date Jan 18, 2021

Figure A-3

C:\...\Future Demand Areas.mxd 16701 Melford Blvd Ste 330 Bowie MD 20715 USA T 240 206 6910 F 240 206 6911 E bowmail@ghd.com W www.ghd.com

Service Layer Credits:
Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by/Org

Opportunities for additional water sources should be explored as the need for reliable water supplies are – and will continue to be – a growing necessity. Consideration for the Vulcan Materials quarry as a reservoir and ground water source would greatly enhance our supply options locally and would potentially improve the water quality of raw water for treatment. This massive hard rock quarry is located immediately adjacent to Havre de Grace to the north. In the long-term, Havre de Grace could increase its role as a point of finished water supply to the broader region. This effort would need to be studied extensively and could proceed only after site mining is complete and with concurrence of private property owners. This is in consideration of the potential for a rise in salinity at the City's water intake in the future due to climate change and whether the estuarine salt lens will come farther up the Bay.

Staff members will continue to consult with the Havre de Grace Water and Sewer Commission to advise the Mayor, City Council, and Administration on its long-range capital improvement program, operational cost structure, and rate setting. Through DPW, professional operators will continue to oversee successful operations and high-quality water supply to City customers and skilled staff will implement ongoing improvements and oversight to the distribution system. Yearly federal reporting requirements offer the public a published report of finished water quality so that customers are assured that their water supply meets or exceeds water quality standards.

Actions for the Provision of Safe Drinking Water

- Continue to maximize the City's updated water treatment plant which has been outfitted with new SCADA systems (Supervisory Control and Data Acquisition), valves, filter controls, and chemical feed systems for improved efficiency, sustainability, and safety.

- Continue to work with engineering consultant GHD for identifying necessary system-wide capital improvements to serve the City's current customers and planned growth areas as well as accommodating the contracted sale of finished water to the City of Aberdeen.

- Continue to monitor capacity of water treatment plant to serve current City demand and future residential, commercial, and industrial growth.

- Continue to coordinate with Harford County regarding semi-annual revisions to the Harford County Water and Sewer Master Plan for planning water service area extensions and timelines.

- Continue to implement system upgrades and renewal as needed which will provide efficiency, sustainability, and safety for water distribution system.

- Continue to support the interrelated water systems within Harford County to insure adequate drinking water within the City of Havre de Grace, Aberdeen, Harford County, and the Baltimore Metropolitan Region.

- Annually revise 10-year capital improvement program for water infrastructure so that needed capital projects continue to be identified and funded in a fiscally responsible manner.

- Continue to utilize the advice of the Havre de Grace Water and Sewer Commission for the annual review of water and sewer rates, fee structure, and 10-year capital improvement program. Responsibilities include determining the strategic direction of the Water and

Sewer Enterprise Fund (Fund 9) and establishing and monitoring operational goals and objectives.

- Continue to attract and retain highly-trained licensed professionals to operate the water treatment plant within the regulatory structure of Maryland Department of Environment Water Management Administration and federal law.

Wastewater Collection and Treatment

The City of Havre de Grace operates its own wastewater treatment plant located at the southern edge of the City's shoreline, which has a current permitted design flow for treating 3.03 million gallons of effluent per day[7] for the citizens and businesses located within the City. Improvements were made with the latest technology for enhanced nutrient removal (ENR) in December 2009 as a requirement of the Chesapeake Bay Restoration Act. This technology significantly reduced nitrogen and phosphorus in the treated effluent that is discharged into the Chesapeake Bay which are the City's receiving waters for its treated effluent. ENR requires annual average nutrient goals of effluent quality of total nitrogen (TN) at 3 mg/L and total phosphorus (TP) at 0.3 mg/L. These treatment plant upgrades placed Havre de Grace at the forefront of technology and timeliness for achieving Bay restoration goals with its early implementation.

The City also owns and operates a system of gravity sewer lines, force mains, and pumping stations which collect household, commercial, and industrial effluent and send it to the wastewater treatment plant, all which need to be continuously maintained. All improved properties within City limits are served by public sewer and are billed for this service on a quarterly basis. The series of sewer lines consist of pipes that have been recently installed from new development as Havre de Grace expanded its borders and those from over a century ago. Older areas of the City suffer from aging sewer lines, which pose a particular challenge for maintenance. Disintegrating lines and aging pipe intersections allow for inflow of stormwater in rain events and cause the treatment plant to have to process high daily flows. DPW staff have been aggressively working to eliminate such sources of inflow or flooding of the sewer collection system, commonly referred to as I&I for inflow and infiltration. Due to continued improvements, the City has regained measureable treatment plant capacity and staff continue to be vigilant in reducing inflow in an effort to reduce costs and increase plant efficiency.

Havre de Grace constructed its first sewage collection system in 1910 as a combined sanitary and stormwater gravity flow system with raw sewage discharging directly into the Susquehanna River. Havre de Grace completed its first wastewater treatment facility in 1967 at the south shore of the City adjacent to the Maryland National Guard property where it is currently located. This plant was designed to provide primary treatment only, meaning that the solids were settled out and effluent disinfected before release into the Bay. Improvements to the wastewater treatment plant were completed in 1986 to provide secondary treatment which enlisted biological processes for the treatment of the City's effluent and provided surge tanks for storm flow control, dewatering facilities, a lab, and a composting facility for the reuse of sludge. To meet State water quality goals set in 1987, BNR, or biological nutrient removal, was added to the facility to deal with nitrogen and phosphorous removal. The more-recent ENR upgrades reach the limits of technology for removing nutrients, a leading cause of the degradation of the Bay.
As of July 1, 2023, the City processes an average of 1.51 mgd per day, meaning it operates at just under half its current permitted flow of 3.03 mgd. As mentioned earlier, state-of-the-art ENR technology must meet

[7] The physical capacity rated/design flow of the City's wastewater treatment plant is 4.84 mgd; however, the permitted flow from MDE is 3.03 mgd.

concentrations of 3.0mg/L or less of total nitrogen (TN) and 0.3 mg/L or less of total phosphorous (TP); the City's WWTP has met this requirement every year since 2011 reporting after refinement in its first operational year of 2010. To continue to meet State requirements, nutrient load caps must be maintained at an annual average concentration of 4.0 mg/L TN and 0.3 mg/L TP[8] for a plant the size of Havre de Grace (> 500,000 gpd), with an annual cap for TN of 27,715 lbs/year and 2,079 lbs/year for TP based on a 2.3 mgd flow. Additional flow can be accommodated (up to 2.8 mgd) as long as the annual average nutrient levels stay within MDE requirements.

The City's ENR plant discharges directly into the Chesapeake Bay. One of the requirements of the Water Resources Element is to discuss the suitability of receiving waters for effluent discharge. As the City does not discharge into a tributary with identified impairments for limited assimilative capacity, Havre de Grace is in a good position for continuing to build its designated growth areas within the City. State and Federal requirements for the Bay are ongoing and being addressed through the EPA's Chesapeake Bay Total Maximum Daily Load (TMDL), which outlines requirements affecting nutrient limits and the City's growth.

Table 2 shows the City's estimated capacity demand of all current usage, developing, and future growth areas which is estimated to be 2.25 mgd. At a current flow of 1.51 mgd, the Havre de Grace WWTP facility has sufficient capacity to serve a growing community as well as meet nutrient load requirements. As stated in the paragraph above, nutrient caps (for TN and TP) for the City's ENR plant are based on 2.3 mgd. Any additional flow greater than 2.3 mgd would require ENR treatment levels no greater than 3.25 mg/L TN. If the City cannot achieve this level of nutrient treatment and can only expect to achieve 4 mg/L TN, then the WWTP cap would present a constraint to implementing the land use plan for new growth. If this were the case, the City could pursue land application for nutrient offloading to stay within required limits or modify its land use plan for serving future growth areas.

An allowance of 250 gallons per day per estimated dwelling unit (EDU) is used for residential projects. For commercial flows, an allowance of 1,200 gallons per day per acre of commercial land is used. These residential and commercial unit flow values are consistent with the design guidelines used by the City in wastewater capacity management plans required by MDE. The information in this table is based on residential development capacity calculated in the Municipal Growth Element as of January 1, 2023 and estimates for identified growth areas for full build-out of the Comprehensive Plan Areas.

Table 2 includes capacity estimates for all planned projects and growth areas identified in 2023 and will allow full build-out. Currently, the City of Havre de Grace WWTP serves an estimated population of 14,807[9] people as of January 1, 2020 as well as local businesses, institutional uses, and industry. Some areas identified on the map – such as Shawnee Brooke and Havre de Grace Heights – are included for water service in the event of failing wells, however full incorporation into the City with sewer service could also be considered based on public need. These projects will be evaluated on a case-by-case basis to insure that adequate facility capacity for both water and sewer is available to accommodate them. The City will continue to work within the framework of the Harford County Water and Sewer Master Plan for service area planning with direct oversight by MDE and Harford County Health Department.

[8] Maryland's Chesapeake Bay Tributary Strategy Statewide Implementation Plan, January 24, 2008

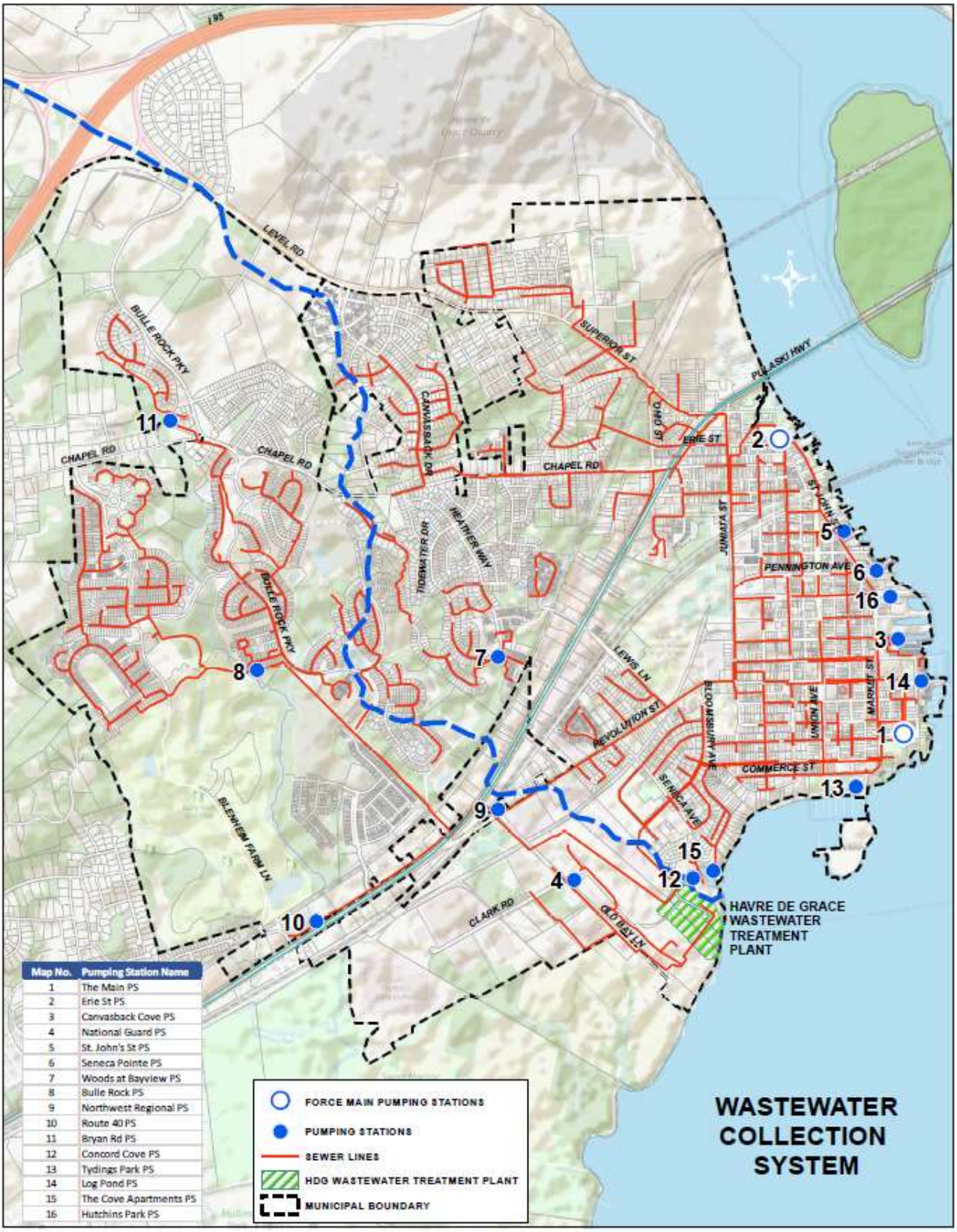
[9] Based on 2020 Census information.

TABLE 2, ESTIMATED WASTEWATER CAPACITY REQUIREMENTS

	Average Day (Gallon/Day)	Subtotals by Area
Current Capacity Usage[10]	*1,511,000*	*1,511,000*
Developing Areas		
Blenheim Run; 111 units and mixed-use commercial	*30,450*	
Bulle Rock; 569 units remaining, January 2023	*142,250*	
Green/Ianniello/Patrone annexed properties; estimated 500 units and mixed-use commercial[11]	*190,000*	
Greenway Farm; 284 units remaining	*71,000*	
Lampson Property; 40 units	*10,000*	
Mixed Office Employment; MOE/I-95 interchange	*187,500*	
Old Bay Lane; Industrial redevelopment	*100,000*	
Old Town; In-fill estimated at 75 units	*18,750*	
Tranquility homes; Redevelopment 150 units)	*37,500*	*787,450*
Future Growth Areas		
US 40 Section 1; Commercial (66,000 SF)	*11,880*	
US 40 Section 2; Commercial (38,000 SF)	*6,840*	*18,720*
Future Service Areas Based on Need		
Chapel Road; 12 units	*Water only; based on future need*	
Havre de Grace Heights; 22 units	*Water only; based on future need*	
Shawnee Brooke; 24 units	*Water only; based on future need*	
Susquehanna Hills; 95 units	*Water only; based on future need*	
Total Estimated Wastewater Capacity		***2,317,170***

[10] Calculations are based on estimated units known as of July 1, 2023 and coincide with residential estimates from the Municipal Growth Element: A Strategy for Growth chapter. Current capacity usage is based on calendar year 2023 due to a dysfunctional effluent flow meter; prior calendar years had incorrect flows (2020, 2021, 2022) A factor of 250 gallons per day per household is being used to estimate usage per unit.

[11] Estimated 500 equivalent dwelling units used as a factor at 125, 000 gpd with additional 65,000 gpd for commercial mixed-use.



Map No.	Pumping Station Name
1	The Main PS
2	Erie St PS
3	Canvasback Cove PS
4	National Guard PS
5	St. John's St PS
6	Seneca Pointe PS
7	Woods at Bayview PS
8	Bulle Rock PS
9	Northwest Regional PS
10	Route 40 PS
11	Bryan Rd PS
12	Concord Cove PS
13	Tydings Park PS
14	Log Pond PS
15	The Cove Apartments PS
16	Hutchins Park PS

This Wastewater Collection System map is incomplete at this time for some neighborhoods. However, it was important to illustrate the sewer infrastructure in a similar was as the GHD Water System map for future demand areas.

Major capital projects include continued inflow and infiltration reduction, replacement of older sewer lines, and other repairs relating to an aging collection system. Equipment upgrades and/or renewal will be identified and funded through the 10-year capital improvement program as needed to maintain service. Maximizing system efficiency is key for plant operations. In addition, inspection of new infrastructure as it is built is critical to ensure that new wastewater lines are constructed properly for reduced maintenance costs in the future.

From an operational standpoint, the City will continue to support highly-trained, licensed professionals to run the wastewater treatment facility and to retain skilled technicians and field crew. Operator training for ENR and general relicensing is ongoing and required by the State and many of the staff members are highly specialized. In addition to the plant operations, a substantial compost facility is also located on the grounds which transforms solids from the WWTP into compost for soil enhancement. The City maintains its permit for its compost facility, but is not actively providing the product to customers at this time. The City utilizes a third-party handler for fertilizer in the form of sludge for land application.

Actions for Wastewater Collection and Treatment

- Continue to operate state-of-the-art Havre de Grace WWTP ENR facility within the limits of the City's permit to meet Chesapeake Bay Restoration goals.
- Continue to coordinate with Harford County regarding biannual revisions to the Harford County Water and Sewer Master Plan for planning sewer service area extensions and timelines.
- Continue to monitor capacity of the wastewater treatment plant to serve current City demand and future residential and commercial growth.
- Continue to implement inflow and infiltration improvements to the sewer collection system to reduce the amount of surface and groundwater flowing into aging sewer lines, pipe intersections, and manholes.
- Continue to implement equipment upgrades and renewal as needed which will provide efficiency, sustainability, and safety for collection system and plant operations.
- Annually revise 10-year capital improvement program for sewer infrastructure so that needed capital projects continue to be identified and funded in a fiscally responsible manner.
- Continue to rely on the advice of the Havre de Grace Water and Sewer Commission for the annual review of water and sewer rates, fee structure, and 10-year capital improvement program for determining strategic direction of the Fund 9, Water and Sewer Enterprise Fund and establishing and monitoring operational goals and objectives.
- Continue to attract and retain highly-trained licensed professionals to operate the wastewater treatment plant within the regulatory structure of Maryland Department of Environment Water Management Administration and Federal law.
- Continue to operate the compost facility at the wastewater treatment plant to maximum efficiency and provide high-quality compost material for soil enhancement.

- Explore progressive options with public and private landowners for innovative land applications of treated effluent for irrigation and nutrient offloading.

- Explore the possibility to use gray water from the WWTP to increase capacity of the plant.

Management of Stormwater Runoff

Stormwater management regulations have been in place in Maryland since 1982 and have evolved over time, first to address flooding associated with new development in the early years and now to more closely match natural hydrology for water quality before it meets shared waterways. The goal is still to control the flow of water across properties but also to greatly reduce the amount of sediment, pollution, and nutrients getting into those waterways. A basic, elemental question about the topics covered in this section is "why should we care about stormwater management and nutrient reduction?" To answer that, we have to understand the importance of water quality in relation to human health and clean drinking water sources, a beneficial environment for habitat and wildlife, and the overall health of our planet.

In this section, concepts relating to sediment and erosion control, stormwater management implementation for development and redevelopment, MS4 Phase II and NPDES program implementation will be covered to show the interrelationship of different approaches for improving the quality of our waterways. In addition, an introduction to the topic of the federal-level Total Maximum Daily Loads, or TMDLs, will be initiated as it plays a direct role in the City's management of stormwater runoff for Chesapeake Bay Restoration. The goal of this section is to define the issues and strategies being used currently at all levels of government – federal, state, and local – and to show the heightened level of concern and attention for addressing the problems facing the region and the Chesapeake Bay.

Control of stormwater runoff is an important function of local government. In developed areas and municipalities like Havre de Grace, runoff comes from paved surfaces like roads, sidewalks, parking lots and buildings such as houses, shopping centers, and industrial complexes during rain and snow events. These are referred to collectively as impervious surfaces. Due to the high density of development, there is little area for rainwater to infiltrate the soil naturally so the water runs off into streams and other tributaries. On a small scale, rainwater builds up velocity on paved surfaces, washing out soil and eroding stream banks, and causes nuisance complaints between neighbors for misdirected downspouts and yard grading. On a large scale, it floods roadways and property, causing damage and threatening public safety. The goal of stormwater management is to successfully limit stormwater runoff as areas develop, to reduce flooding, and to improve water quality so that streams and major waterways are not adversely affected by human-made pollution – such as oil, chemicals, sediment, nitrogen, phosphorous, and trash – carried in the runoff. It is also to have as much water return to the soil, which filters it naturally and replenishes groundwater.

Stormwater management is critically important in maintaining the health of stream systems as land is developed. Related to stormwater management is the concept of nonpoint source nutrient loading which describes the amount of pollutants that come from the impervious surface created by development. As with Havre de Grace, more intensive land uses in towns, cities, and suburban areas have a great degree of impervious surface due to high density of buildings and pavement. The design of stormwater management facilities and the way land is developed can significantly reduce nonpoint source pollutant loading which, in turn, will measurably affect the quality of our waterways. In addition to increased runoff as a result of development, nonpoint source pollutants can also come from: excess fertilizers, herbicides and insecticides from agricultural lands and residential areas; oil, grease and toxic

chemicals from urban runoff and energy production; sediment from improperly managed construction; bacteria and nutrients from livestock, pet wastes, and faulty septic systems; and atmospheric deposition such as emissions from power plants and motor vehicles[12]. Nutrient runoff in the form of nitrogen and phosphorous is particularly problematic because it leads to increased algae growth (or algae blooms) which then die and decay, leading to large dead-zones in the Chesapeake Bay due to oxygen depletion.

From an ecological and a human health standpoint, all waterways are important. Our major water resource in Maryland is the Chesapeake Bay; however all the streams, creeks, and rivers leading to the Bay contribute to its overall health and water quality. This system of waterways is defined in terms of its respective watershed, which is the region draining into a river, river system, or other body of water. The Chesapeake Bay watershed includes a 64,000 square mile land mass within six states – Delaware, Maryland, New York, Pennsylvania, Virginia, and West Virginia and all of Washington, D.C. The cumulative effect of this land mass and its waterways on the Bay is profound.

On a local scale in Havre de Grace, the geographic relationship the City has with the Chesapeake Bay is immediate. The City lies directly on the shores of the northernmost Bay where the Susquehanna River opens up to the Susquehanna Flats and the Chesapeake itself. Portions of the City lie in the Harford County watersheds of the Lower Susquehanna and Swan Creek[13] which drain to the River and upper Bay and are shown on the watershed map included in this chapter. Because of the City's direct relationship to the Bay, Havre de Grace has additional environmental regulations through the State's Chesapeake Bay Critical Area law that modify land use and development immediately adjacent to the Bay.

This section of the Water Resources Element is important for describing the benefit of the various regulations relating to water quality. Though tiny in comparison to the overall watershed at 5.9 square miles, Havre de Grace must adhere to all water quality programs and regulations. Following this section on stormwater management, the important initiative called the Chesapeake Bay Clean Water Blueprint will be described to show the intense focus at the federal level that is driving the protection and restoration of the Chesapeake Bay.

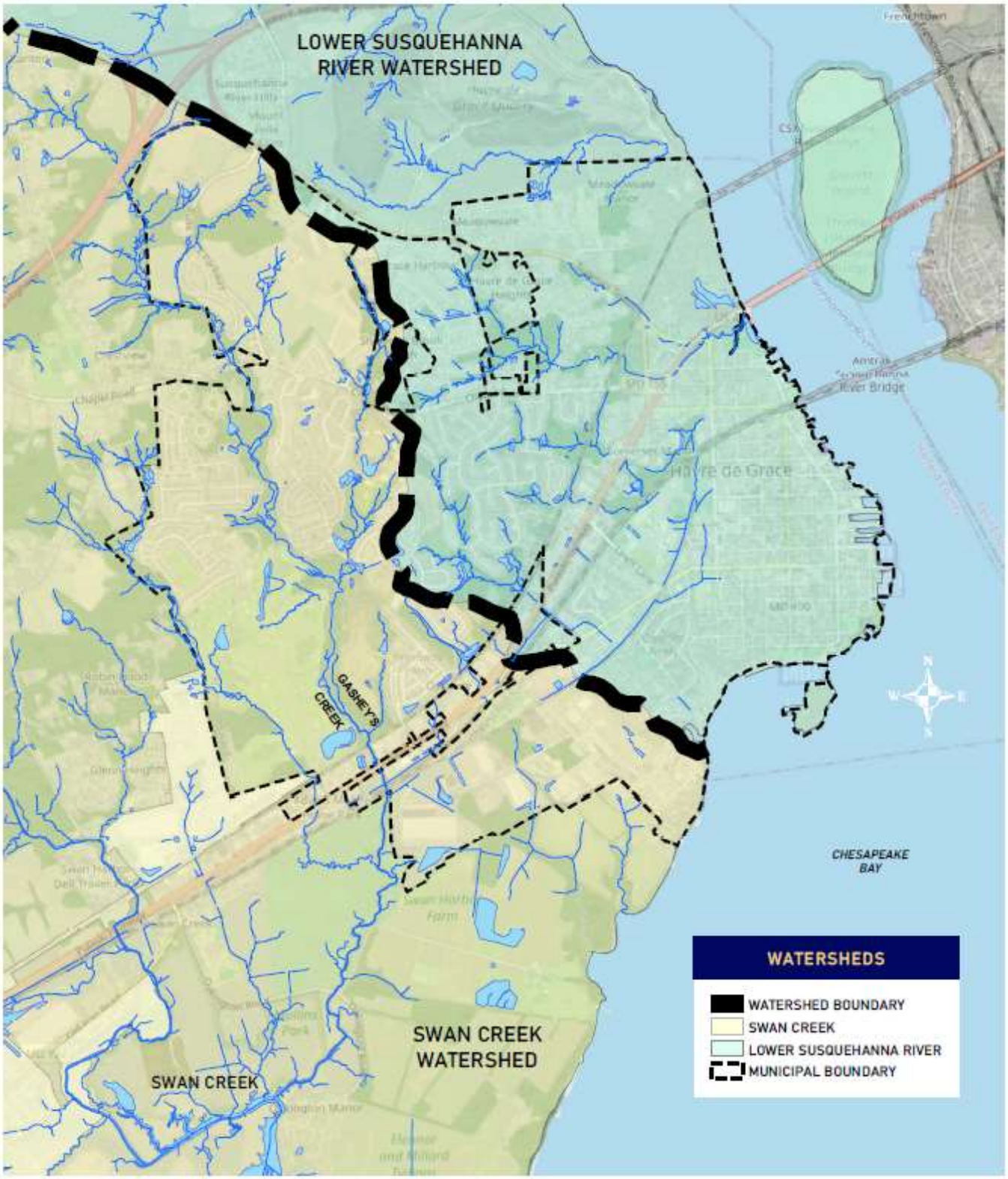
Images of stormwater management practices along Concord Street

12 U.S. EPA website for polluted runoff (nonpoint source pollution)

13 From Maryland 8-digit identified watersheds

ENVISION HdG

WATERSHEDS



Sediment and Erosion Control

Sediment and erosion control law came into effect statewide in 1970, prior to stormwater management regulations which followed in the early 1980's. The intent of sediment and erosion control is to reduce the amount of soil (and thereby nutrients and sediment) that get into waterways as a result of land disturbance, largely through construction but also from agriculture and other practices. Sediment and erosion control plans are required for land disturbances greater than 5,000 square feet or 100 cubic yards or more, which are reviewed and approved by the local Soil Conservation Districts through the Maryland Department of Agriculture. Upon approval, the City or other local jurisdiction provides a grading permit to respective applicants and provides inspection and enforcement.

The level of sediment and erosion control is dependent upon site characteristics and the amount of land disturbance, with the goal of keeping soil on the site with containment. For instance, simple sediment and erosion control practices may include placement of silt fences to retain soil on a site, temporary swales, or stabilized stone construction entrances to keep soil off of roadways as vehicles leave a construction site. Major projects may require sediment trapping devices such as the construction of sediment basins or significant land grading, such as re-grading the terrain into serrated slopes which are then stabilized with vegetation. Often in cases of land development, sediment basins were later converted to permanent stormwater management facilities to deal with post-development runoff volume.

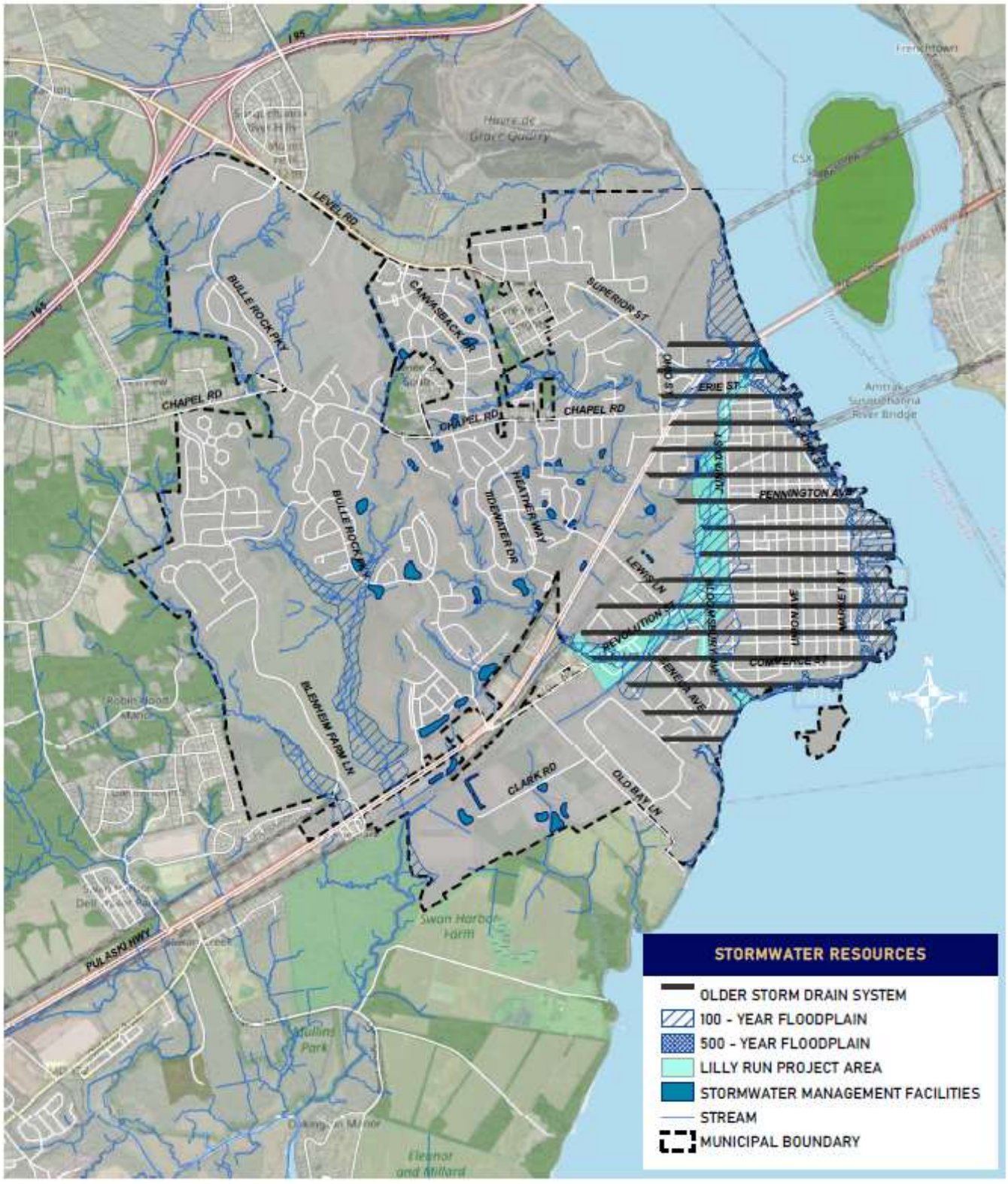
Stormwater Management Implementation

Stormwater management is a method of controlling the quantity and quality of runoff from precipitation events in more densely developed urban and suburban areas. The State of Maryland has always been progressive in its stormwater management law, developing State regulations and requiring local ordinances for stormwater management due to our direct relationship to Chesapeake Bay waters. These regulations apply during the land development or redevelopment process and when new road improvements are constructed. This issue is forefront in Maryland after decades spent on Chesapeake Bay restoration where it is recognized that land development practices are major contributors to the Bay's degradation. Ultimately, the goal is to change land use practices through improved best management practices to make measureable improvements to the Bay's health and water quality.

To meet stormwater management law, Havre de Grace adopted its first ordinance in 1984 with the stated purpose to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding. New development was required to provide quantitative and qualitative control of stormwater runoff, with plans submitted and approved by the Director of Public Works. Grading and building permits could be suspended for infractions due to lack of progress or failures of stormwater management facilities. Minor amendments relating to fees were added to the original ordinance. In 2002, the City passed Ordinance No. 826 which was based on the State's model ordinance and the 2000 Maryland Stormwater Design Manual, Volumes I & II. This Ordinance superseded prior stormwater management ordinances and revised its program relative to State requirements. Stormwater management facilities were designed to reduce impervious area by 20% of pre-development; provide best management practices that treat water quality for 20% of the existing impervious area; or a combination of impervious area reduction and the area treated by BMPs equal to 20% of the existing impervious area.

ENVISION HdG

STORMWATER MANAGEMENT RESOURCES



Best management practices, or BMPs, are structural devices or nonstructural practices designed to temporarily store and treat stormwater runoff in order to mitigate flooding, reduce pollution, and provide other amenities.[14] They include stormwater management ponds and wetlands, infiltration and sand filter practices, bioretention facilities, open channels, filter strips, and buffers. During the course of new development or redevelopment, stormwater runoff control must be designed and built into the landscape so that the runoff does not affect watercourses and adjacent or downstream properties. This is for both large-scale projects, like new multi-unit housing subdivisions or an industrial park, and smaller projects that have greater than 5,000 square feet of land disturbance.

In 2007, the State of Maryland strengthened its water quality laws through implementation of The Stormwater Management Act of 2007. With these regulations, developers are required to use Environmental Site Design (ESD) wherever practicable to control runoff and pollution from new development and to provide water quality treatment or impervious surface reduction by 50% for redevelopment[15]. Havre de Grace adopted the regulations as required by May, 2010.

Currently in Havre de Grace, there are over 160 stormwater best management practices[16] or features for which the City is responsible, either in terms of inspection and maintenance enforcement or in some cases direct ownership. These facilities include ponds, open swales, underground filtration systems, and outfall filters to name a few and all require regular maintenance and are inspected every 2 years by trained DPW staff. DPW staff members also oversee initial design, facility construction, and any sediment and erosion control conversion to stormwater facilities. Stormwater regulation require a 3-phase design review to include concept, site development, and final plans.

Stormwater management is one aspect of environmental regulation that is considered in land development. Additional but related regulations exist for sediment and erosion control, development within a floodplain, and the Chesapeake Bay Critical Area Law. These laws are separate but related regulatory measures that interplay during the design and construction phases of development and redevelopment.

MS4 Phase II and NPDES Program Implementation

Federal law administered through the Environmental Protection Agency (EPA) directs State action for limiting pollution sources in waterways, from either nonpoint or point sources. The Federal Clean Water Act was passed in 1972 to restore waters of the United States to fishable or swimmable conditions. Originally, it regulated point source discharges such as municipal and industrial wastewater discharges through the National Pollutant Discharge Elimination System, or NPDES, permit requirements.

In 1987, Congress broadened the definition of point source to include industrial stormwater discharges and municipal separate storm sewer systems, shorted to MS4, which were divided into Phase I and Phase II for implementation. The City of Havre de Grace falls under Phase II requirements because of its small size (population less than 100,000), the rules of which came into effect in 2003. The City is required to participate in a 5-year NPDES permit as a point source for its storm drain system as well as its stormwater management program which outlines a plan of action for reducing its contribution to pollutant loading in local waterways. Havre de Grace is covered under a general permit with over 50 other jurisdictions –

14 Maryland Model Stormwater Management Ordinance, June 2009

15 Maryland Department of the Environment Press Release, October 17, 2008

16 Actual number of physical feature BMPs is 167 as of July 1, 2023 reporting with an additional 58 coming online due to new development and redevelopment. This will provide a total of 225 BMPs for inspection reporting within the next 3 to 5 years.

towns, cities, and counties – of similar size within the State of Maryland. In addition, it has its own permit.

The general permit for Phase II jurisdictions requires that each jurisdiction has a program in place to provide minimum control measures, or MCMs. The six minimum control measures include the following and are described in the General Permit for Discharges from Small Municipal Separate Storm Sewer Systems, which became effective October 31, 2018:

1. Public Education and Outreach
2. Public Involvement and Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Stormwater Runoff Control
5. Post Construction Stormwater Management, and
6. Pollution Prevention and Good Housekeeping

To comply with these requirements, Havre de Grace has a program in place to meet each of the 6 requirements through DPW. Measures such as the City's intense street sweeping program, consistent oversight for stormwater management construction and maintenance, and sediment and erosion control enforcement are just a few of the major initiatives that the City performs to meet the requirements of the permit. Like stormwater management, this program is administered through DPW.

For the purposes of NPDES, Havre de Grace is considered a point source for its storm drain collection system and series of stormwater management facilities. Point sources are individual sewage treatment plants, industrial wastewater systems, and urban and suburban stormwater systems. As covered in the wastewater collection and treatment system section of this chapter, the City also holds a separate permit for its point source pollutant discharge for the Havre de Grace Wastewater Treatment Plant. This permit caps, or limits, the amount of nutrient loading discharged directly into the Chesapeake Bay from that plant. Industrial discharge permits are required from separate industries located in City, such as Evonik Corporation located on Revolution and Juniata Streets.

With regard to stormwater management and water quality for receiving waters, Havre de Grace has been aggressive in the pursuit and construction of projects to meet requirements under its MS4 Phase II permit[17]. For the past 5 years, the City has been constructing water quality projects in the older section of town by removing direct outfalls into the Susquehanna and Chesapeake Bay and creating systems for runoff treatment, oftentimes through step-pool systems on publicly-owned land along the waterfront. These projects are all part of meeting the 5-year NPDES permit which outlines Chesapeake Bay Restoration efforts to meet pollution benchmarks called Total Maximum Daily Loads, or TMDLs, where the City and all Phase II jurisdictions are required to meet 20% pollution reduction in areas not treated by stormwater management practices by 2025.

To show progress, the permit outlines stringent reporting requirements for individual communities to describe how they are to meet their 20% nutrient reduction goals with practices that are measurable. The areas affected within city-limits are those of the older areas of the City that predated stormwater management practices, where stormwater was gathered in a storm drain system with direct outfall to waterways, like the Lilly Run stream system, the Susquehanna River, and the Chesapeake Bay. At the first year of the permit, the City's baseline for untreated impervious surface was established at 771 acres

[17] MS4 Phase II permits are related to the National Pollutant Discharge Elimination System (NPDES) requirements for stormwater management through the federal government's Environmental Protection Agency for small municipalities.

requiring a pollution reduction of 20% or 154 acres within the permit 5-year term. As of June 2023 reporting, the City's DPW has achieved 220 acres of impervious surface treatment, exceeding the 20% reduction. This has been done through several shoreline projects with regenerative stormwater conveyance treatment systems that provide water quality before the runoff goes into waterways. This is all part of the Chesapeake Clean Water Blueprint which will be described in the next section of this chapter as well as a following section on shoreline projects.

Actions for Management of Stormwater Runoff

- Administer and enforce stormwater management regulations as per the Stormwater Act of 2007, which insures environmental site design (ESD) to the maximum extent practicable (MEP) in new development projects and 50% impervious surface reduction or the equivalent for redevelopment. Updates to stormwater management requirements were adopted through Ordinance No. 912 Stormwater Management passed in May, 2010.

- Review stormwater management plans at the concept, site plan, and final plan phase of design to insure adequate retention of stormwater runoff from new development and redevelopment projects, as required through the stormwater management ordinance.

- Continue to inspect stormwater facilities or the construction of on-site environmental site design applications as they are built during the development process as required by law.

- Continue to inspect existing stormwater management facilities on a biennial schedule to insure that they are maintained and functioning properly, with necessary reporting as required by MDE on an annual basis.

- Develop a formalized internal development review process in which all departments review development plans for regulatory, zoning, stormwater management, facility, and infrastructure sufficiency to be applied to all new development and redevelopment projects, regardless of scale.

- Continue to work with Harford County Soil Conservation District to review and approve sediment and erosion control plans prior to site grading in construction projects within the City, as required. Projects include all new development and redevelopment as well as City infrastructure improvements which exceed 5000 square feet or 100 cubic yards of soil disturbance.

- Continue to utilize MDE for enforcement to insure that sediment and erosion control devices are properly installed and maintained during the development process.

- Continue to implement NPDES MS4 Phase II requirements to be performed by the City's DPW staff and as outlined in the General Discharge Permit which went into effect October 31, 2018.

- Continue to participate in the development of inter-jurisdictional watershed management plans for nutrient reduction to meet the City's TMDL requirements as part of the Chesapeake Clean Water Blueprint.

- Continue to Identify and administer water quality mitigation projects to meet anticipated

nutrient reduction requirements, specifically in regard to the direct storm drain discharge outfalls in the older portion of the City.

- Implement the *Lilly Run Improvement Plan* for flood relief/flood control in the interior portions of the City for the purposes of public safety and emergency access; protection of public and private property from damage; expedited floodwater exit; water containment; and environmental enhancement.

- Implement the priorities identified in the Havre de Grace Continuity of Operations Plan (COOP) of 2009 for disaster planning, to include flood emergencies.

- Continue to administer and enforce Chesapeake Bay Critical Area regulations on shoreline parcels and land areas within 1,000 feet of mean high water which has a specific requirement called the 10% Rule for stormwater management in the Critical Area for protection of Chesapeake Bay water quality.

- Align existing City development regulations, such as zoning, parking requirements, road code, etc., with stormwater management regulations to reduce the impervious surface runoff of future development.

Chesapeake Clean Water Blueprint

The Chesapeake Clean Water Blueprint is a framework of accountability for Chesapeake Bay water quality restoration that is both at the interstate level – with the 6 Bay States and Washington, D. C. -- and effecting jurisdictions at the local level such as Havre de Grace. It started from a settlement of a lawsuit against EPA by the Chesapeake Bay Foundation and other plaintiffs to enforce Bay Restoration efforts in 2010. A Chesapeake Bay Total Maximum Daily Load, or TMDL, was developed to create science-based enforceable limits on the amount of pollution entering the Bay, a pollution diet to restore the Chesapeake by 2025.

As part of the settlement, the 6 States and District of Columbia agreed to develop individual plans and milestones to show and account for incremental, measurable improvements to the Bay's health. These Statewide Watershed Implementation Plans, or WIPs, outline how each state is progressing with their respective requirements to meet the Chesapeake Bay TMDL – i.e. showing how they will get there -- and each state apportions their own division of the TMDL to local jurisdictions. Through this complicated process, Havre de Grace is part of Harford County's WIP, which is entitled *Harford County Chesapeake Bay Total Maximum Daily Load Restoration Plan for Nitrogen, Phosphorous, and Sediment*.

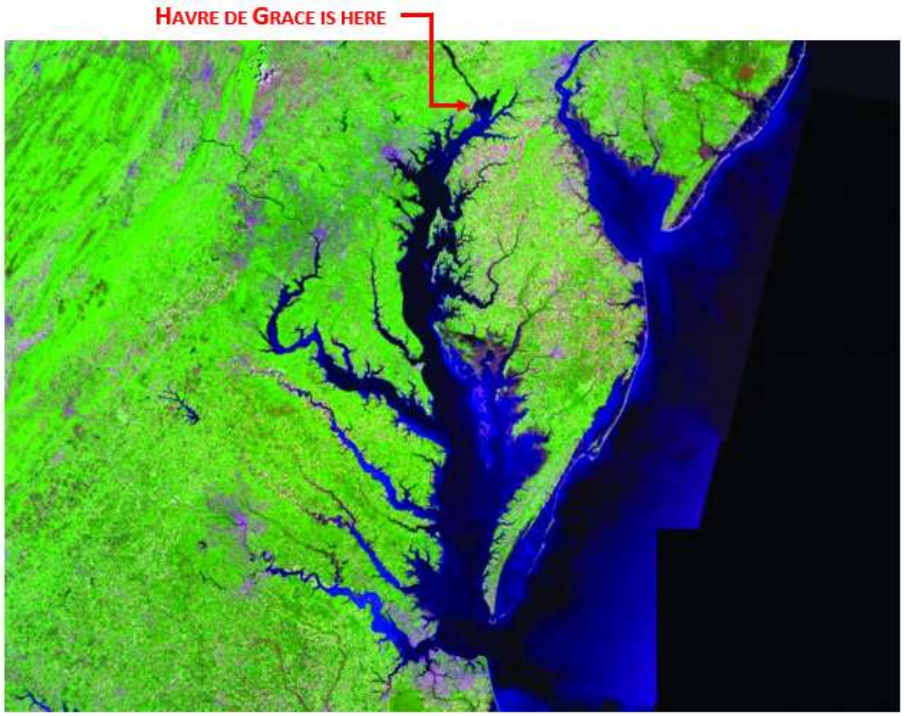
Within each state and county WIP, 2-year milestones are created showing the path to reach the required nutrient load reduction related to nitrogen, phosphorous, and sediment pollution by 2025. Maryland is on-track to meet its overall 2025 pollution reduction commitments, specifically due to aggressive efforts for nutrient reduction in wastewater treatment plants. According to the Chesapeake Bay Foundation's website:

> Maryland remains on track to meet its overall 2025 pollution-reduction commitments. However, there are red flags. The state's progress relies heavily on technology upgrades at wastewater treatment plants, but operational failures at two of the largest plants jeopardize its gains. Moreover, this one sector alone cannot sustain progress over the long term. Agricultural pollution is declining as more conservation practices are placed on farms, though

not fast enough to meet the state's commitments. And polluted runoff from urban and suburban areas is growing. Maryland must broaden its pollution-reduction strategy to manage these sources, blunt the effects of climate change, and ensure all communities benefit from investments in clean water. https://www.cbf.org/how-we-save-the-bay/chesapeake-clean-water-blueprint/state-of-the-blueprint/

Havre de Grace has been aggressive in meeting its set goals for its proportion of the TMDL. As a small jurisdiction of only 5.9 square miles, its nutrient targets are small comparatively. As described in the prior section, the City has been aggressive in meeting and exceeding its 20% pollution reduction goal. This is determined by treatment of 20% impervious surfaces which equates directly to measurable nitrogen, phosphorous, and sediment reduction. As discussed in the earlier section of this chapter, the City's wastewater treatment plant consistently operates within its permitted nutrient requirements. All of these focused activities assist in making measurable improvements to the health of the Chesapeake Bay.

One last aspect of this that is immediately relevant to Havre de Grace is its proximity to the Conowingo Dam which has an enormous impact to the Upper Bay receiving waters for nutrient pollution, sedimentation, and its impacts to navigation and in-water habitat. This is only mentioned here due to a separate initiative called the Conowingo Watershed Implementation Plan, or CWIP, which will have lasting effects for Bay-wide nutrient reduction. For ongoing information on the CWIP effort, information is available on the EPA's Chesapeake Bay Program website at: www.chesapeakebay.net/who/group/conowingo-watershed-implementation-plan-steering-committee.



Satellite image of the Chesapeake Bay. Base photo by Landsat/NASA

Actions for Chesapeake Clean Water Blueprint

- Continue to aggressively pursue meeting and exceeding pollution reduction goals through projects that provide water quality improvements at the outfall where water is

treated through designed filtration systems prior to nutrients and pollution getting into waterways.

- Continue to support staff within DPW who do this work of reporting, grant-writing, administration, and procurement through design and construction of these green infrastructure facilities.

- Continue to aggressively pursue grants as provided through many state and federal agencies to meet ongoing TMDL efforts. A list of grant funding sources is provided in the *Sensitive Areas: Environmental Resource Protection* which immediately follows this chapter.

Shoreline Projects for Water Quality and Coastal Resiliency

As part of the local answer to meet TMDL requirements, the City has aggressively pursued water quality projects along the extensive shoreline. These projects work to meet both NPDES 20% pollution reduction requirements as well as local WIP 2-year milestone targets while ideally offering a measure of coastal resiliency in both the riverine and coastal conditions. Often, these shoreline projects have regenerative step-pool conveyances, a type of best management practice, that assist in water quality improvements from the urban storm drain system. Photos from 3 of these systems are included on the map for this section showing Chesapeake Bay restoration projects.

Each of these systems is designed to provide quantifiable nutrient reduction based on the acreage of the sub-watershed that it receives. The sub-watershed is the runoff area that a storm drain system picks up before it ends in an outfall where these facilities are located to filter the surface runoff water; this is before it reaches a stream, the Susquehanna River, or the Chesapeake Bay directly. The City has performed a total of 8 of these projects to date, some of which are connected projects that are done in multiple phases, like at Concord Point Park which was done in 3 phases, each its own project for engineered nutrient reduction.

Each of these individual projects takes tremendous effort on the part of DPW staff for grant-writing, design, waterway permitting, construction, and maintenance. It is through their work that major portions of the historic City now have stormwater water quality treatment located on public lands, also providing habitat and recreational amenities. These projects have changed the face of the City's shoreline, making dynamic public spaces that beautifully and creatively treat stormwater runoff where the land and Chesapeake Bay intersect.

Actions for Shoreline Projects

- Aggressively pursue grants as provided through many state and federal agencies to continue efforts for living shoreline projects where they are feasible and cost effective.

- Continue to repair and maintain completed living shoreline projects as their native plant material gets established. This includes ongoing invasive and non-invasive weed eradication in order to allow beneficial natives to flourish, ideally creating a layer of coastal resiliency. At times, the sand and rock base may also need to be repair due to wave action, swift water currents, and erosion.

ENVISION HdG

BAY RESTORATION RETROFIT PROJECTS

Coastal and Urban Flooding

As a coastal city, Havre de Grace is subject to significant flooding. Many factors contribute to this – an extensive shoreline, exposure to extreme weather from easterly and southerly directions, many substantial tributaries, ditches, and waterways in the coastal plain, increased development, and Conowingo Dam, a major hydro-electric dam 8 miles up-river which at times releases great volumes of water requiring notification to downstream communities. Major flooding has happened along the shoreline as with Hurricane Isabel in 2003 storm surge or interior to the City due to heavy rain event such as with Hurricane Floyd in 1999 or other unnamed high-rain events. Historically, other flood events included Hurricane Agnes in 1972, which left Maryland devastated and the submerged aquatic vegetation (SAVs) in the Susquehanna Flats decimated. In a worst-case scenario, a tidal surge and flood rains could occur in a single event where a major section of old town becomes cutoff and residents on the waterfront forced to leave homes without emergency evacuation options.

CITY WEBSITE FOR FLOODPLAIN MANAGEMENT: https://havredegracemd.gov/departments/planning-and-zoning/floodplain-management-2/

Because of the recurring threat to public safety and property, the City has undertaken a series of studies to identify specific measures to reduce the impacts of flooding and provide for emergency access to the older portions of town. The focus of the study has been on the interior portions of the City which are part of the floodplain associated with Lilly Run and its tributaries. Historic changes to topography through massive re-grading for transportation systems (such as the Amtrak, formerly Pennsylvania Railroad), altered watercourses, channelization, undersized culverts, and new development all contribute to the interior flooding problem in severe rain events. The City's geography relative to the fall line (which demarcates coastal and higher piedmont regions) and the topography of its contributing watershed are factors in the severe flood recurrence. Engineering studies to alleviate flooding date as far back as 1966, but it was a documented problem well before then. A comprehensive study was performed by URS Corporation in 2007, identifying system-wide priorities and providing cost estimates for improvements.

Most recently, design engineering has been performed by Underwood and Associates for a regenerative stream channel project which will involve approximately 3,500 linear feet of stream system improvements within the Lilly Run stream system. This project is planned from Seneca Avenue to the old Harris Stadium field at Juniata Street north of Evonik in areas known for early flooding during a high-rain event. Design completion as well as the initiation of permitting should be accomplished within 2023.

Any new development or structures within a floodplain are required to meet additional construction standards to withstand flood events. Such requirements include the elimination of living/occupied space, plumbing fixtures, and mechanical/electrical fixtures (as measured to specific heights above mean high water) and installation of breakaway panels and flood vents for enclosures in the flood areas. All structures within a floodplain also require MDE approval, including fences and sheds.

In 2006, the City applied for the voluntary Community Rating System (CRS) for reduced flood insurance premiums for residents of flood-prone properties. First certified in 2009 with a Class 9 rating, staff members are continuing to reduce flood insurance rates through a points/percentage system through FEMA and the Insurance Service Office, Inc. (ISO). Currently, the City has a rating of 7 due to the diligent efforts of the City's Floodplain Manager. Each decrease in rating steps results in a five percent reduction in flood insurance rates for policyholders in the community. Please see identified floodplain on authoritative FEMA (Federal Emergency Management Agency) maps for locating affected properties

within the floodplain. The City also outlines alternative emergency operations in its Havre de Grace Continuity of Operations Plan (COOP) for disaster planning, to include flood emergencies.

Actions for Coastal and Urban Flooding

- Implement Lilly Run project studies that have been completed, specifically the most recent Lilly Run Improvement Plan by URS in 2007 as well as design projects that address interior flooding from the Lilly Run stream system.

- Continue to administer and improve on the voluntary Community Rating System (CRS) for reduced flood insurance premiums for residents in the floodplain.

- Continue to support staff certified in floodplain management as they are a key contributor to public safety and education about the City's significant flooding issues, whether from coastal, riverine, or interior stream-system related flooding. Havre de Grace faces unique threats with regard to flooding.

- As a coastal City, continue to update and administer required construction standards for all new buildings in the floodplain.

- Continue to educate the public about flood-prone areas within the City and floodplain management as related to improvements to private property.

- Consider proactively adopting standards for greater protection within flood prone areas, such as regulating 2% flood areas (as opposed to current 1% as required) and adopting higher freeboard requirements. Current standard is 2 feet above base flood elevation, as required; the City could adopt a 3-foot standard.

Sea Level Rise and Climate Change Impacts

Harford County in conjunction with APG-CSSC Joint Land Use Study Committee[18] contracted a study of the Upper Bay called *Planning for Coastal Resiliency in the Northern Chesapeake Bay*, which was prepared by EA Engineering, Science, and Technology, Inc. in 2019. It was an intensive study of sea level rise (SLR) scenarios for the Upper Bay and includes the coastal lands of Aberdeen Proving Ground and Harford, Cecil, and Kent Counties. The City is lucky to have such an in-depth examination of various SLR scenarios for planning purposes. Though the focus was on federal APG and its assets, many of which are located in low lying areas of former Harford County, the adjoining communities get the benefit of the asset mapping, whether they be cultural or infrastructure, and future areas of inundation.
The study takes into account 4 SLR scenarios, 2 of which are the same (scenarios 2 and 3). These are:

1. 2050 mid-level scenario with 1.2 feet of water level increase
2. 2050 high-level scenario with 2.3 feet of water level increase
3. 2100 mid-level scenario with 2.3 feet of water level increase
4. 2100 high-level scenario with 6.9 feet of water level increase

[18] Aberdeen Proving Ground-Chesapeake Science and Security Corridor is part of Harford County Office of Economic Development. The study was performed with financial support from the Office of Economic Adjustment, Department of Defense, February 2019.

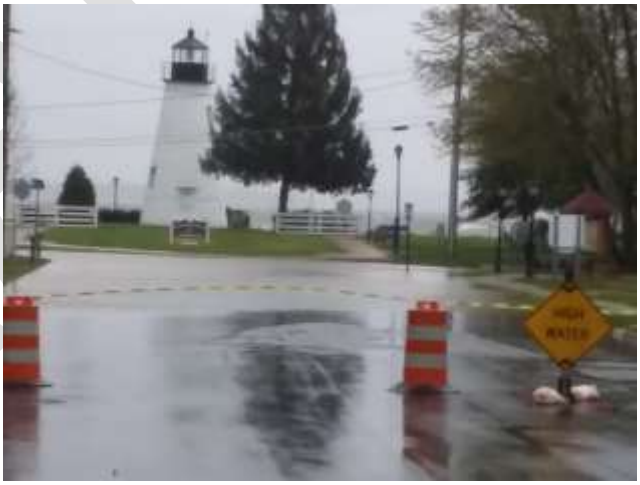
Included here are slides from the study showing areas of impact for Havre de Grace. Specific focus on the cultural resources was placed on county and municipal assets in the maps not infrastructure, but great information can be extrapolated from the inundation scenarios for the City's own planning purposes. For the full study: https://apg-chesapeakejlus.com/157/Susquehanna-River-Impact-Accretion-Study.

Assets that are listed in the study are cultural resources, like the Concord Point Lighthouse and Keeper's House, the Lock House Museum with the Susquehanna & Tidewater Canal remnants, or some privately-owned structures like those at Havre de Grace Marina located on Water Street. However, City-owned pumping stations, both the major ones at Erie Street and Lafayette Street and the smaller ones serving waterfront residential areas, need to be evaluated for SLR vulnerability.

RESOURCES FOR CLIMATE CHANGE
NOAA Sea Level Rise Viewer: https://coast.noaa.gov/slr/

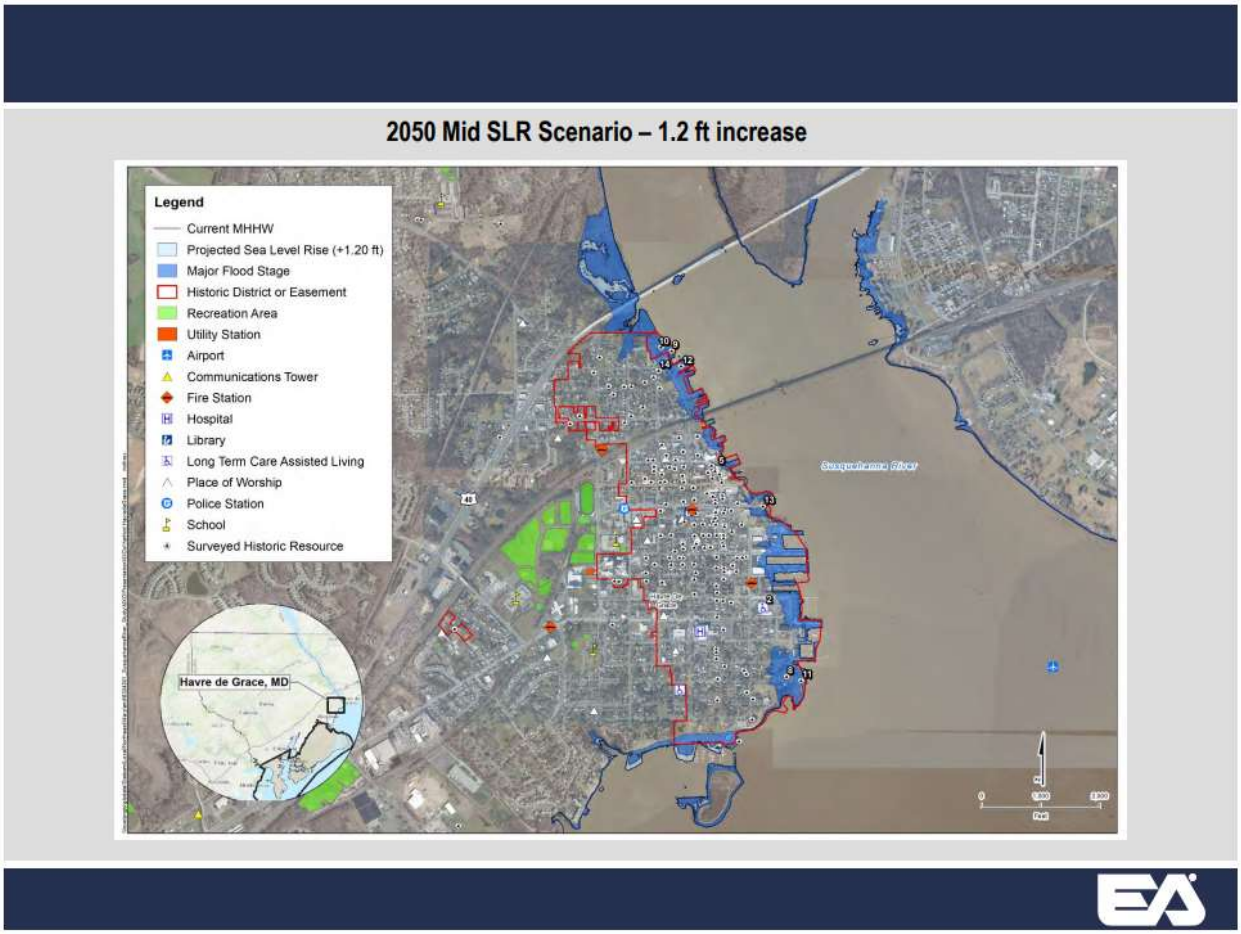
Report: Updating Maryland's Sea-level Rise projections (2018)
University of Maryland Center for Environmental Science
https://www.umces.edu/sites/default/files/Sea-Level%20Rise%20Projections%20for%20Maryland%202018_1.pdf

Maryland Coastal Atlas:
https://gisapps.dnr.state.md.us/coastalatlas/WAB2/



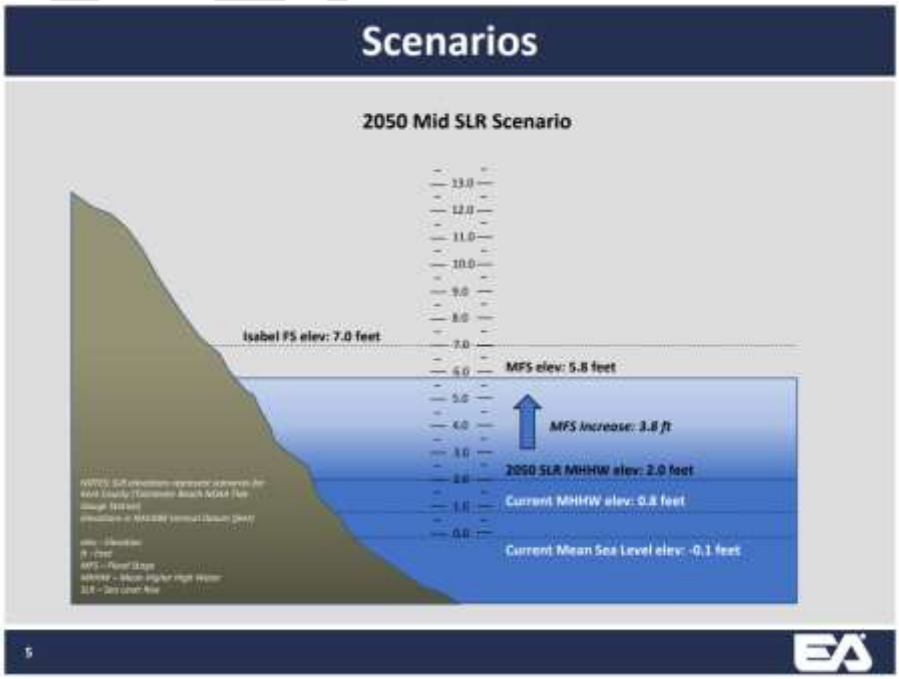
Images from a series of coastal high water events, April 13 and April 30, 2020.

Scenario 1: 2050 mid-level scenario with 1.2 feet of water level increase



From Planning for Coastal Resilience in the Northern Chesapeake Bay presentation, slide # 17
2050 mid water level sea level rise scenario from the APG-CSSC Joint Land Use Study website

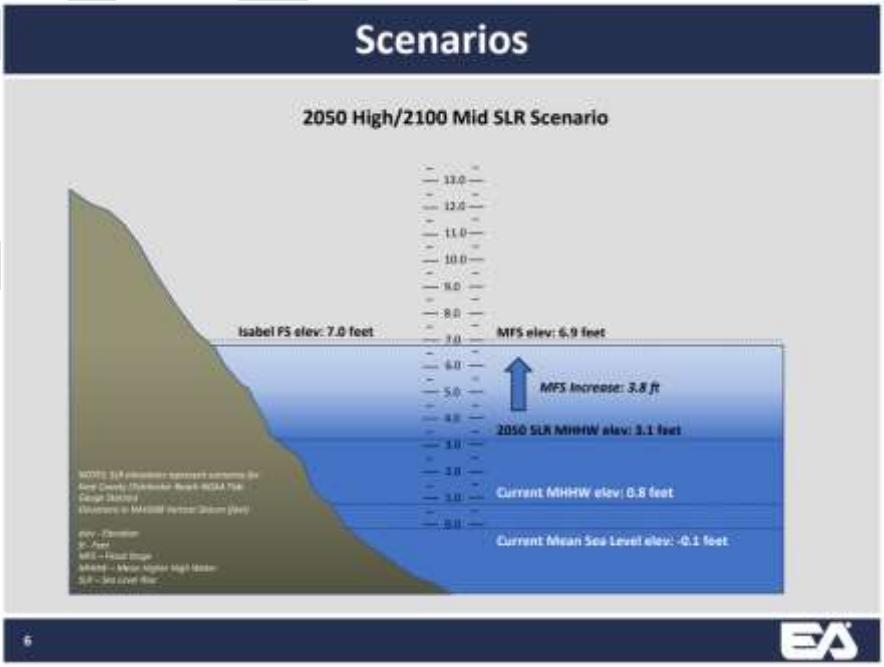
SLR Illustration



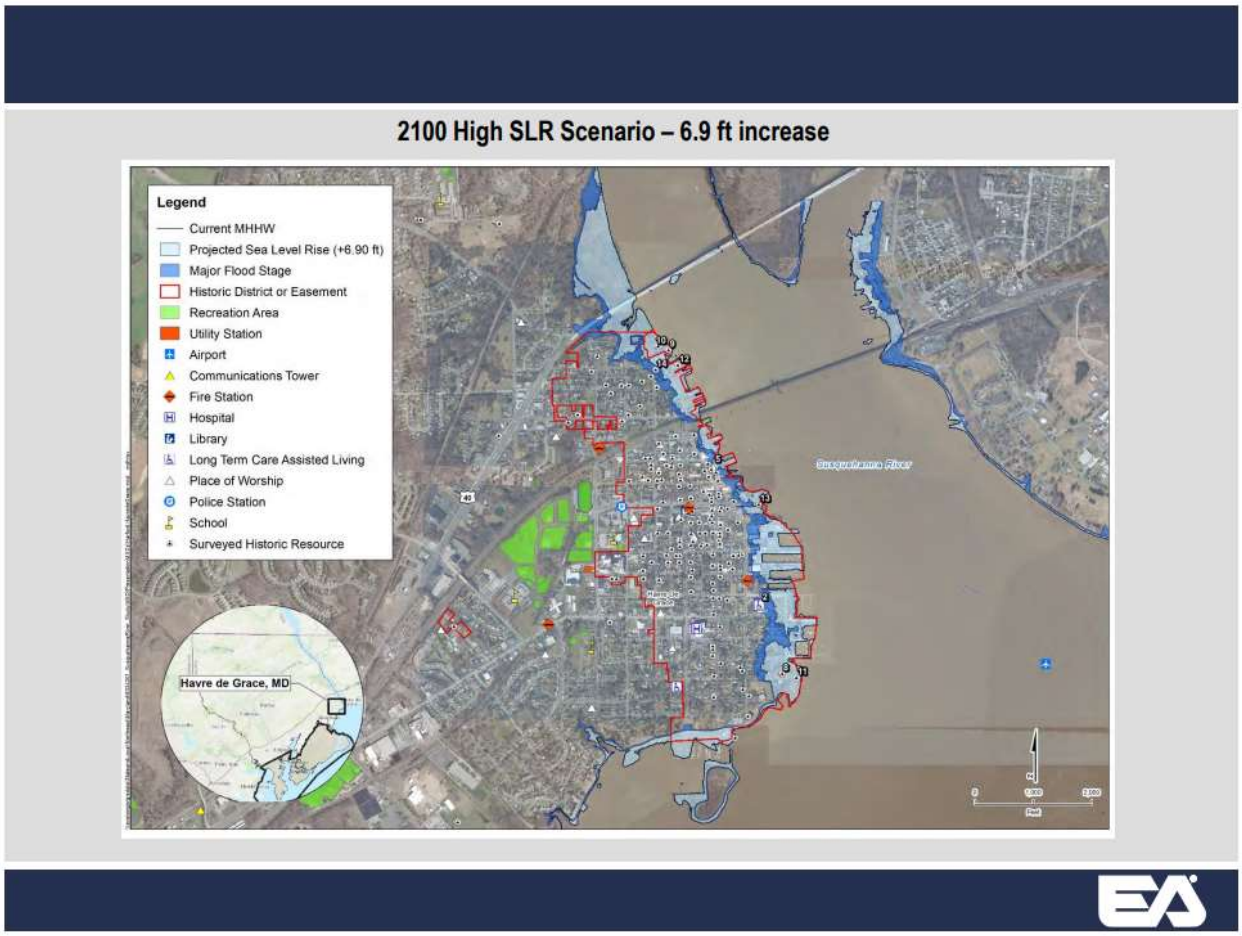
Scenario 2, 3: 2050 high-level scenario/2100 mid-level scenario with 2.3 feet of water level increase

From Planning for Coastal Resilience in the Northern Chesapeake Bay presentation, slide # 18
2050 high water/2100 mid water sea level rise scenario from the APG-CSSC Joint Land Use Study

SLR Illustration

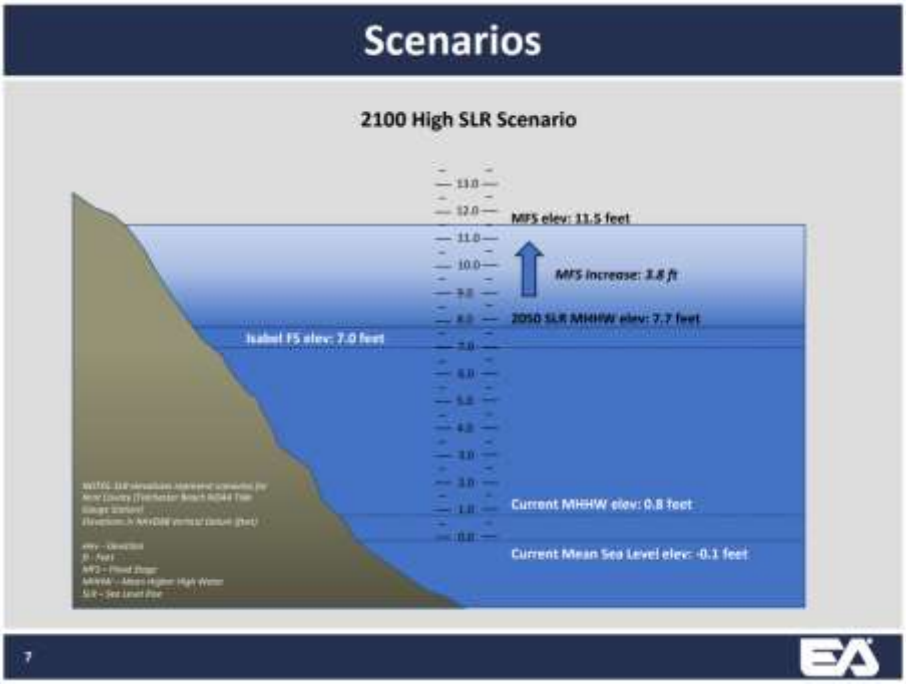


Scenario 4: 2100 high-level scenario with 6.9 feet of water level increase



From Planning for Coastal Resilience in the Northern Chesapeake Bay presentation, slide # 19
2100 high water sea level rise scenario from the APG-CSSC Joint Land Use Study website

SLR Illustration



Actions for Sea Level Rise and Climate Change Impacts

- Evaluate City infrastructure, specifically its sewer collection system pumping stations located in the floodplain areas, for their vulnerability to various scenarios of sea level rise.

- Consider land use policies that limit additional development in flood-prone areas, especially in the riverine and coastal waterfront areas.

- Educate the public about the anticipated threats as a coastal City.

List of Technical Resources:

The City maintains technical documentation for City services relating to water supply, wastewater treatment, stormwater management and non-point source program implementation. The following is a list of major sources of information for the development of this chapter and other supporting documentation for further inquiry. Please contact the City of Havre de Grace Department of Planning or Department of Public Works, Harford County Department of Public Works Water and Sewer Division, the Maryland Department of the Environment or other agencies for more specific information regarding Havre de Grace described in this chapter.

City of Havre de Grace Water System Hydraulic Model Update; Study performed by engineering consultant, GHD, for outlining necessary improvements for the water system in relation to bulk sale of finished water to the City of Aberdeen and new development near I-95/MD 155 interchange, January 2021. Additional studies are required for refinement and identification of phasing infrastructure improvements in relation to pressure zones for water distribution. Several earlier GHD studies were performed for water distribution system beginning in 2014.

Water Supply Capacity Management Plans – required yearly by Maryland Department of the Environment Water Management Administration to show available capacity of water treatment plant to serve current and future planned needs for public water supply.

Water Allocation Permit: HA 71S004 for Havre de Grace Water Treatment Plan. Intake point: Susquehanna River. Water Allocation Permit administered through the Maryland Department of the Environment Water Management Administration.

Annual Drinking Water Quality Reports: PWSID #0120012 (Public Water Source Identification Number) required annually by Federal Environmental Protection Agency for potential contaminant levels, source of contaminants, turbidity, and treatment techniques.

Wastewater Capacity Management Plans – required yearly by Maryland Department of the Environment Water Management Administration to show available capacity of wastewater treatment plant to serve current and future planned needs for wastewater disposal.

Wastewater Discharge Permits: NPDES Discharge Permit number for Havre de Grace Wastewater Treatment Plant: MD0021750, State Discharge Permit number: 18-DP-0673. Discharge point: Chesapeake Bay. NPDES; National Pollutant Discharge Elimination System administered through Maryland Department of the Environment.

General Permit for Discharges from Small Municipal Separate Storm Sewer Systems, NPDES (Phase II): General Discharge Permit Number: 13-IM-5500, General NPDES Number: MDR055500. This is a General Permit for Small Municipal Separate Storm Sewer Systems in the State of Maryland and had a final determination date of April 27, 2018, an effective date of October 31, 2018, and an expiration date of October 30, 2023.

Harford County Chesapeake Bay Total Maximum Daily Load Restoration Plan for Nitrogen, Phosphorous, and Sediment; Prepared for Harford County Government, URS Corporation, March 2016. The City of Havre de Grace is one of 11 permittees within this document.

Harford County Water and Sewer Master Plans. Formally adopted by Harford County Council in the spring and fall of each year, it includes all project information for water and sewer planning for Harford County as well as the municipalities of Havre de Grace, Aberdeen, and Bel Air.

Planning for Coastal Resiliency in the Northern Chesapeake Bay, Volumes 1 and 2; EA Engineering, Science, and Technology, Inc. as prepared for Harford County and APG-CSSC Joint Land Use Study Committee, Office of Community & Economic Development, February 2019.

Ordinance No. 912, Stormwater Management (Chapter 169, General Code eCode360, City of Havre de Grace, MD); adopted in May 2010; formerly Ordinance No.826 Stormwater Management from March 2002.

Ordinance No. 1027, Subdivision of Land (Chapter 173, General Code eCode360, City of Havre de Grace, MD: most recently updated in March 2020.

Ordinance No. 1045, Site Plan Approval (Chapter 155, General Code eCode360, City of Havre de Grace, MD): most recently updated December 2020.

Ordinance No. 896, Establishment of Water and Sewer Commission (Chapter 25, General Code eCode360, City of Havre de Grace); adopted June 2008.