City of Alexandria, Virginia

MEMORANDUM

DATE: SEPTEMBER 16, 2020

TO: THE HONORABLE MAYOR AND MEMBERS OF CITY COUNCIL

FROM: MARK B. JINKS, CITY MANAGER

SUBJECT: WORK SESSION ON ACCELERATION OF FLOODING MITIGATION THROUGH STORMWATER MANAGEMENT (TECHNICAL SUPPLEMENT)

ISSUE: Increasingly frequent flooding from storm events attributable to more frequent and intense climate change-triggered storms from changing weather patterns are requiring an urgent City response including acceleration of capital projects and expansion of maintenance capacity

BACKGROUND: Based upon the feedback from City Council at its September 12 meeting, staff has prepared this memo as a technical supplement in response to questions about (a) how the City currently regulates development with respect to stormwater and floodplain management; (b) the City's Infiltration and Inflow (I&I) efforts with respect to operating and maintaining the sanitary sewer collection system and (c) maintenance intervals. *This memo supplements the presentation which provides the framework for the work session.*

Additionally, staff has provided (Attachment 2) an outline of the issues and questions raised by City Council at the September 12 meeting. Those with an asterisk include items that staff will be prepared to cover on September 22 and will be addressed in the presentation. For those issues and questions not covered at this initial work session, staff will develop follow-ups to share with Council either in writing or at future work sessions.

DISCUSSION: The three items included here are intended to provide a technical addendum to material provided in the presentation.

a) How does the City use development requirements to regulate stormwater impacts and manage the floodplain?

Alexandria has had stormwater management (SWM) requirements for development since 1992, even though some detention facilities in the City date back to the 1970s.

Section XIII of the Alexandria zoning ordinance, the City's Environmental Management Ordinance (EMO), contains most of these requirements and has been updated and strengthened several times since including in 2004, 2006, and 2014. The City's program focuses on three

areas of stormwater management: Erosion and Sediment Control, Water Quality, and Water Quantity.

The Erosion and Sediment (E&S) Control requirements are designed to reduce erosion and the release of sediment during the construction process. The City requires an E&S Plan for projects involving a land disturbance that is equal to or greater than 2,500 square feet. These regulations are developed by the State, and enforcement is delegated to the City. The City approves plans and has an inspection program where construction sites are inspected on a regular basis, including after storms to ensure all E&S measures are being implemented and maintained.

As required by the Commonwealth of Virginia the city also manages Water Quality by establishing numeric limits for specific chemical, biological or other physical characteristics of water. These limits are intended to protect all state waters for recreation, wildlife and the growth of balanced populations of aquatic life among other purposes. The City's requirements for development are currently more stringent than the state's minimum requirements and are also triggered by development disturbing more than 2,500 square feet. Water Quality requirements are two-fold: First, all development must meet certain performance criteria designed to reduce pollution (as measured as phosphorous) once construction is completed. Second, the "first flush" runoff from all impervious surfaces must be treated. Both are achieved through the installation and maintenance of Best Management Practices (BMPs) on the developed sites. The City is also more stringent by requiring the use of green infrastructure to meet the performance criteria.

The city uses Water Quantity requirements to prevent erosion of natural or downstream channels by controlling the rate of runoff both small and large storms. Channel and flood protection requirements based on a 2-year storm are applicable for any development disturbing equal to (or more than) 2,500 square feet. Flood protection requirements apply to larger storms to help protect property and infrastructure. Per City Code and industry standards, any new storm sewer facilities are sized to handle the 10-year storm (as defined above) and flood protection measures require that the applicant show that the rate of runoff from the site in post-development is less than the pre-development rate of runoff for the 10-year storm. This can be accomplished through changes to the site impervious area or BMP/Detention facilities that slow the rate of runoff and will have no negative impact on the existing capacity of the City's existing infrastructure.

As part of the storm sewer analysis, the applicant is required to show the downstream analysis of the path that the stormwater will take, including the capacity of the pipes or the overland path that the stormwater will take. This analysis helps identify any problem areas. The City may ask for additional detention with a 10% reduction in post-development runoff for known problem areas which helps with the capacity of the City's infrastructure.

The city also uses the Small Area Plan process to meet City's goals and objects and address specific issues related to SWM or sanitary sewer issues by establishing performance criteria for certain Small Area Plans. Recent examples include:

- Establishing more stringent water quality and Green Roof requirements for North Potomac Yard SAP.
- Establishing more stringent water quality and detention requirements for Landmark SAP.

- Requiring sanitary connections for redevelopment to be shifted from the Commonwealth Interceptor to the Potomac Interceptor in the Braddock Road SAP.

In addition to having to meet the SWM requirements described above, development in the floodplain has additional requirements to reduce the risk to life and property. The City's Floodplain Management Ordinance regulates development in the floodplain. First, the ordinance does not allow new development to increase the risk of flooding by not allowing any increase to the base flood elevation for the site or neighboring properties. For residential development, the ordinance does not allow occupied spaces to be developed in the floodplain below the base flood elevation. This for example prohibits underground parking for residential uses in the floodplain. For other types of development, the ordinance requires certain features be incorporated into the design of the building such as automatic deploying flood control measures or other flood proofing measures. In addition, the City's Building Code also requires many similar safety features related to construction and compliments the City's FPM Ordinance and is enforced by Code Administration.

b) What is Infiltration and Inflow (I&I)? Does this relate to recent basement backups?

In the late 1990s, the City implemented an infiltration and inflow (I&I) program with the goal of reducing the amount of stormwater making it into the sanitary sewer system. I&I is excess water that flows into sewer pipes from groundwater and stormwater. This has the potential to cause sewer back-ups into homes and sanitary sewer overflows into the environment. Since the start of this program, the City has invested approximately $30 million on field investigations, design and construction. Construction efforts have included manhole rehabilitation, sewer point repairs, and sewer rehabilitation using cured-in-place pipe (CIPP) lining.

The program began in areas with the most I&I (Four Mile Run and Commonwealth sewer sheds) and then progressed to areas with lower I&I (Taylor Run and Holmes Run sewer sheds). Work was completed in the Four Mile Run and Commonwealth sewer sheds in the mid-2000s and resulted in just over one-third of the City sewers being rehabilitated and the rehabilitation of approximately 1,500 manholes. Pre-construction and post-construction flow monitoring was conducted and reductions in the total amount of I&I in the sanitary sewer system were measured.

As part of the FY 2021 to FY 2030 Capital Improvement Plan (CIP), a total of $33 million is programmed as part of the City's Sanitary Sewer Asset Renewal Program over the next 10 years for continued field investigations and sanitary sewer rehabilitation. Field investigations are scheduled to resume in the Four Mile Run and Commonwealth sewer sheds in early 2021. Field investigations will include closed circuit television (CCTV) inspection of the sanitary sewer system and manhole inspections. Structural defects and other defects contributing to I&I will be recorded during the inspections and will be followed up with rehabilitation. As part of the asset renewal program, the City will be expanding its previous efforts to include inspection and rehabilitation of the portions of lateral sewers for which the City is responsible for. City responsibility of lateral sewers includes the portion of lateral sewers constructed on or before July 1, 1955 from the connection to the City's main to the curb.

c) What are the City's maintenance standards for storm sewers and infrastructure?

T&ES's Public Works Services (PWS) Division is responsible for stormwater system maintenance Citywide. This team includes seven (7) FTEs dedicated to stormwater system maintenance, although other staff supplement efforts when needed. These employees are responsible for maintaining over 180 miles of storm sewer pipe, 13,500 storm system structures, over 125 stormwater BMPs, and 26 miles of open stream channels. Given these resources, the City's infrastructure maintenance has historically been largely reactive in nature with regular but less frequent intervals for some ongoing preventative maintenance.

As a result of the extreme rain events experienced in 2020, PWS has received over 500 requests for service through the City's 311 system. Issues which can be quickly resolved are being taken care of, while those more complex issues are being further field verified and investigated. Once a initial investigation is complete, next steps will be identified. City staff is in the process of reaching out and will begin meeting with impacted residents this fall.

A good example of this process is the area prone to flooding impacts around the city's Hooff's Run Culvert. As mentioned above, while the culvert is subject to bi-annual inspections for structural integrity, maintenance of the culvert is largely reactive. Crews respond to reports of downed trees and debris in the sections of Hooff's Run which are visible and accessible. After the large storm in 2019, staff identified the need for a more thorough inspection and cleaning. In May 2020 a team from RedZone Robotics completed an exhaustive inspection of the culvert. This inspection led to recommendations for additional structural analysis and cleaning of the culvert. A structural engineer has been onsite this week and began detailed analysis on sections of the culvert identified as areas of concern. The City has worked through the emergency procurement process to identify a contractor who will begin a thorough cleaning of the culvert later this year. The cleaning effort is expected to cost nearly $2 million and will take as long as six months to complete due to the challenge presented by accessing the culvert safely. Finally, based on resident concerns, a tree contractor will be onsite within the next three weeks to remove additional brush and limb up trees with branches that currently overhang the culvert and could interfere with water flow.

Scheduled maintenance intervals for other city infrastructure are included in the presentation.