City Council
Staff Report

Subject/Title:	Flood Protection Program Referendum Questions
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Department(s):	City Manager, Budget and Management Services, Public Works
Date:	August 20, 2021
Type of Item:	Informational

Summary/Recommendation

Attached to this cover is a series of questions and answers related to the Flood Protection Program and Bond Referendum as referenced by Mr. Moss in his email to you today. We will continue to vet additional questions over the coming weeks and look forward to your discussion at Tuesday's Workshop. Ultimately many of these can be added to our Flood Protection Program on www.vbgov.com/RippleEffect

Question: What is the City's stormwater system being designed for?

In order to address the need for more accurate design rainfall data and to consider projected increases in rainfall frequency depths over the next 30 years, the Public Works Design Standards Manual rainfall depth-duration values were increased by 20% over current NOAA Atlas 14 values.

Table VIII-1
Design Rainfall Depths for City of Virginia Beach (Inches)

Design Storm Frequency	NOAA Atlas 14 Rainfall (24-Hour Duration)	Design Rainfall (NOAA Atlas 14 + 20%)
1-YR	3.00	3.60
2-YR	3.65	4.38
10-YR	5.64	6.77
25-YR	6.99	8.39
50-YR	8.16	9.79
100-YR	9.45	11.34

Note: NOAA Atlas 14 precipitation depths do not vary significantly across the City (generally < 0.1" difference). The NOAA 14 rainfall values shown above are based on latitude 36.8201 degrees, longitude – 76.0756 degrees but shall be used for the entire City.

- Most projects are designed for a 10-year storm; however, the design storm is based on the size of the contributing drainage area.

Drainage Area (Acres)	Design Storm Frequency
< 300	10-year
300 – 500	25-year
≥ 500	50-year

- Critical infrastructure projects are designed using a 100-year design storm. Critical Infrastructure includes primary and secondary evacuation routes, hospitals, buildings that are considered shelters, etc.
- Non-Critical Infrastructure must increase design tidal elevations (tailwater) by 1.5 feet to address the impacts of sea level rise.
- Critical Infrastructure within the City of Virginia Beach must increase design tidal elevations (tailwater) by 3.0 feet to address the impacts of sea level rise.

Question: What is the source of the data used to establish the standard, and the data used to model the 100-year storm event?

- City digital elevation model (DEM) for surface elevations and creation of drainage areas in the model
- City Stormwater GIS layer was used for stormwater pipes and structure data
- Design tidal elevations (tailwater) are based on study "Joint Occurrence and Probabilities of Tides and Rainfall", October 2017 by Dewberry.
- Precipitation depths based on study "Analysis of Historical and Future Heavy Precipitation", March 2018 by Dewberry

Question: Where is the requirement documented?

- Public Works Design Standards Manual
- Stormwater Model Development Methodology, by CDM Smith, explains how the models were created, and how to use and modify the models. This is provided to all design consultant engineers who request a submodel for use in their design.

Question: What assumptions about land use development were used in modeling the 100-year storm event requirement?

- Impervious area based on City GIS layer
- Existing Land use (zoning) of the property

Question: Can you translate the design standard to a rainfall event?

- Based on NOAA Atlas 14 precipitation frequency data with 20% increase a 10-yr rain event is 6.77 inches of rain in a 24-hr period
- Based on NOAA Atlas 14 precipitation frequency data with 20% increase a 100-yr rain event is 11.34 inches of rain in a 24-hr period

- Design tidal elevation (tailwater) is considered constant for the entire duration of the storm

Question: How did Matthew compare to the standard the system is being designed for?

Matthew was a 500-1000-yr storm

Question: Will the inside of my home flood during the design standard or less rainfall event?

- Roads may flood and yards may flood, but the system is designed to preclude flooding inside structures.
- System is designed to maintain roads as passable, but roadways and yards provide margin for rainfall events that exceed the design standard

Question: Is the City guaranteeing that my home will not flood?

- No, the City cannot guarantee that any given home will not flood.
- At build out, the City will be able to request FEMA flood map updates to secure the lowest FEMA cost flood insurance policy premium rating for homes in upgraded protection areas

Question: What is the design standard that we are improving from?

Storm systems constructed prior to 1980 may have the capacity to handle a 1–2-year storm event.

Question: Of the twenty-one projects that will be completed under the Bond Referendum:

- 11 will be designed to the current NOAA Atlas 14 10-year design standard as follows
  - No Sea level Rise accommodation
  - Peak rainfall of 1.59 inches of rain in a 1-hour period in a single 24-hour period
  - 5.64 inches total rain in a single 24-hour rain period
- 2 will be designed to the NOAA Atlas 14+20% 10-year design standard as follows

- 1.5-ft Sea level Rise accommodation
- Peak rainfall of 1.9 inches of rain in a 1-hour period in a single 24-hour period
- 6.77 inches total rain in a single 24-hour rain period
  - 3 will be designed to the NOAA Atlas 14+20% 100-year design standard as follows
    - No Sea level Rise accommodation
    - Peak rainfall of 3.2 inches of rain in a 1-hour period in a single 24-hour period
    - 11.34 inches total rain in a single 24-hour rain period
  - 4 will be designed to the NOAA Atlas 14+20% 100-year design standard as follows
    - 1.5-ft Sea level Rise accommodation
    - Peak rainfall of 3.2 inches of rain in a 1-hour period in a single 24-hour period
    - 11.34 inches total rain in a single 24-hour rain period
  - 1 will be designed to the NOAA Atlas 14+20% 100-year design standard as follows
    - 3-ft Sea level Rise accommodation
    - Peak rainfall of 3.2 inches of rain in a 1-hour period in a single 24-hour period
    - 11.34 inches total rain in a single 24-hour rain period
- The current NOAA Atlas 14 10-year storm event is 5.64 inches of rain in a 24-hour period with a peak rainfall of 1.59 inches in 1 hour.
- The current NOAA Atlas 14 100-year storm event is 9.45 inches of rain in a 24-hour period with a peak rainfall of 2.67 inches in 1 hour.
- The NOAA Atlas 14+20% 10-year storm event according to PWDSM is 6.77 inches of rain in a 24-hour period with a peak rainfall of 1.9 inches in 1 hour.
- The NOAA Atlas 14+20% 100-year storm event according to PWDSM is 11.34 inches of rain in a 24-hour period with a peak rainfall of 3.20 inches in 1 hour.

- The 7 projects in Windsor Woods, Princess Anne Plaza & The Lakes will be designed for roads to remain passable for the current NOAA Atlas 14 10-year storm and structures to be protected from flooding for the current NOAA Atlas 14 100-year storm (this is a modified level of service from the design

- requirements of the Public Works Design Standards Manual). The gates and barriers will accommodate 1.5-ft of sea level rise.
- The 2 projects in the Central Resort have not been designed. We will evaluate whether we can meet the NOAA Atlas 14+20% 100-year design standard but will not be able to accommodate sea level rise. A future seawall along the boardwalk is the recommended city-wide strategy that will protect this area from 3-ft of sea level rise.
- The 4 legacy projects in Eastern Shore Drive will protect the area and Shore Drive from a combination of rainfall and tidal flooding for the current NOAA Atlas 14 10-Year storm but will not accommodate sea level rise.
- The 2 projects in the Lake Bradford/Chubb Lake will be designed for roads to remain passable for the NOAA Atlas 14+20% 10-year storm and structures to be protected from flooding for the NOAA Atlas 14+20% 100-year storm, and will accommodate 1.5-ft sea level rise.
- The 2 projects in the Linkhorn Bay Drainage Basin area will be designed for the NOAA Atlas 14 +20% 10-yr storm to be contained within the stormwater system, roads will remain passable for the NOAA Atlas 14+20% 100-yr storm and accommodate 1.5-ft of sea level rise.
- The West Neck Creek Bridge will be designed to protect streets and structures for the NOAA Atlas 14 +20% 100-yr storm and 3-ft of sea level rise.
- The Pungo Ferry Road project will be designed for roads to remain passable for the NOAA Atlas 14+20% 100-yr storm and accommodate 1.5-ft of sea level rise
- The Sandbridge Road/New Bridge Road Intersection project will be designed for roads to remain passable for the Atlas 14 +20% 100-yr storm, but cannot accommodate sea level rise.
- The Marsh Restoration project will be designed for the Atlas 14 +20% 100-yr storm and will accommodate 1.5-ft sea level rise.

Question: What is the before and after water discharge capacity of the systems?

Designs are based the 10 and 100-yr design storms.

Question: If the legacy drainage is not upgraded to the design standard, how much of the City will flood under a 100-yr design storm?

If we do not make any improvements 103,104 acres or 161.1 sq miles will flood under a NOAA Atlas 14+20% 100-yr design storm.

Question: What exactly mean when it is said this a 100-year flood?

- Does it mean once it occurs we should not see another flood for hundred years?
- Can you multiple one hundred year floods in the same calendar?
- What is the basis of the probability statistics

USGS defines a 100-year storm event as an event that has a 1% chance of occurring every year. Multiple 100-year storms, and larger, can occur during a calendar year. (https://www.usgs.gov/special-topic/water-science-school/science/100-year-flood?qt-science_center_objects=0#qt-science_center_objects)

Question: Are there other flood event definition for example a 500-year flood?

- What does a 500 year flood event like compared to a one hundred year flood event (in terms of peak rainfall and overall rainfall in twenty-four hour period)

According to the City's PWDSM, the NOAA Atlas 14+20% 500-year storm event is 15.60 inches of rain in a 24-hour period with a peak rainfall of 4.40 inches in 1 hour. The 100-year storm event according is 11.34 inches of rain in a 24-hour period with a peak rainfall of 3.20 inches in 1 hour.

Question: What is proposed by year bond issuance by year over the ten year construction period:

Modeling has the issuances occurring every other year within the 10 year period.

FY 23	FY 24	FY 25	FY 26	FY 27	FY 28	FY 29	FY 30
-	$132 M	-	$184 M	-	$204 M	-	$47 M

Question: What safeguards are in place to make sure bond proceeds and associated real estate tax rates to cover total life cycle costs to include debt service are not diverted by future councils?

Revenues generated through the dedicated tax rate will be "lock boxed" in a dedicated special revenue fund. All revenue collected and realized within the

special revenue fund will be preserved for the purpose of future debt service payments related to the Stormwater Bond Referendum. Funding will be preserved for the purpose of future replacement life cycle cost as well as potential future bond issuances once initial referendum debt is retired.

Question: How much of the bond referendum amount is net new money over and above what was programmed in the last Six Year Capital Improvement Program?

Existing appropriations or programmed funds dedicated to bond referendum projects total $126 million over the six-year CIP period. $442 million will be the net new appropriations for the $567 million program.

Question: What is the estimated real estate book value on I July of each fiscal year that the proposed real estate tax rate associated with the stormwater bond referendum (total life cycle cost)?

The estimated per penny for FY 22 is $6.2 million. A 3% growth factor was assumed each year in the modeling to determine the rate necessary to support bonds through a referendum.

Question: Will the real estate tax rate associated with the total life cycle cost of the stormwater bond referendum be adjusted up and down to offset the change in the "book value" to hold actual revenues to comply with forecast?

An annual review of the special revenue fund will occur to ensure adequate capacity within the fund remains to cover its obligations. Over time, adjustment in the means of financing within the Flood Protection Program will be adjusted to ensure the proper use of bonds and potentially the use of pay-go or fund balance within the CIP. It is a possibility that future City Council's could modify the dedicated real estate tax rate should less/more revenue be necessary to meet future needs.

Question: What is the general process and public visibility of that process under which these adjustments are adjudicated and put in place?

Any adjustment in the rate would require approval by City Council. Typically these adjustments would occur during the annual budget process.

Question: Will federal and state funds be used to reduced the amount being borrowed for the initial twenty-one projects and adjustments to revenue debt servicing requirements as part of determining the

As funding becomes available any amount identified would be used in lieu of GO Bonds. The freed-up bond capacity would then be directed to other outstanding Flood Protection Program needs.

Question: Will the real estate tax rate take into account that the full real estate I July book value of any Tax Increment Financing (TIF) district or the full real estate 1 July book value of any property within the boundary of a CDA for the governing budget year are included the taxable base for determining the real estate tax rate necessary to meet the life cycle total cost obligations of the 21 projects named in the November 2021 bond referendum?

No, the amount of revenue estimated from the tax rate needed to finance $567 million in referendum debt does not include revenues generated in the City's TIF district. The per penny amount is net of any TIF established within the City of Virginia Beach. As long as a TIF is in place, the assessment amount above the base year will not be available for use toward other purposes unless approved via ordinance by City Council.