The Best Place - For All

NOTICE

Issued by:

Department of Inspections and Permits

Notice #:

IP-23-03

Release Date:

07/21/23

Contact:

Tracie Reynolds, PIO

Phone #:

410-222-7502

Mark R. Wedemeyer
Director

Anne Arundel County Department of Inspections and Permits Provides Guidance on Downstream Analyses

The Department of Inspections and Permits is providing updated guidance on downstream analyses and inspections.

This guidance clarifies and summarizes downstream analyses requirements from the Stormwater Manual as well as offering supplemental guidance. It is expected to improve common understanding, leading to better efficiency, improved work products and less review time. Inspections and Permits staff has been working with the development community to implement this guidance.

The guidance memo and supporting documentation may be found here.

For more information please contact Hala Flores, Engineer Manager at 410-222-7577 or ipflor22@aacounty.org.

# # #

Mark Wedemeyer, Director

Memorandum

To: MBIA, Review Agencies and the General Public

Through: Raghavenderrao Badami, PE, Assistant Director, Department of Inspection and Permits

From: Hala Flores, PE, Engineer Manager, Department of Inspection and Permits H.E. Flores

Subject: **Downstream Investigation Guidance**

Date: July 21, 2023

Background

Anne Arundel County Practices and Procedures Manual (Manual) requires capacity and stability analysis of downstream conveyances as a part of the downstream analysis and determination of adequate outfall. A photo walking tour is required to document conditions from the site outfall to the POI. Additionally, the location and direction of the photographs must be indicated on the approved plan.

Purpose

The Manual establishes criteria for assessing the adequacy of the outfall by requiring the applicant to perform a downstream analysis to evaluate the capacity and stability of downstream conveyances. Establishing stability and capacity currently relies on the first step of adequately locating all the analysis/investigation points and accurately identifying the extent of the downstream reach to be investigated. This first step serves as the basis for performing the photographic tour, stability analysis/determination, and capacity evaluation. The stability determination is based on visual inspections of the photographic tour and the explanations provided by the applicant's engineer. Currently, the presentation of these materials is not standardized.

Standardized guidance, including term definitions, clarification of the exemption criteria, and an example with step-by-step instructions, have been developed and are accessible through this ***link*** to assist the engineers with the preparation of the downstream investigation.

This memo is not intended to replace requirements in the Manual; instead, it clarifies and summarizes these requirements and provides supplemental guidance. This is expected to improve common understanding, leading to better efficiency and less review time/cycles.

Timing

This guidance is effective for all projects that have not submitted a downstream investigation and a photo tour by the effective date of this memo. This office encourages the use of this guidance for all projects going through the review process as much as possible, as this is intended to help all involved in the process. This office has worked with the development community regarding this guidance, and we appreciate the collaboration.

Description of terms

Manual: Anne Arundel County Practices and Procedures Manual

Concentrated discharge: Any discharge from the site that does not meet the MDE's ESD criteria for alternative surfaces and/or nonstructural practices. Additionally, NRCS/SCS has determined that sheet flow will never occur for more than 300 feet, regardless of the evenness of the surface. Due to this, NRCS has recommended the use of 100 feet as the recommended length/limit for sheet flow. Alternatively, the McCuen-Spiess equation (added in Hydro CAD 10.01-6) may be used to calculate the sheet flow length based on the slope and surface roughness.

From Part 630 Hydrology National Engineering Handbook, Chapter 15:

"Typically, sheet flow occurs for no more than 100 feet before transitioning to shallow concentrated flow (Merkel 2001)."

and

"Kibler and Aron (1982) and others indicated the maximum sheet flow length is less than 100 feet. To support the sheet flow limit of 100 feet, Merkel (2001) reviewed a number of technical papers on sheet flow.

McCuen and Spiess (1995) – Equation 15-8, L = 100 * S^.5/n, Where, L is the length of sheet flow, S is the slope, and n is the Manning roughness coefficient.

Nonstructural Practices: These are limited to the Disconnection of Rooftop runoff, disconnection of non-rooftop runoff, and sheet flow to conservation areas. According to 5.4.2 of the MDE Design Manual, "Consequently, requirements and conditions for nonstructural practices reflect the need to maintain sheet flow conditions".

Discharge Points (DPs): The DPs are the points where the proposed discharge is considered "concentrated" and crosses the project's limit of disturbance (LOD).

Site Outfall Points (SOs): SOs are the points where the post-development discharge generated onsite travels downstream to the property boundary and leaves the site. These are the points where analysis of the pre-development and post-development conditions is needed to determine whether right-to-discharge permissions will be required. Refer to AACO Practices and Procedures Manual - 7.5.2 - Basis for determination of rights-to discharge). It is noted that any of the site outfall points can be the same as any of the discharge points when the LOD intersects with the property boundary

Points of Investigation (POIs): POIs are located downstream of the site, where the $\mathbf{Q_{10\text{-}max}}$ from the DPs are less than or equal to 10 percent of the $\mathbf{Q_{10\text{-}max}}$ to those points. The POI should be **placed just before** the confluence with a non-tidal or tidal system, where the $\mathbf{Q_{10\text{-}max}}$ is reasonably expected (label the DA value, no delineation required) to exceed 10 times the flow generated at the DPs.

Flow Path: The flow path starts at the DP and travels to the POI, tracking the flow route. After the visual inspections are completed, the flow path should be identified on the map as stable or unstable based on the photographic tour visual inspection.

$Q_{10\text{-}max}$: This is the 10-year, 24-hour maximum ultimate-development runoff (based on current zoning for off-site drainage areas and the proposed conditions for the on-site drainage areas). The calculations shall not include any reductions due to the proposed SWM.

$Q_{10\text{-}pre}$: This is the 10-year, 24-hour pre-development discharge and shall be based on the existing land cover conditions. The designer must be consistent in the selection of the hydrologic model when modeling the pre and post discharge conditions.

$Q_{10\text{-}post}$: This is the 10-year, 24-hour post-development discharge and shall be based on the proposed development condition of the site. The runoff curve number for post development conditions shall be reduced based on the calculations in the Manual 7.2.3 G. No additional hydrograph routing in TR20 is allowed. The designer must be consistent in the selection of the hydrologic model when modeling the pre and post discharge conditions.

Outfall Statements: An outfall statement is required per section 11.5.1 of the Manual. The Outfall statement must be placed in the SWM report and on the grading plans and shall be updated to indicate the approval date of any associated mitigation plan. Refer to the Manual for sample outfall statements.

Exemption Criteria

Projects that meet the criteria below (as stipulated in the Manual) are exempt from providing a downstream investigation analysis, and the outfall is deemed adequate.

1- Single lot single-family development plan submitted under the grading or building permit process discharging directly to a publicly maintained closed storm drain system or a publicly maintained open channel located within a publicly maintained easement or right of way. These exclude developments with a variance/modification to disturb steep slopes or other sensitive environmental features, which must demonstrate that the proposal will not impact water quality or be detrimental to public health, safety, or welfare and not be injurious to other properties.

2- Projects that qualify as redevelopment as defined by the State SWM manual (greater than 40% of the site is impervious) AND the existing condition curve number is higher than the zoning-based curve number (AACO Practices and Procedures Manual Table Appendix table 11.8).

3- Projects exempt from testing for Storm drain APF per County code 17-5-201b are exempt if the $Q_{10\text{-}post}$ does not exceed the $Q_{10\text{-}pre}$ for the site.

Photo Walking Tour Guidance

The Manual (7.2.2.D.2.b. Stability) requires the submission of a photo walking tour in accordance with the requirements of Chapter III of “Stream Assessment Protocol” and the “Sketch Plan-Preliminary Plan Checklist”.

The photo documentation should support the assessment determinations recorded on the individual photos and in the outfall statement (to be added as a narrative to the report and to the approved final and grading plans). At the minimum, the photo walking tour should be representative of and cover:

1. Streambank stability conditions

2. Head cuts and/or bed aggradation areas, if existing

3. Infrastructure (e.g., utilities, bridges, etc.), if existing

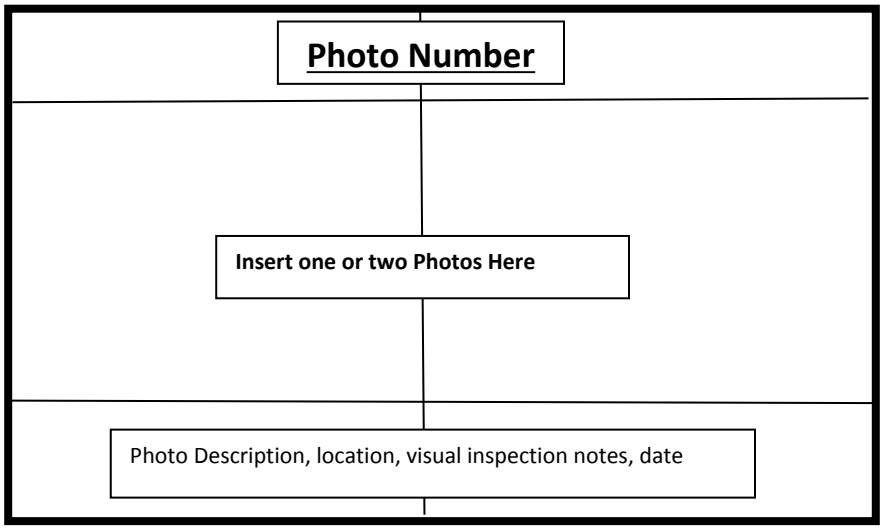
4. Adjacent land uses/vegetation (to identify deficient buffer areas)

5. Summary narrative of the deficiencies identified

Additional guidance:

6. All photos should be geo-referenced on the exhibit map. This can be achieved by logging the coordinates for the photos or by utilizing a camera application that records the spatial coordinates to allow geo-referencing of the points. It is understood and accepted that spatial accuracies may have up to 30 feet of accuracy errors. As shown in the attached exhibits, the photograph GIS point may not always fall precisely on the flow path.

7. A photo log in the format shown below should be prepared. The photo log shall include sufficient pages to display all colored photos at a readable scale. Up to four photographs may be shown per page as long as the resolution and readability are not compromised. Each page shall feature the photo number, the colored photo-oriented in the original format the picture was taken, and a description at the bottom section of the photo log to include a description of the location, date the photo was taken, and all visual inspection notes to support the stability assessment/determination.



8. The frequency of the photographs should be representative of the flow type/conditions (50 ft. photo spacing is suggested with a maximum spacing of 200 feet).

9. In the event that the applicant could not obtain access from certain private downstream properties to take photos or heavy vegetation prevented access, other efforts should be explored such as aerial photographs and 3D street views. Further, instability determination in this case should be conducted based on theoretical values and topographic information. The engineer shall document in their narrative the addresses for the properties that couldn't be accessed, along with the reason.

10. The report shall also include a summary of the downstream drainage/erosion/flooding-related concerns brought up during the community meeting or at any point during the development application process.

11. All information related to the downstream investigation must be included in the project's SWM report. This section of the report must be signed by a certified and qualified design professional with relevant experience.

Example with step-by-step instructions

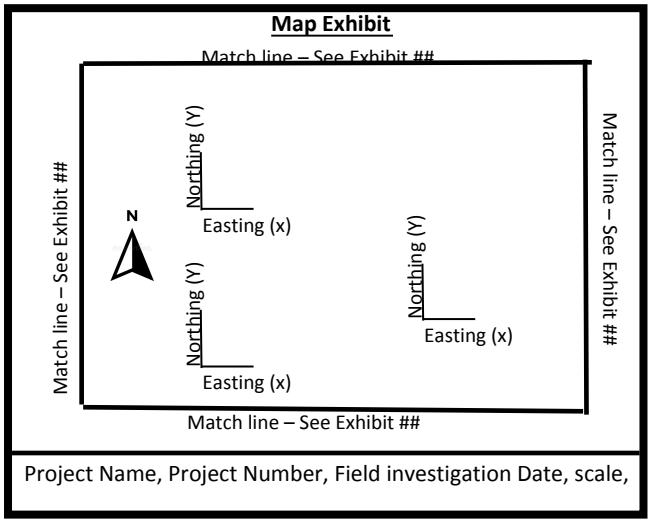
A hypothetical project will be used as an example to explain the step-by-step procedures. The location of the hypothetical project is the Anne Arundel County Riva Heritage Complex.

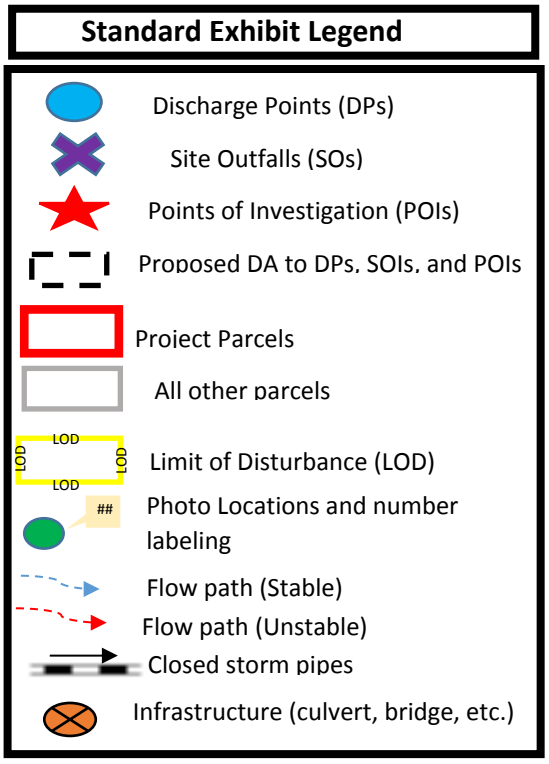
The steps for conducting the downstream investigation and the exhibit maps, photographs, and outfall statement are included below.

1- Provide a narrative project explanation, including the preliminary proposed SWM mitigation.

> *"The hypothetical proposal is to reconstruct the entrance and reconfigure two buildings (2664 and 2666). The site drains to two separate discharge points. For the southern portion, a green roof is proposed for building 2666 and the entrance is proposed to be treated in an underground facility that will drain to inlet A. The existing SWM pond will be retrofitted for the northern portion to accommodate the ESD volume."*

2- Start with a base map that shows the proposed site layout, parcel boundaries, topographic information, environmental features, and the existing storm infrastructure. The Exhibit shall be prepared at no more than 1 inch = 200 feet scale and shall include three tick marks and other location identifying information such as street addresses, road names, etc. Match lines shall be used to connect the sheets. A composite exhibit map shall be provided for map sheets exceeding two pages. The standard exhibit legend, as shown below, should be followed. Add a legend if deviating from the standard legend. Not shown in this example are the topographic information, Time of concentration delineation, and other pertinent information that are required to be shown on the proposed drainage area map to verify the correctness of the hydrologic calculations and underlying assumptions.





3- Delineate the Limit of Disturbance (LOD) for the project. This is highlighted in a yellow line labeled with LOD.

4- Identify the DPs per the definition, delineate their drainage areas, and calculate/label the $Q_{10\text{-}max}$. There are two DPs for this example. For the southern portion, DP1 is located just upstream of Inlet A. For the northern portion, DP2 is located at the pond outfall. Include all the hydrologic qualifying calculations in the report and document the results as tabulated below on the plans. (All numbers are hypothetical)

Discharge Points	**DP1**	**DP2**
Total Drainage Area (Acres)	0.13	17
Off-site Upstream Drainage Area –Acres (if any)	0	0
$Q_{10\text{-}max}$ (cfs)	##	##

5- Identify the SOs per the definition, delineate their drainage areas, and calculate/label the $_{Q10\text{-}pre}$ and $Q_{10\text{-}post}$. The southern portion is located at SO1 where the discharge leaves the County right of way, which is the outlet located on the southern side of Riva Road at the edge of the County Right of way. For the northern portion, SO2 is located at the County parcel boundary, which happens to coincide with the DP2 at the pond outfall. Include all the hydrologic qualifying calculations in the report and document the results as tabulated below on the plans. (All numbers are hypothetical)

Site Outfalls	**SO1**	**SO2**
Total Drainage Area (Acres)	22	17
Off-site Upstream Drainage Area (Acres)	26	9
Pre-development Imperviousness of site (Acres)	##	##
Post-development Imperviousness of site (Acres)	##	##
Level of SWM controls (1 inch WQv, ESDv, quantity management?)	ESDv	1-inch WQv and 10-year management
Reduced Curve Number	##	##
$Q_{10\text{-pre}}$ (cfs)	##	##
$Q_{10\text{-post}}$ (cfs)	##	##

6- Identify the POIs per the definition, delineate their drainage areas, and calculate/label the $Q_{10\text{-max}}$. Include all the hydrologic qualifying calculations in the report and document the results as tabulated below on the plans. (All numbers are hypothetical)

Points of Investigations	**POI1**	**POI2**
Total Drainage Area (Acres)	30	24
$Q_{10\text{-max}}$ (cfs)	##	##

7- Delineate the flow paths from the discharge points to the points of investigation. The flow paths should eventually be segmented as stable versus unstable based on the determination from the photo tour (step 9).

8- Conduct a field investigation and acquire photos along the flow paths. Refer to the photo walking tour guidance. Document the qualitative conditions for each photo (refer to the attached photo log). The County has used the "timestamp photos" application to generate the photos in this example.

9- Identify the stable versus unstable sections on the flow paths on the exhibit map based on the qualitative conditions from the photo tour. Color code the flow path segments referenced in (step 7).

"It is noted that the downstream segments for this example were previously stabilized between the years 2005 and 2012 via stream restoration/SPSC systems, which remain stable to this day. Due to this, the example as shown

does not reveal any unstable segments, and the flow paths are all shown as blue versus red."

10- Complete the narrative portion of the report and the outfall stability statement that will be affixed to the plans.

11- If stream instabilities are found, additional documentation should be gathered to document the severity of the problem. All stream instabilities need to be evaluated by a qualified stream professional, who shall be responsible for determining the potential evolution and departure of the stream channel over time, the expected impact of the proposed development during and post construction, and shall proffer a mitigation plan to address all issues.

References:

Anne Arundel County, Maryland. Stormwater Management Practices and Procedures Manual, Revised October 1, 2017.

Rosgen, D. L. 1994. A classification of natural rivers. Catena 22

Rosgen, D. L. 2001a. A practical method of computing streambank erosion rate. In Proceedings of Seventh Federal Interagency Sedimentation Conference. Vol.2, Reno, Nevada, March 25-29

Doll, B. A. etal. 2009. NC Stream Restoration Institute and North Carolina Sea Grant, "Stream Restoration: A Natural Channel Design Handbook", Copyright @2009 Online-PDH

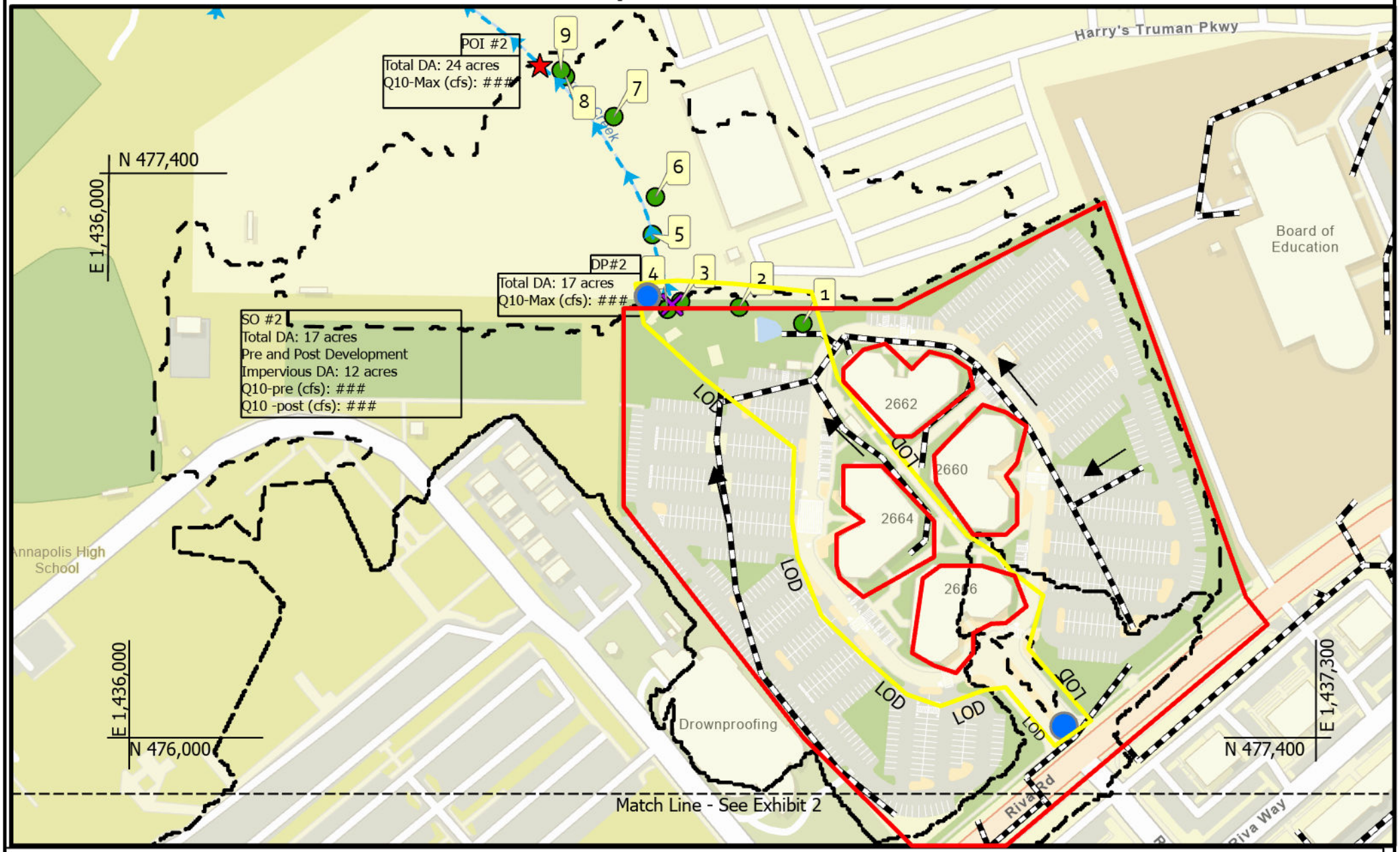
Heritage Complex Exhibit Enlarged

N

0 200 400 600 800 Feet

Heritage Complex Project
Project Number 123-4567
Field Investigation Date: February 3rd, 2023 and March 1st, 2023
Scale: 1"= 400'

Map Exhibit 1

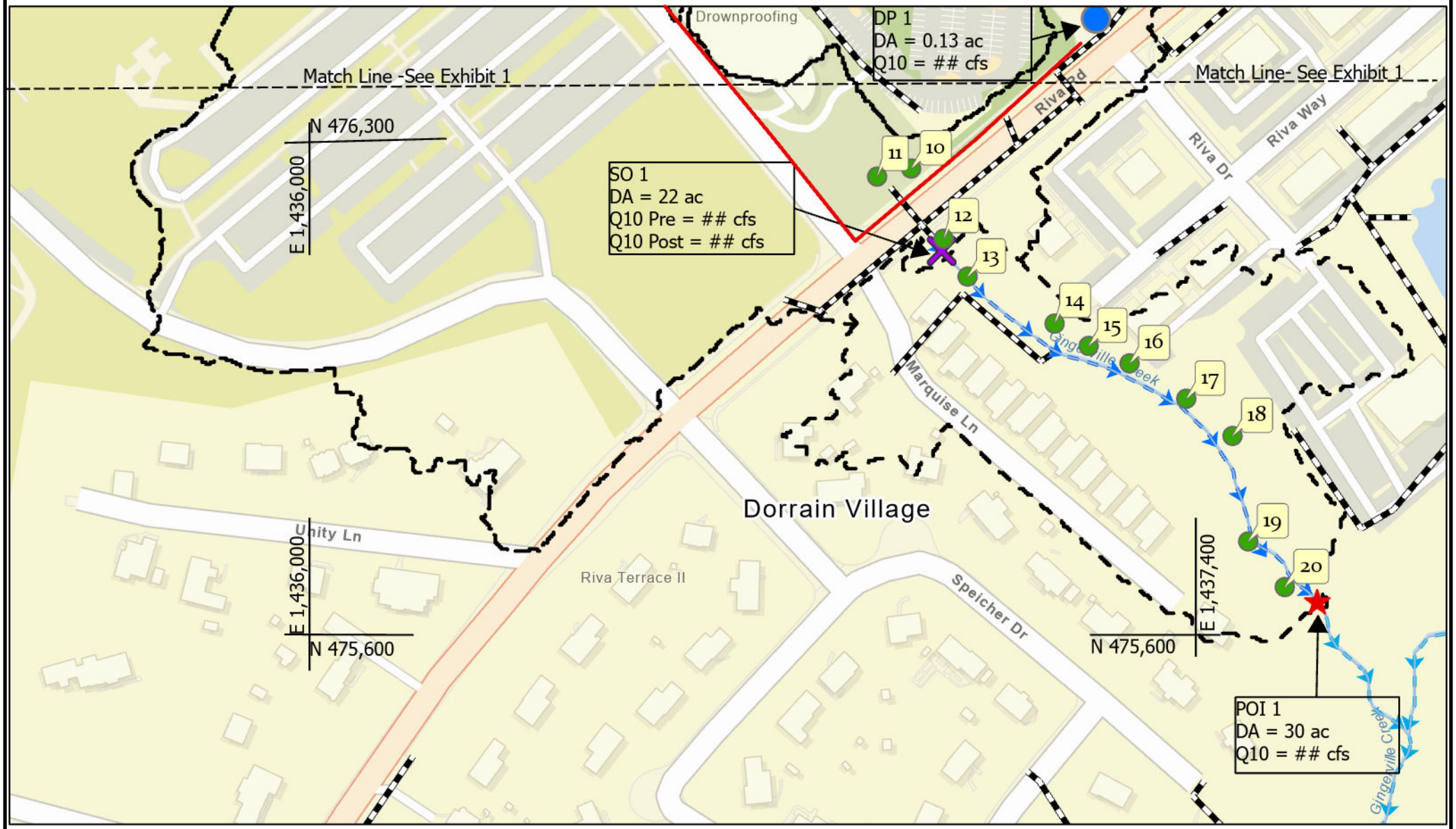


N

0 100 200 US Feet

Heritage Complex Project
Project Number: 123-4567
Field Investigation Date: February 3rd, 2023

Map Exhibit 2



N

0 100 200 300 400 Feet

Heritage Complex Project
Project Number 123-4567
Field Investigation Date: February 3rd, 2023 and March 1st, 2023

Photo 1

Stormwater Basin located at Site Outfall (West View)

Photo 3

Stones located in stormwater basin

Photo 4

Site outfall (see map 2 and overall site map) discharging from the stormwater basin into Broad Creek

Photo 5

Downstream view of the beginning of Broad Creek

Photo 6

Downstream View of Broad Creek. Check dams can be seen in the distance

Photo 7

Downstream View of Broad Creek; Check dam and step pool can be seen in picture

Photo 8

Downstream view of Broad Creek with check dam and step pool show. POI location can be seen in the distance (see map 1)

Photo 9

Upstream view of Broad Creek with step pools and check dams shown. This is located near the hypothetical POI

Photo 10

View of the roadside swell with a culvert along Riva Road, adjacent to the Project property. The area appears stable. No erosion is present.

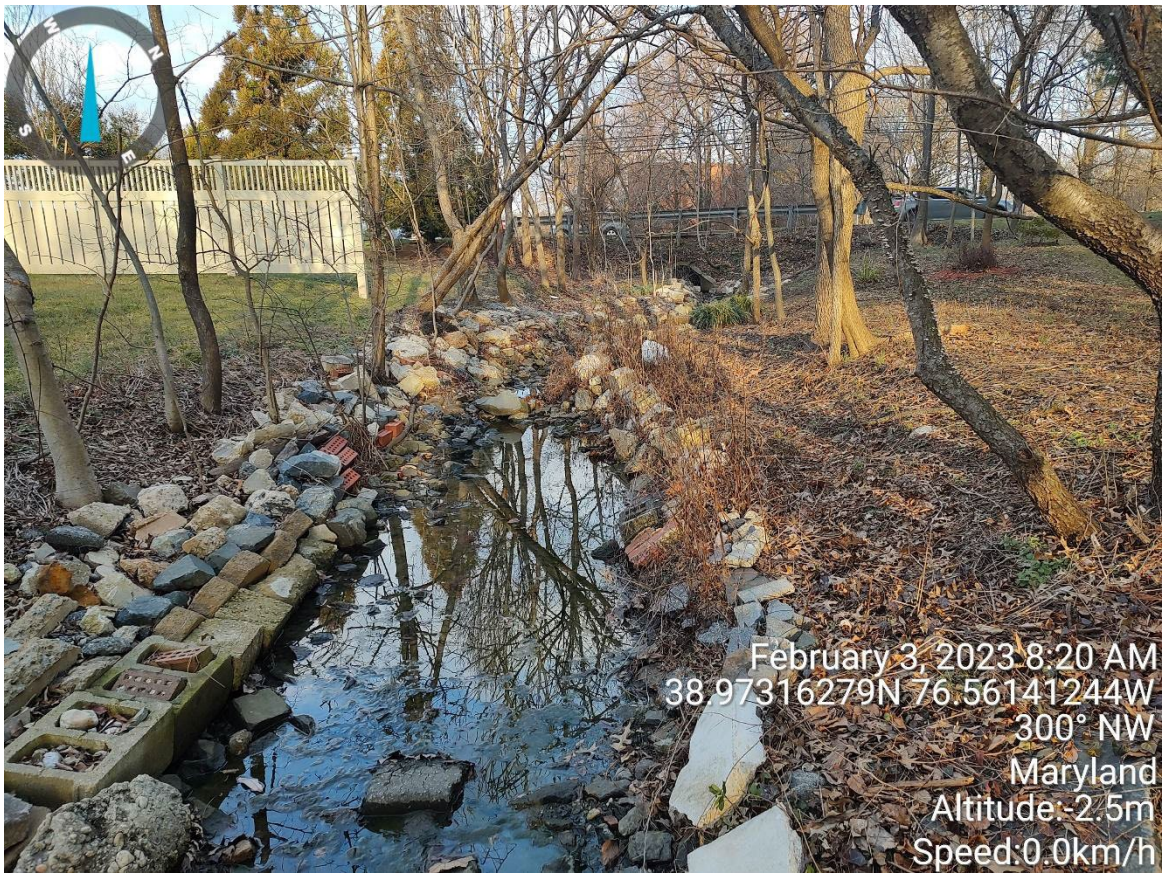
Photo 11

View of the roadside ditch and an inlet, north of Riva Road. The inlet appears to be partially clogged with debris. This area appears stable with no erosion present.

Photo 12

View of the Discharge Point 1, a 48” storm drain, an outlet, and rip rap to the south of Riva Road. Displaced rip rap is present. The area appears to be stable with no erosion present.

Photo 13



View of the reinforced channel facing the outlet. Area appears stable with no erosion present.

Photo 14

View of the channel facing west. Trash and siltation are present in this portion of the channel. Area appears stable.

Photo 15

Step pool conveyance facing south along the channel. Area appears stable with no signs of erosion.

Photo 16

View of the stable channel facing west. Area appears stable with no signs of erosion.

Photo 17

Step pool conveyance facing southwest along the channel. Area appears stable with no signs of erosion.

Photo 18

Step pool conveyance facing southwest along the channel. Area appears stable with no signs of erosion.

Photo 19

View of the channel facing south.

Photo 20

View of the channel facing south.