

Appendix F – County Property with Greater than Two Acres

High priority municipal facilities and on County properties with greater than 2-acres of impervious surface with the number of stormwater inlets to have “Drain to Stream” markers installed.

Facilities with greater than 2 acres of impervious surface
Arlington Health Center
Barcroft Park
Bluemont Park
Fairlington Community Center
Fort Ethan Allen Park
Four Mile Run Park And Wpc Plant
Glencarlyn Park
Greenbrier Park
Long Bridge Park
Lubber Run Park
Quincy Park
Shirlington Park
Thomas Jefferson Community Center
Trade Center
Virginia Highlands Park
Walter Reed Community Center
Water Pollution Control Plant**
High Priority Municipal Facilities
Arlington County Trades Center
North Side Salt Storage Facility
26 th St N Leaf / Mulch Storage and Distribution Center
Department of Parks and Recreation Nursery
Quincy Park Recycling Center
ART Bus Facility

** Water Pollution Control Plant is covered under a separate MS4 permit and will not be inspected as part of this permit.

Appendix G

Arlington County Dry Weather Screening Plan

**ARLINGTON COUNTY
DRY WEATHER SCREENING
PROGRAM:
SITE SELECTION AND
SCREENING PLAN**

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March 14, 2014

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1.0 INTRODUCTION

This plan establishes the screening methodology for use in implementing [1.B.2.m.1.d] of Arlington County's Municipal Separate Storm Sewer System (MS4) Permit.

This Site Selection and Screening Plan establishes the protocol for identifying and screening outfalls draining the designated Shirlington Village commercial district and the South Four Mile Run Drive industrial area for illicit discharge. These target areas are screened on an annual basis for presence of illicit discharge as is required by the County's current VPDES MS4 permit. This Plan also serves as the field operations and data management manual for the dry weather screening program. This dry weather screening program is part of an effort to (1) identify and map MS4 outfalls; (2) screen MS4 outfalls for dry weather discharge, the presence of pollutants, or other visible signs of an illicit connection; and (3) isolate and correct the illicit connection.

2.0 SITE SELECTION PROTOCOL

Both Shirlington Village commercial district and the South Four Mile Run Drive industrial area are located in the southeastern portion of Arlington County, abutting Four Mile Run. Both areas discharge directly or indirectly to Four Mile Run. Maps of the areas, as well as the locations of potential outfalls, are presented in Figure 2-1 through Figure 2-3.

Target outfalls were identified by mapping stormwater conduit infrastructure from County ArcGIS coverage. During the initial screening, field teams will also conduct a visual survey of drainage channels in the study areas to identify any unmapped outfalls for screening.

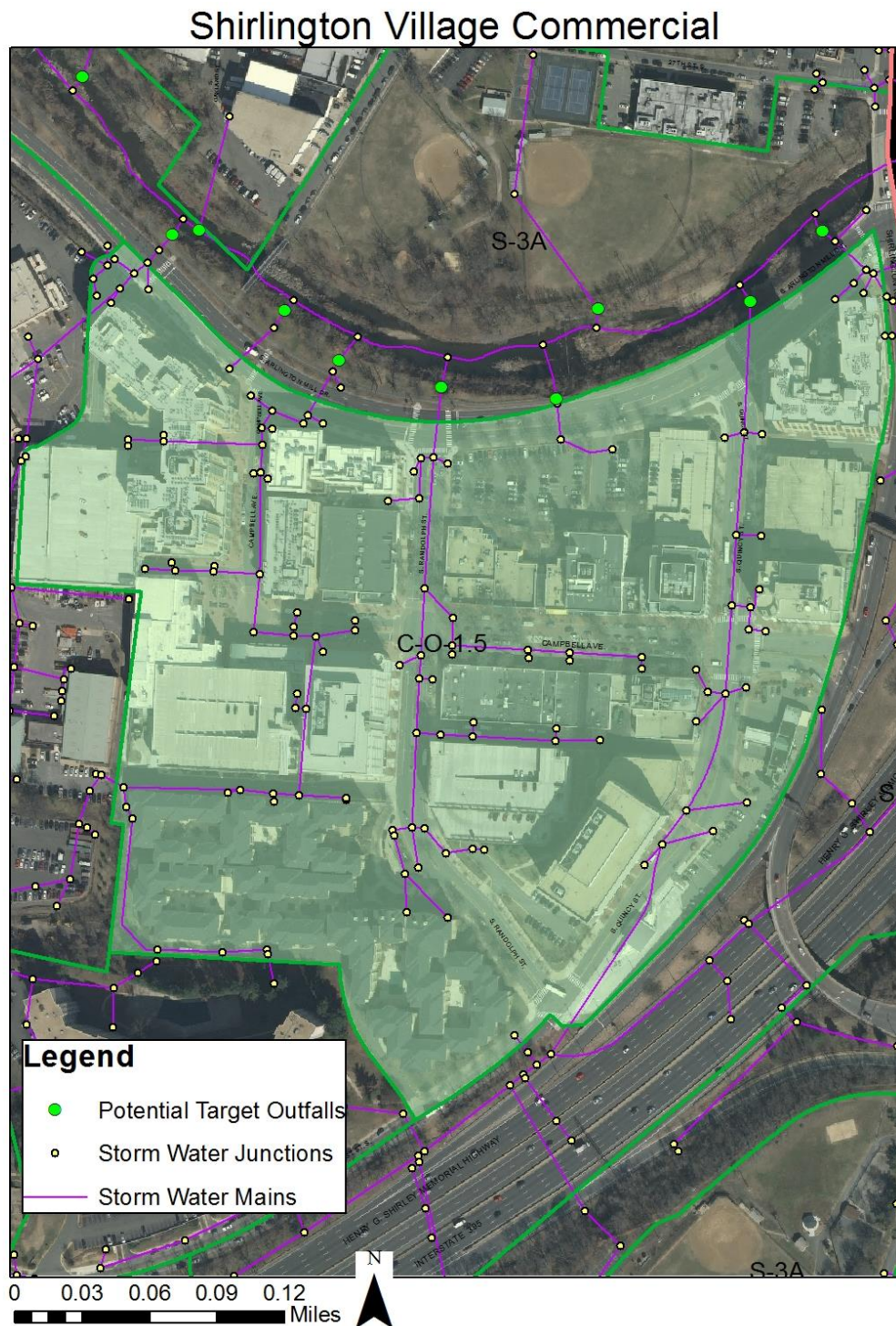


Figure 2-1. Shirlington Village commercial district target outfalls.

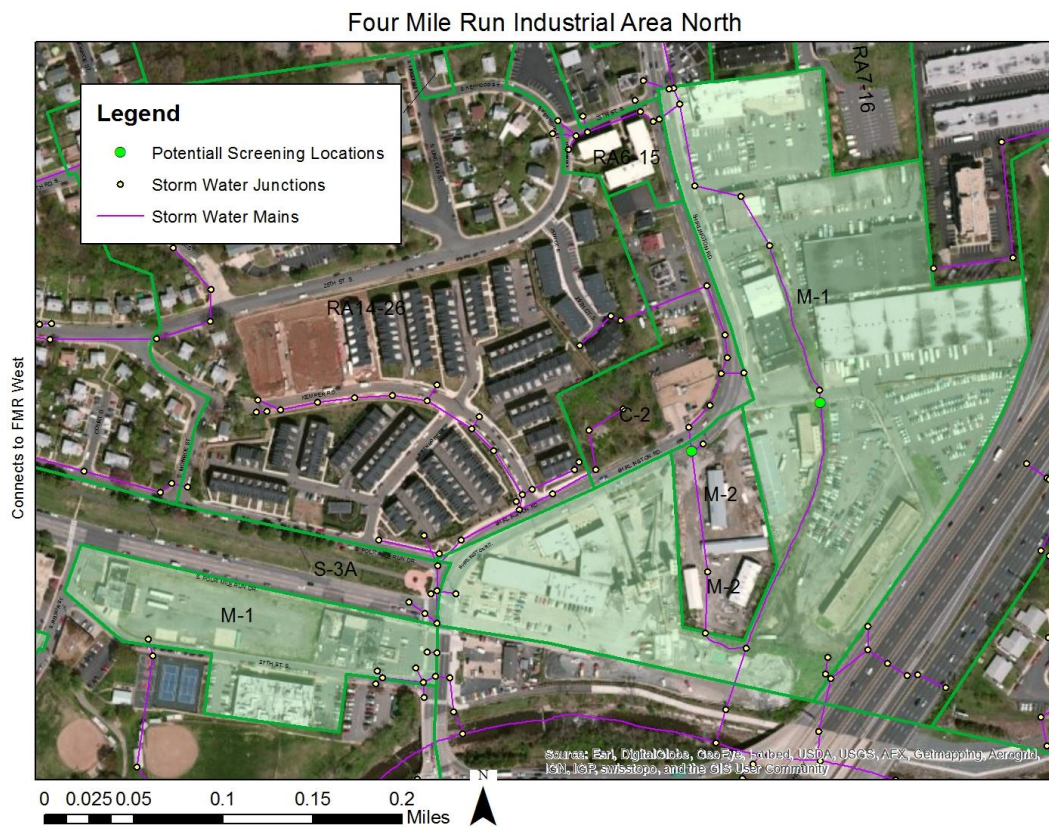


Figure 2-2. South Four Mile Run Drive/Shirlington Road industrial area (north) target outfalls.

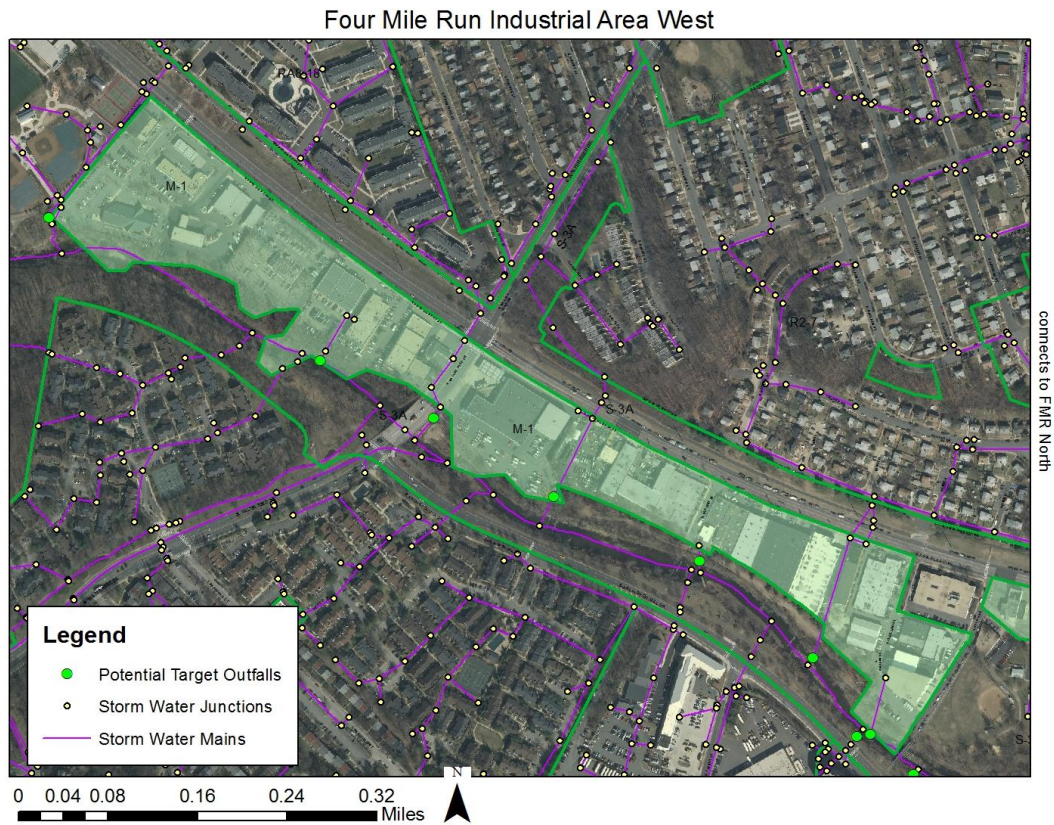


Figure 2-3. South Four Mile Run Drive industrial area (west) target outfalls.

3.0 FIELD PROTOCOL

3.1 BACKGROUND

Dry weather MS4 screening programs involve monitoring both physical and chemical characteristics of dry weather flows. Physical indicators of a potentially improper discharge are often evident even when flow is not present; such indicators include outfall damage, deposits or stains, unfavorable colors or odors in plunge pools, deposits of material in receiving channels, and algal growth in pipes. Physical indicators in flowing water include odor, color, turbidity, and the presence of floating material such as oil, sewage, or suds (Brown *et al.* 2004). If flowing water is present at an outfall during dry weather, the quality of the flowing water is assessed in the field. Water quality testing for possible pollutants and characteristics such as pH, temperature, and turbidity provides on-the-spot information to help distinguish between improper discharges and other possible sources of dry weather flow, such as groundwater infiltration.

For the Arlington County field effort, screening of outfalls will consist of the following:

- Locate outfalls using GPS and infrastructure maps in the target areas.
- Inspect the selected outfalls for physical evidence of illicit discharge.
- If flowing water is present, perform water chemistry tests in the field.
- If the presence of suspected illicit discharge is detected, the Department of Environmental Services, Office of Sustainability and Environmental Management (DES OSEM) will be notified within 24 hours.

Field procedures for dry weather screening as well as health and safety procedures common to all components, are described in Sections 3.3 through 3.7.

3.2 SELECTED ANALYTES

Table 3-1 shows the selected analytes and their ability to aid in detecting various kinds of discharges. Selection was based primarily on information provided in Brown et al. (2004) and County requirements. The Arlington County program includes identification of sources of pollutants of concern identified in TMDLs and stream impairment listings applicable to Four Mile Run.

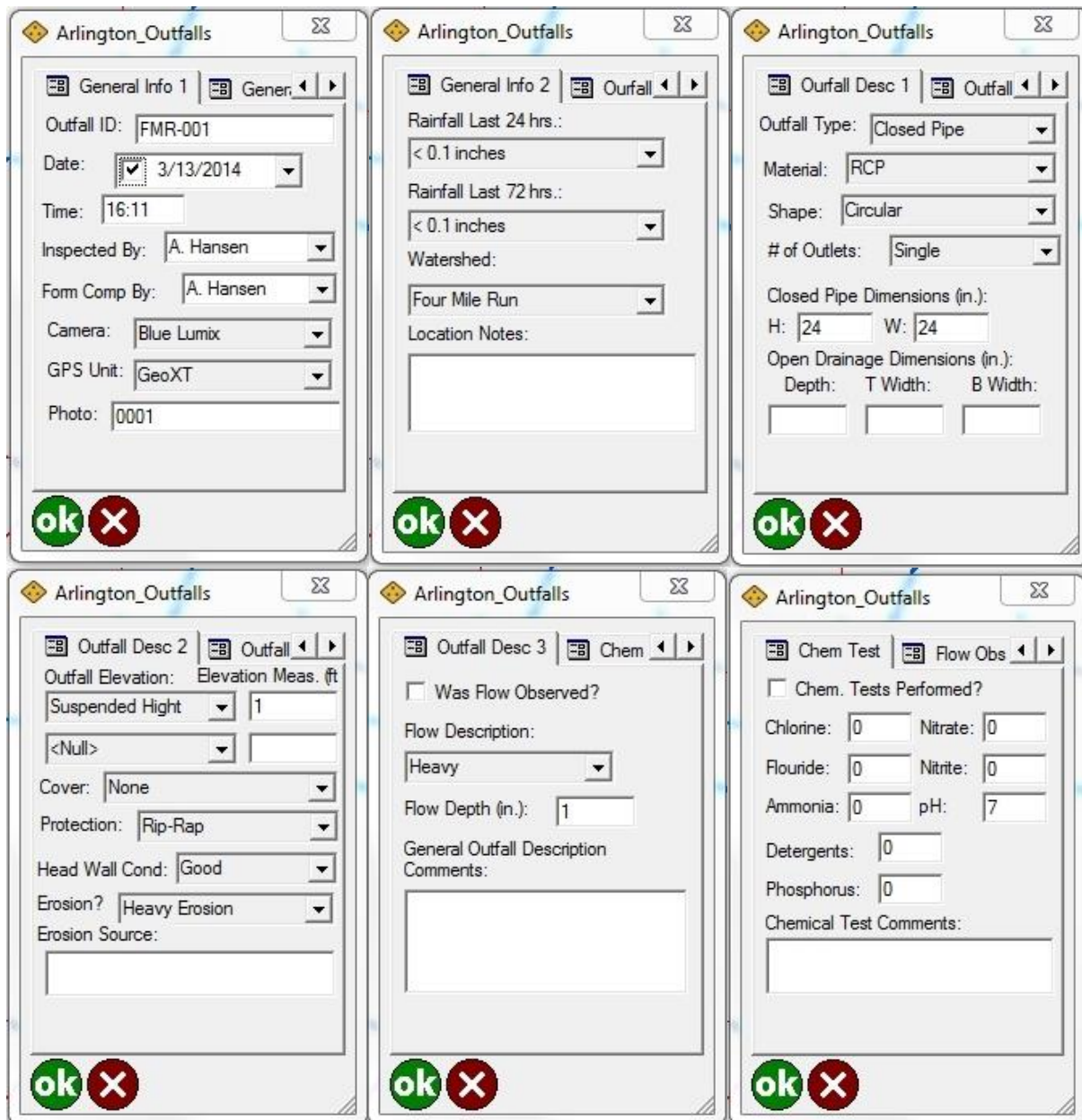
Results of screening tests will be compared to the criteria presented in Table 3-1 to assist in identifying the possible source of a suspected improper discharge or illicit connection. Testing results will be included in a monitoring report.

Table 3-1. Dry weather screening parameters and action criteria.				
Recommended Analyte	Effluent Type Indicated	Kit or Probe	Recommended Action Criterion	Instrument Range
IDDE Parameters				
total chlorine*	industrial drinking water sewage	photometer	≥ 0.4 mg/l	0 to 5 mg/l
fluoride	tap water	single analyte meter	≥ 0.25 mg/l	0 to 10 mg/l
ammonia	sewage washwater industrial	photometer	≥ 1 mg/l	0.2 to 30 mg/l
surfactants (detergents)	sewage washwater	single analyte meter	≥ 0.25 mg/l	0.15 to 1 mg/l
pH	industrial washwater	sonde	≤ 5 (industrial)	0 to 14
TMDL Parameters				
nitrate	fertilizer application	photometer	N.A.	0.2 to 1.5 mg/l
nitrite	fertilizer application	photometer	N.A.	0.08 to 0.80 mg/l
total phosphorus	washwater fertilizer application	photometer	N.A.	0-2.30 mg/l
*Exceedance criteria are based on the test range of the field kit				

3.3 DRY WEATHER SCREENING PROCEDURE

Initial dry weather screening activities include assessing the physical characteristics of the outfall and any discharge, and performing screening chemistry tests on the discharge (if present). Field screening will not proceed unless there has been less than 0.10 inches of rainfall in the preceding 72 hours. Field crews will verify that this dry-time criterion has been met before beginning field operations. The field staff will obtain and gather the materials listed in Appendix A prior to field work on any given day. Standard operating procedures for use, calibration, maintenance, and quality control for all field equipment are provided in Appendix B.

To facilitate data collection and information management, data gathered during the dry weather screening field effort will be recorded in electronic datasheets running on ArcPad 10 software (Figure 3-1). In case of instrument failure, data will be recorded on pre-printed field data sheets (Appendix C). Datasheets developed by the CWP (Brown et al. 2004) were used as the basis for the electronic field datasheets. Field crews will use this data entry form to record on-site information for each outfall using a series of text boxes, drop down menus, and check boxes.



The figure displays six example dialog boxes for recording outfall screening data, arranged in a 2x3 grid. Each dialog box is titled "Arlington_Outfalls" and contains different sections for data entry. Each dialog has "ok" and "X" buttons at the bottom.

- Dialog 1 (Top Left):** "General Info 1" section. Fields include Outfall ID (FMR-001), Date (3/13/2014), Time (16:11), Inspected By (A. Hansen), Form Comp By (A. Hansen), Camera (Blue Lumix), GPS Unit (GeoXT), and Photo (0001).
- Dialog 2 (Top Middle):** "General Info 2" section. Fields include Rainfall Last 24 hrs. (< 0.1 inches), Rainfall Last 72 hrs. (< 0.1 inches), Watershed (Four Mile Run), and Location Notes.
- Dialog 3 (Top Right):** "Outfall Desc 1" section. Fields include Outfall Type (Closed Pipe), Material (RCP), Shape (Circular), # of Outlets (Single), Closed Pipe Dimensions (H: 24, W: 24), and Open Drainage Dimensions (Depth, T Width, B Width).
- Dialog 4 (Bottom Left):** "Outfall Desc 2" section. Fields include Outfall Elevation (Suspended High), Cover (None), Protection (Rip-Rap), Head Wall Cond (Good), Erosion? (Heavy Erosion), and Erosion Source.
- Dialog 5 (Bottom Middle):** "Outfall Desc 3" section. Fields include Was Flow Observed? (checkbox), Flow Description (Heavy), Flow Depth (in.) (1), General Outfall Description, and Comments.
- Dialog 6 (Bottom Right):** "Chem Test" section. Fields include Chem. Tests Performed? (checkbox), Chlorine (0), Nitrate (0), Fluoride (0), Nitrite (0), Ammonia (0), pH (7), Detergents (0), Phosphorus (0), and Chemical Test Comments.

Figure 3-1. Example dialog boxes used to record outfall screening data

Information collected at each site will be stored in a geodatabase for subsequent organization and reporting.

The following screening information will be entered onto field data sheets:

1. Background Data: Record current date, physical location, GPS location, investigators, and other background data.

2. **Outfall Description:** Enter information describing the outfall, including outfall ID (if provided by County), whether closed pipe or open channel, physical dimensions, shape, orientation, material type, etc. Indicate if water is flowing from the outfall and describe (e.g., yes, no, intermittent, stagnant).
3. **Quantitative Characterization:** If flowing water is observed, perform water chemistry tests as described in Appendix B-1.
4. **Physical Indicators for Flowing Outfalls Only:** Collect information on physical features of flowing outfalls (e.g., odor, color, turbidity, sheens, floating materials).
5. **Physical Indicators for Flowing and Dry Outfalls:** Collect information on physical features of both flowing and dry outfalls. Examine outfall for presence and type of algae, abnormal vegetation, damage, stains, sheens, and condition of plunge pool (if any). Structural problems (e.g., cracking, holes in corrugated metal pipes, dissolved concrete) should also be noted.

3.4 TRACKING DOWN THE SOURCE OF AN IMPROPER DISCHARGE

No trackdowns will be performed for flowing outfalls with clear flow and typical flow rate for groundwater seepage. However, upland site conditions (e.g., presence of hotspots) or activities that are resulting or may result in improper discharge will be noted by field staff on paper field data sheets, photographed, and included in the final report. County staff (DES OSEM) will be notified during the screening if any active pollution discharge (elevated flow, discoloration) is evident.

The final report will include any recommendations for follow-up actions based on screening results and field observations.

3.5 HEALTH AND SAFETY

Ensuring the health and safety of field personnel is the responsibility of every staff member of the program. The collective effort of all staff members in providing a healthy and safe work environment will minimize or eliminate the potential for accidents. The safety of field staff overrides all other considerations. In general, the following safety protocol will be followed to protect the field staff:

1. Bring mobile phone and first aid kit on all field site visits.
2. Exercise caution when encountering ants, stinging insects, ticks, snakes, raccoons, geese, mice, rats, and the like, as well as off-leash pets.
3. Many outfalls are located in remote areas that may be near gathering places for homeless or transient individuals. Do not enter a potentially hostile area.

4. Exercise caution when accessing outfall areas and encountering uneven or slippery terrain (rip rap), steep slopes, and possible sharp objects such as broken glass, gabion baskets, metal, fencing, needles, or any debris with sharp or pointed edges or corners.
5. Perform field work in teams of two whenever possible.
6. Storm sewer outfalls contain a variety of waterborne bacteria and other harmful chemicals. Wash hands or use antibacterial wipes or hand gels liberally, especially prior to lunch breaks, etc.
7. Any work in confined spaces will be performed by technicians who are appropriately trained and certified for such work.

4.0 DATA MANAGEMENT/QUALITY CONTROL

Data will be captured electronically in the field using a data entry form designed specifically for this effort that is operated with a hand-held computer. The data entry form is configured to display prompts that prevent the user from leaving key data fields blank. The template stores electronic data in a geodatabase. The data fields include those used for the county's dry weather screening efforts. If the hand-held unit fails, field crews will complete hardcopy field datasheets (Appendix C). The electronic datasheet will speed data collection and eliminate the need for post-field data entry, thereby saving time and preventing errors introduced by data entry mistakes.

At the conclusion of each field day, data recorded on the handheld unit will be backed up to a desktop computer and uploaded to a network computer system. This daily backup will lessen the chances of losing data due to theft, breakage, loss, or other failure of the handheld computer. If hardcopy field data sheets have been used, copies will be stored in a secure location, and information will be entered directly into the geodatabase via ArcPad. The list of outfall sites visited will be checked periodically against the target list of outfalls to be screened to be sure that none have been missed and no data have been lost.

A separate field data sheet will be used to record data related to tracking down the source of an improper discharge (Appendix C). Copies of these field data sheets will be stored in a secure location.

5.0 REFERENCES

- Brown, E., D. Caraco, and R. Pitt. 2004. Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments. Center for Watershed Protection, Ellicott City, MD. October.
- Pitt, R., M. Lalor, R. Field, D. Adrian, and D. Barbé. 1993. A User's Guide for the Assessment of Non-Stormwater Dischargers into Separate Storm Drainage Systems. EPA/600-R-92-238. Risk Reduction Engineering Laboratory, U.S.EPA. Cincinnati, OH.

APPENDIX A

FIELD EQUIPMENT CHECKLIST

ARLINGTON COUNTY EQUIPMENT CHECKLIST

Table C-1. Checklist of field equipment and supplies for dry weather screening	
Item	
Field maps (large and small scale) of study area	
GPS antenna	
GPS display	
Spare GPS Batteries	
Field data sheets (spare) on waterproof paper	
Pencils	
Measuring tape	
Flashlight	
Insect repellent	
Chest waders	
Knee boots	
First-aid kit	
Outfall water quality screening kit(s) and procedure manuals	
Calibrated sonde and display	
Backpack	
Orange/reflective vests	
Work gloves	
County letter of introduction	
Digital camera	
Spare batteries for digital camera	
Swing sampler and extender pole	
Polypropylene bottles for sharps/waste	
Polypropylene bottles (500 ml) for nutrients sample	
250-mL plastic cup	
500-mL wash bottle containing distilled water	
Gallon cubitainer (or equivalent) containing distilled water	

APPENDIX B

**STANDARD OPERATING PROCEDURES
FOR DRY WEATHER SCREENING**

B-1. Procedures for Water Chemistry Testing

Water chemistry and water quality measurements of outfall effluent (if present) will be obtained by the use of a single analyte meter (detergents, fluoride) and portable photometers (all others), and multiparameter sondes, respectively. The photometer and single analyte meter will measure concentrations of targeted, specific analytes that will be used to assess whether a possible illicit discharge exists. The multiparameter sonde measures water quality parameters such as conductivity, pH, and temperature as a secondary assessment of illicit discharge potential. Samples to be tested for nitrate, nitrite, and phosphorus will be placed on ice and tested in a controlled location (e.g., a laboratory).

Photometer (or equivalent)

The water chemistry testing equipment to be used during the field screening will consist of an economical, portable, battery powered photometer. Such photometers are versatile and can be configured to screen for a variety of indicators (e.g., ammonia and chlorine) of illicit discharge. The detection range is appropriate to the screening criteria that are being employed. Dedicated single-analyte comparator kits will be used for analytes for which photometric analysis is not available.

Calibration – Initial calibration of the photometer is achieved by inserting the zeroing ampoule from the appropriate test kit. Photometric solutions and ampoules that are expired shall not be used for field screening. There are no specific QC requirements for field photometers except for practicing proper technique in the field in accordance with the manufacturer's instructions. The portable photometer will be maintained according to the manufacturer's specifications.

Preparing sample – Depending on the test, the sample is prepared by pouring a measured amount of effluent into a sample cup. An appropriate chemical is added to the sample in the cup. A testing ampoule from the appropriate kit is inverted into the sample and the tip snapped off against the side of the cup, allowing the sample to flow into the ampoule.

Reading sample – The sample is read by wiping the exterior of the ampoule completely dry and inserting it into the sample cell adaptor. The mark on the ampoule is lined up with the arrow on the bottom of the adaptor. The ampoule is covered with a light shield, and the photometer is instructed to measure the sample. The photometer automatically waits the specified development time, then displays the result in parts per million (ppm) of the particular analyte.

The following steps are specific to Chemetrics test kits for chlorine, ammonia, nitrate, nitrite, and phosphorus. If other kits are used, follow manufacturer instructions.

Total Chlorine

1. Rinse sample cup from Chlorine Test Kit three times. Fill to **25 ml** mark with sample.
2. Add **5 drops** Activator Solution, stir briefly with ampoule tip, wait **1 minute**.

3. Place ampoule in sample cup and snap tip by pressing on side of cup. Allow ampoule to fill (it will leave a small bubble, which facilitates mixing).
4. Invert ampoule several times to mix, allowing bubble to travel from end to end each time. Tap ampoule on hard surface to cause any small bubbles to rise to top of liquid.
5. Wipe ampoule completely dry. Continue with directions under **Reading Sample**.
 - Use program number **32**
 - There will be a **1 minute** automatic wait for color development

Ammonia

1. Rinse sample cup from Ammonia Test Kit three times.
 2. Add **5 drops** of Stabilizer Solution to the empty sample cup.
 3. Fill to **25 ml** mark with sample.
 4. Add **2 drops** Catalyzer Solution, stir briefly with ampoule tip.
 5. Add **2 drops** Activator Solution, stir briefly with ampoule tip.
 6. Immediately place ampoule in sample cup and snap tip by pressing on side of cup. Allow ampoule to fill (it will leave a small bubble, which facilitates mixing).
 7. Invert ampoule several times to mix, allowing bubble to travel from end to end each time. Tap ampoule on hard surface to cause any small bubbles to rise to top of liquid.
 8. Wipe ampoule completely dry and wait **15 minutes** for color development. Continue with directions under **Reading Sample**.

Nitrate

1. Using the syringe or pipet, measure and dispense **2 mL** of the sample to be tested into the reaction tube. Dilute to the **15 mL** mark with distilled water.
2. Empty the contents of one Cadmium Foil Pack into the reaction tube. Cap the reaction tube and shake it vigorously for exactly **3 minutes**. Allow the sample to sit undisturbed for **2 minutes**.
3. Pour **10 mL** of the treated sample into the empty 25 mL sample cup, being careful not to transfer any cadmium particles to the sample cup.
4. Place ampoule in sample cup and snap tip by pressing on side of cup. Allow ampoule to fill (it will leave a small bubble, which facilitates mixing).
5. Invert ampoule several times to mix, allowing bubble to travel from end to end each time. Tap ampoule on hard surface to cause any small bubbles to rise to top of liquid.
6. Dry the ampoule and wait **10 minutes** for color development.
7. Insert the ampoule into the photometer, flat end first, and obtain a test result

Nitrite

1. Fill the sample cup to the **25 mL** mark with the sample to be tested.

2. Place the ampoule, tip first, into the sample cup. Snap the tip. The ampoule will fill leaving a bubble for mixing.
3. To mix the ampoule, invert it several times, allowing the bubble to travel from end to end.
4. Dry the ampoule and wait **10 minutes** for color development.
5. Insert the ampoule into the photometer, flat end first, and obtain a reading in ppm (mg/Liter) nitrite-nitrogen (NO₂-N).

Total Phosphorus

1. Preheat the digester to **150°C**.
2. Remove the cap from a Total Phosphate Vial and add **5 mL** of the sample to be tested.
3. Remove the Oxidizer Powder from the storage bag. Replace the flat cap on the bottle of Oxidizer Powder with the powder dispenser cap. Open the plug on the top of the powder dispenser cap. Position the dispenser above the vial and press the button once to dispense a single dose.
4. Securely cap the Total Phosphate vial. Invert the vial several times to mix the contents.
5. Place the vial into the preheated digester. Allow the vial to heat in the digester for **30 minutes at 150°C**.
6. Turn the digester off and remove the hot vial from the digester and place it in a rack to cool to room temperature. Allow at least **30 minutes** for the vial to cool.
 - CAUTION: The hot vials are under pressure and may shatter if dropped or rapidly cooled.
7. Wipe the exterior of the vial until it is clean and dry. Place the vial into the photometer sample compartment and zero the instrument.
8. Remove the vial from the photometer. Using the syringe with tip provided, dispense **1 mL** of Neutralizer Solution into the vial using care not to touch the syringe tip to sides of the vial. Securely cap vial. Invert the vial several times to mix the contents.
 - If the syringe tip comes in contact with the glass vial, the tip will become contaminated and must be cleaned before it is used again.
9. Add **3 drops** of Stabilizer Solution. Securely cap vial. Invert the vial several times to mix the contents.
 - For samples with more than 5000 ppm chloride, adjust the drops of Stabilizer Solution: 5000-10,000 ppm Chloride; use 5 drops 10,000-20,000 ppm Chloride; use 7 drops 10.
10. While holding the double tipped ampoule in a vertical position, snap the upper tip using the tip breaking tool. Invert the ampoule and position the open end over the vial. Snap the upper tip and allow the contents to drain into the vial. Securely cap the vial. Invert the vial several times to mix the contents.

11. Remove the cap from the vial and place the funnel into the neck. Remove the Reducer Powder from the storage bag. Add **1 full scoop** of the Reducer Powder to the Total Phosphate vial. Tap the funnel gently on the neck of the vial to make sure that all of the powder falls into the vial.
12. Securely cap the Total Phosphate vial. Shake the vial vigorously for **10 seconds** to dissolve the powder and mix the contents.
13. Wipe the exterior of the vial until it is clean and dry and wait 2 minutes for color development. Read the vial in your photometer. If necessary, use the calibration equation below to obtain test results in ppm P. Accuracy may be impaired if test results are outside the stated test range.
 - $\text{ppm P} = 0.12 (\text{abs})^2 + 1.69 (\text{abs}) - 0.02$
 - NOTE: To convert test results to ppm PO₄, multiply test result by 3.06.

Detergents

Fill zero test tube (in detergents test kit) with **distilled water** and wipe dry. Insert into sample cell compartment. Press and hold button until display reads “---” then “0.00.”

1. Rinse red-tipped dropper bottle with sample 3 times, then fill to line with sample.
2. While holding ampoule in vertical position, **snap upper tip** using tip-breaking tool.
3. **Invert** ampoule and position open end over open dropper bottle. **Snap upper tip** and allow to drain into dropper bottle.
4. Cap dropper bottle and shake vigorously with thumb on red cap for **30 seconds**.
5. Loosen and re-tighten cap and then allow to stand undisturbed for **1 minute**. Layers should separate.
6. Remove red cap and slowly invert over a clean **test tube**. Squeeze bottle until all of the **clear** chloroform layer is in test tube. Remaining blue liquid should be disposed of and dropper bottle thoroughly cleaned before next sample.
7. Wipe dry and insert into meter. Allow test tube to stand undisturbed for **4 minutes**.
8. Press and release button; reading will appear immediately (Do NOT hold down button, or you will re-zero meter).

FL700 Fluoride Meter Calibration

Calibrate meter in the low range (0 to 5 ppm) for outfall screening.

1. Prepare 0.5 ppm fluoride solution by mixing 10ml of 1 ppm fluoride solution with 10ml of DI water.
2. Pour solution in fluoride meter sample cup to 2nd line.
3. Add 1 TSIAB reagent tablet in the cup and shake vigorously until it dissipates.
4. Gently wipe sensor clean with a damp cloth and then dry it.

5. Place the sensor in the 0.5 solution in the sample cup.
6. Press the CAL key and “CAL” will show up on the display, with 0.5 and 5.0 ppm reading.
7. Continue holding the CAL key until 0.5 ppm is blinking. Release the CAL key once the display stops blinking. The unit then enters Hold mode and is ready for use.

Calibrate every 12 hours or before every batch of samples.

Use 1 TSIAB reagent tablet for every sample taken.

Waste Disposal – Waste containers containing sharps from the field (typically 1-liter polypropylene bottle) will be capped, marked clearly as “glass” and placed in ordinary trash at the office. Waste containers containing liquid waste from screening tests (typically 4-liter glass jugs) will be stored in a secure location at the office until a licensed hauler is contracted to remove them. A written report of the detailed contents of the waste will be provided to the hauler.

APPENDIX C

DATA SHEETS

FOR DRY WEATHER SCREENING

Arlington County, VA – Dry Weather Screening

SECTION 1: BACKGROUND DATA

Watershed:	Outfall ID:	
Date (MM/DD/YY): ____ / ____ / 20 ____	Time (Military): ____ : ____	
Investigators:	Form completed by:	
Rainfall: Last 24 hours: ☐ < 0.1 inches ☐ > 0.1 inches Last 72 hours: ☐ < 0.1 inches ☐ > 0.1 inches		
Latitude (dd.dddd): ____ . ____ ° N	Longitude (dd.dddd): ____ . ____ ° W	GPS Unit:
Camera:	Photo #s:	
Notes/Comments (e.g., origin of outfall, if known):		

SECTION 2: OUTFALL DESCRIPTION

Location	Material	Shape	Dimensions (In.)
☐ Closed Pipe	☐ RCP ☐ CMP ☐ PVC ☐ HDPE ☐ Steel ☐ Terra-cotta ☐ Other: _____	☐ Circular ☐ Box ☐ Elliptical ☐ Arch ☐ Other: _____	☐ Single ☐ Triple ☐ Double ☐ Other: _____ Dimensions: _____ Height: _____ Width: _____
☐ Open Drainage	☐ Concrete ☐ Rip-Rap ☐ Earthen ☐ Other: _____	☐ Trapezoid ☐ Parabolic ☐ Other: _____	Depth: _____ Top Width: _____ Bottom Width: _____
Outfall Elevation: Suspended Height (ft): _____ / Submerged Depth: In Water (ft): _____ In Sediment (ft): _____			
Outfall Cover: ☐ Steel Grate ☐ Cage ☐ None ☐ Other: _____			
Outfall Protection: ☐ Rip-Rap ☐ Gabion Basket ☐ Concrete ☐ None ☐ Other: _____			
Outlet Erosion: ☐ None ☐ Minimal Erosion ☐ Moderate Erosion ☐ Heavy Erosion ☐ Silted			
Erosion Source:			
Headwall Condition: ☐ No Headwall ☐ Good ☐ Fair ☐ Poor			
Flow Present? ☐ Yes ☐ No ☐ Intermittent ☐ Stagnant If No, Skip to Section 5			
Flow Depth (In.):			

SECTION 3: QUANTITATIVE CHARACTERIZATION

FIELD DATA FOR FLOWING OUTFALLS					
PARAMETER	RESULT	UNITS	PARAMETER	RESULT	UNITS
Chlorine	__ . __	mg/L	Nitrate	__ . __	mg/L
Fluoride	__ . __	mg/L	Nitrite	__ . __	mg/L
Ammonia	__ . __	mg/L	Phosphorus	__ . __	mg/L
Detergents	__ . __	mg/L	pH	__ . __	pH Units

(Form adapted from Brown, *et al.* 2004)

Arlington County, VA – Dry Weather Screening

Outfall ID:

Today's date:

SECTION 4: PHYSICAL INDICATORS FOR FLOWING OUTFALLS ONLY

INDICATOR	CHECK if Present	DESCRIPTION
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Chemical ☐ Other: _____
	<i>Relative Severity</i>	☐ 1 – Faint ☐ 2 – Easily detected ☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other: _____
	<i>Relative Severity</i>	☐ 1 – Faint colors in sample bottle visible in outfall flow ☐ 2 – Clearly visible in sample bottle ☐ 3 – Clearly
Turbidity	☐	See severity
	<i>Relative Severity</i>	☐ 1 – Slight cloudiness ☐ 2 – Cloudy ☐ 3 – Opaque
Floatables	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other: _____
	<i>Relative Severity</i>	☐ 1 – Few/slight ☐ 2 – Some ☐ 3 – Widespread

SECTION 5: PHYSICAL INDICATORS FOR BOTH FLOWING AND NON-FLOWING OUTFALLS

INDICATOR	CHECK if Present	DESCRIPTION COMMENTS
Outfall Damage	☐	☐ Spalling, Cracking or Chipping ☐ Peeling Paint ☐ Corrosion
	Comments	
Deposits/Stains	☐	☐ Oily ☐ Flow Line ☐ Paint ☐ Other: _____
	Comments	
Abnormal Vegetation	☐	☐ Excessive ☐ Partially Inhibited ☐ Totally Inhibited
	Comments	
Poor pool quality	☐	☐ Odors ☐ Colors ☐ Floatables ☐ Oil Sheen ☐ Suds ☐ Excessive ☐ Algae ☐ Other: _____
	Comments	
Pipe algae growth	☐	☐ Brown ☐ Orange ☐ Green ☐ Other: _____
	Comments	
Trash	☐	☐ Aluminum ☐ Glass bottles ☐ Plastic bottles ☐ Paper ☐ Styrofoam ☐ Other: _____
	Comments	

SECTION 6: OVERALL OUTFALL CHARACTERIZATION OF ILLICIT DISCHARGE POTENTIAL

☐ Unlikely ☐ Potential (presence of ≥ 2 Section 5 indicators)	☐ Suspect (≥ 1 Section 4 indicator with a severity of 3) ☐ Obvious (≥ 1 WQ indicator)
---	--

SECTION 7: NON-ILLICIT DISCHARGE CONCERNS

(Form adapted from Brown, *et al.* 2004)

Appendix H

Arlington County Wet Weather Screening Plan

**ARLINGTON COUNTY
WET WEATHER
AND HIGH RISK
SCREENING PROGRAM:
SITE SELECTION AND
SCREENING PLAN**

Prepared for

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June 11, 2014

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1.0 INTRODUCTION AND PURPOSE

Arlington County, like other urbanized areas, is addressing the effects of nonpoint source pollution entering surface waters. A major source of pollution is untreated stormwater runoff from impervious surfaces such as roads, parking lots, loading docks, and outdoor storage areas. Runoff from these surfaces is carried to surface waters via the storm sewer system.

The purpose of this plan is to establish the screening methodology for use in implementing [1.B.2.m.2 – wet weather screening program] of Arlington County’s Municipal Separate Storm Sewer System (MS4) Permit.

This program plan describes site selection, field reconnaissance, and wet weather screening protocols for evaluating high risk (commercial and/or industrial) facilities that may be contributing excessive pollutant loading to the County’s MS4.

This document contains the following:

- site selection protocol that uses geographic information system (GIS) data to identify industrial and commercial facilities and to rank them according to their potential to contribute pollutants to the MS4.
- field reconnaissance protocol and wet weather screening methods to be used for screening a subset of the selected sites

2.0 SITE SELECTION AND PRIORITY DETERMINATION

In accordance with its MS4 permit, Arlington County will identify areas that are thought to be contributing significant pollutant loads including floatables during wet weather to the MS4. The County uses available data to select applicable industrial and commercial parcels for investigation and possible wet weather screening.

Site selection and prioritization was developed using the following process:

- a) conduct desktop GIS analysis to identify sites
- b) geo-reference County sites of concern
- c) prepare preliminary list of sites for field verification, and
- d) prepare final prioritized list from reconnaissance results.

Any candidate properties located within the Four Mile Run Industrial Area were removed from consideration as potential industrial sites within the industrial area and will be selected using a separate protocol (Section 2.2.3). Potential sites within the Four Mile Run Industrial Area are selected separately in a parallel protocol because the County's Permit requires a facility within the area to be included in all screening efforts.

2.1 GENERAL FACTORS FOR IDENTIFYING CANDIDATE SITES

Categories of criteria that are used to identify potential areas for wet weather screening using the desktop GIS analysis are described below.

2.1.1 Land Use

Specific land use data are used to identify those industrial and commercial areas that are most likely to be the source of high levels of pollutants entering the storm drain system. Specifically, commercial, service industry, and mixed land use categories are used to target site selection efforts.

2.1.2 Parking Lot Area

The availability of impervious surfaces on a commercial or industrial parcel was identified as an indicator of pollution potential. Parking areas have the potential to accumulate drips, spills, waste, and other pollutants such as sediment and trash as a result of routine operations, accidents, or carelessness. During precipitation events, accumulated material may be transported via stormwater runoff to the storm drain system. Parking lot area is used as a surrogate for extent of impervious surfaces. The parking lot area as a percentage of total parcel size is used as a ranking criterion.

2.1.3 Building Age

Generally, the older a commercial or industrial facility is, the greater the likelihood of pollution problems developing onsite. Building age is used to identify those facilities that may not have modern stormwater controls, have older sanitary sewer connections, or are in a state of disrepair and may be leaching pollutants from onsite structures.

2.1.4 Property Class

The class of commercial and industrial properties is used to specifically identify types of businesses that are of concern to the County and which are more likely to contribute pollutant loading to the MS4. Commercial properties that have been identified by the County include retail shopping centers, restaurants, and auto-related businesses (which are specified in the County's permit) are included in this ranking step.

2.2 SITE SELECTION PROTOCOL

Sites that will undergo wet weather screening are drawn from industrial and commercial facilities identified using (a) desktop GIS selection protocol and (b) facility lists maintained by the County.

2.2.1 Desktop GIS Site Identification

The goal of the GIS-based site selection process is to establish a systematic strategy for targeting facilities or sites that have the greatest potential for contributing significant pollutant loading to the MS4. This process increases efficiency of finding possible pollution sources while reducing the amount of staff time spent considering unlikely sites. Site selection using GIS employs a two-tiered site characterization method that (1) targets commercial and industrial facilities, and (2) targets specific parcels that have the greatest potential for contributing polluted runoff via ranking using scoring criteria. Properties containing businesses that typically have a high probability of generating polluted runoff (including automotive businesses) and properties located within the Four Mile Run and Lower Long Branch watersheds will be given higher weighting than other properties. Properties containing older buildings and properties with a large amount of parking lot area will also be given more weight. Table 2-1 lists Arlington County's GIS coverages and data sets relevant to this effort.

The desktop GIS site selection procedure is detailed below.

Step 1: Exclude secure federal facilities such as Reagan International Airport and the Pentagon.

Step 2: Select only parcels that contain the following land use types:

- Service Commercial (201)
- General Commercial (202)
- Service Industry (203)
- Medium Density Mixed Use (501)
- High-Medium Residential Mixed-Use (502)

Step 3: Intersect the Property layer with the Parking Lot layer and calculate the percentage of each parcel that is covered by parking lot. A **Parking Lot Area** score will be assigned to each property using the following scoring system:

- > 65% cover = 2 points
- 30-65% cover = 1.5 points
- 10-30% cover = 1 point
- < 10% cover = 0.5 points

Step 4: Determine the age of each property by merging Real Estate tables and joining to the Property Layer. A **Building Age** score will be assigned to each property using the following scoring system:

- Built before 1960 = 3 points
- Built between 1960 and 1980 = 2 points
- Built after 1980 = 1 point
- No building age = 0 points

Step 5: Determine the property class of each property by joining the Real Estate Inventory table with the Property layer. Property classes associated with the auto industry (253 and 254), warehouses (251), retail strips (211), neighborhood centers (214), fast food (216), and non-fast food restaurants (212) will be considered high priority. Property classes associated with commercial parking (210) and other general commercial activities (215) will be considered medium priority. All other property classes will be considered low priority. A **Property Class** score will be assigned to each property using the following scoring system:

- Property class is either 211, 212, 214, 216, 251, 253, or 254 = 3 points
 - 211 = Retail strip
 - 212 = Restaurant/eating facility
 - 214 = Neighborhood Center
 - 216 = Fast Food
 - 251 = Warehouse
 - 253 = Service station
 - 254 = Auto dealership

- Property class is either 210 or 215 = 2 points
 - 210 = General Comm Parking
 - 215 = Gen Comm – other
- All other property classes = 1 point

Step 6: Determine if each property is located within a watershed containing a TMDL or impaired waterway of interest to the County (Four Mile Run and Lower Long Branch). A **TMDL Watershed** score will be assigned to each property using the following scoring system:

- Property is within the Four Mile Run or Lower Long Branch Watershed = 2 points
- Property is not within the Four Mile Run or Lower Long Branch Watershed = 1 point

Step 7: Determine an overall pollution potential score by summing the scores calculated in Steps 3-6, and normalizing the sum by the number of available categories (4 categories for properties with an associated building age, 3 categories for properties without an associated building age).

2.2.2 High Risk Commercial and Non-Permitted Industrial Facilities

Arlington County maintains a list of non-permitted industrial and commercial facilities, including automotive repair shops, automotive body shops, automotive service gas stations, and dry cleaning businesses inspected by the County Fire Marshal Office, along with a list of restaurants and grocery stores inspected by the County Health Department that are located within the County. Properties inspected by the Fire Marshal Office and Health Department that meet the following criteria are selected for a field assessment:

- Property is located within the Four Mile Run or Lower Long Branch Watershed
- Property is not located within the Four Mile Run Industrial Area

Note that several of the geo-referenced sites in the lists maintained by the County are located in land use areas that are not included in the categories used in the GIS desktop exercise above.

2.2.3 Stormwater Infrastructure Verification using GIS

The County's stormwater GIS dataset is used to examine onsite stormwater infrastructure for all properties that received a pollution potential score of 2.375 or higher from the GIS desktop analysis (Section 2.2.1) and for all of the sites from the lists of County concern (Section 2.2.2). Only properties that contain County-owned stormwater infrastructure and a portion of the stormwater infrastructure network that originates within the candidate site are visited for a field assessment (Section 2.3) to verify suitability for screening.

For the separate Four Mile Run Industrial Area site selection protocol, all parcels within the area are examined for availability of infrastructure and suitability for screening.

2.2.4 Preliminary Site List Preparation

The protocol described above is used to prepare a preliminary list of sites for reconnaissance to verify suitability for wet weather screening. The list is comprised of the highest ranking sites from the GIS desktop portion of the protocol (50%) and sites of County concern (50%) that have favorable stormwater infrastructure as determined using GIS stormwater network coverage.

Any candidate properties located within the Four Mile Run Industrial Area, or any properties that were assigned the incorrect property class code and are associated with businesses that are typically low risk polluters, are removed from consideration. A separate list of candidate sites within the Four Mile Run Industrial area is prepared based on the results of the GIS verification of stormwater infrastructure.

2.3 FIELD RECONNAISSANCE PROTOCOL

Sites identified as candidates for screening according to the site selection protocol are visited to obtain additional information regarding ease of access and sampleability. Field maps prepared for reconnaissance include streams, watersheds, outfalls, the storm sewer network, and major and minor roads. Site conditions are photo-documented. The field reconnaissance protocol consists of the following steps:

1. Evaluate the parcel visually for the presence of trash, poor housekeeping, suspicious spills or stains, and the presence (or absence) and condition of secondary controls (USEPA 2005). Record observations on standard hotspot investigation data sheet (Appendix A).
2. Evaluate site accessibility, security of the area, and storm network accessibility for the purpose of locating an automated sampler. Verify that the stormwater network services the portion of the parcel that experiences the greatest impact from pollution-causing activities. Open manholes and determine the suitability of placing a compact automated sampler within the manhole or at-grade adjacent to the manhole. Verify the diameter of the pipe and depth of the hole to determine the need for personnel trained and certified to work in confined spaces and to identify the required inserts for monitoring equipment (spring ring, scissors ring, or weir). Traffic control authorization and training may be required.

Field data sheets are used to document the visual survey performed in Step 1 of the Field Reconnaissance Protocol above (Appendix A). A hotspot status score is calculated for each site, which is based on the total number of elements tallied on the field reconnaissance data sheet. Sites with the highest hotspot status scores will be considered to have the highest potential for

pollutant discharge to the storm drain system. Factors considered in Step 2 of the Field Reconnaissance Protocol could hinder monitoring or eliminate a site from consideration (e.g., inaccessibility, blocked infrastructure, cannot deploy a sampler). The final prioritized list of wet-weather screening sites is prepared from hotspot status score and stormwater infrastructure suitability information obtained during field reconnaissance.

Table 2-1. GIS layers and data to be used to select industrial/commercial parcels for wet weather screening					
Description	Geodatabase	Feature Dataset/Table	Feature Class	Source File Date	Areal Extent
Stormwater Mains	ArlingtonData.mdb	StormWater	StormWater_arc	2013	County
Stormwater Junctions and Outfalls	ArlingtonData.mdb	StormWater	StormWater_node	2013	County
County Watersheds	ArlingtonData.mdb	StormWater	Watershed_poly	2013	County
Land Use	ArlingtonData.mdb	GLUP	GLUP	2013	County
Stormwater Mains Table	ArlingtonData.mdb	IMP_CW_STORM_MAINS*	N/A	2013	County
Stormwater Junctions and Outfalls Table	ArlingtonData.mdb	IMP_CW_STORMS_NODES*	N/A	2013	County
Property Boundaries	ArlGIS_2013.mdb	REA	Property_poly	2013	County
Parking Lots	ArlGIS_2013.mdb	Pave	Parkinglot_poly	2013	County
Buildings	ArlGIS_2013.mdb	Building	Building_poly	2013	County
Real Estate Inventory Table	DataExtract2013.mdb	ReInventory*	N/A	2013	County
Commercial Real Estate Table	DataExtract2013.mdb	ReCommercial*	N/A	2013	County
Residential Real Estate Table	DataExtract2013.mdb	ResidentialParcels*	N/A	2013	County
Condo Real Estate Table	DataExtract2013.mdb	ReCondo*	N/A	2013	County
Real Estate Property Addresses	DataExtract2013.mdb	RePropertyAddress*	N/A	2013	County
County Aerial Imagery	arl_mosaic_2011_1ft.sid [#]	N/A	N/A	2011	County
* Denotes Table					
# Denotes MrSID file not associated with a geodatabase					

3.0 FIELD PROTOCOL FOR WET WEATHER SCREENING

This section details the water chemistry and floatables protocols to be followed during implementation of wet weather screening. This section consists of descriptions of sampling equipment, analytes, sampling frequency, and antecedent conditions. Specific instructions for operating sampling equipment and health and safety procedures are provided in Appendix B and Appendix C, respectively.

3.1 SAMPLING METHODS

3.1.1 Station Preparation

An inspection of the outfall from the target facility is conducted by field staff when ancillary equipment is installed. Secondary indicators of illicit (non-stormwater) discharge are noted in the installation log. Secondary indicators include: presence of foul or petroleum odors, buildup of stains or deposits along the wetted perimeter of the pipe that are not generally associated with stormwater runoff, or presence of floatables on a debris line within the pipe. Degradation of outfall material (rusting or channelization of pipe) is also a secondary indicator of illicit discharge. The condition of catch basins or manhole structures into which field staff enter are also considered.

3.1.2 Water Chemistry

Sampling is conducted using both grab and automated sampling approaches (USEPA 2002). The electronic, automated sampler collects discrete samples of runoff at fixed intervals throughout a storm. Sampling repeatedly throughout a storm is important for many pollutants because various pollutants of interest mobilize and are delivered to the MS4 at different times depending on the rate and duration of rainfall. A discharge volume-weighted composite sample provides an accurate representation of the overall concentration of given analyte in the runoff from a site. A grab sample is taken by hand at a specific point in time during the storm's progress (e.g., during first flush). Certain parameters are at their highest concentrations during the initial stages of a runoff event.

One grab sample and one composite sample is obtained at each sampling point and transported to an approved, Virginia-certified analytical laboratory to be tested for the analytes listed in Table 3-1. The grab sample is tested for *E. coli* and TPH. The composite, automated sample is tested for the remaining parameters. Samples obtained by grab and automated means are transferred to laboratory bottles of the required type and containing appropriate preservative.

Grab samples are taken remotely by using an extender pole with swing sampler attached. A Teflon pitcher is attached to the swing sampler. Automated samplers (ISCO model 6712C or equivalent) are attached to the appropriate pipe leading into the MS4 from the selected site of

interest. The pipe should be as far upstream in the MS4 as possible so that the parcel is isolated from other pollutant inputs. Flow rates are logged at all sampling points to enable flow-weighted compositing of samples. The flow-logging apparatus is secured (e.g., with scissors ring) within the pipe for the duration of screening at a site (i.e., four storms). Individual samples are combined into a discharge volume-weighted composite sample. Field technicians measure composite pH and specific conductivity before delivering samples to the laboratory.

Table 3-1. Laboratory analytes and detection limits for Arlington County's wet weather screening and industrial/high risk monitoring program

Constituent (units)		Detection Limit	Method
<i>E. Coli</i> (col/100mL)	Grab	1	SM 9223B
TPH (mg/L)		5	EPA 1664
Nitrate and nitrite (mg/L)	Composite	0.02	SM 4500 NO3-H
Ammonia (mg/L)		0.2	SM 4500 NH3-C
Total Suspended Solids (mg/L)		1	SM 2540 B
Chemical Oxygen Demand (mg/L)		10	EPA 410.4
Total Phosphorus (mg/L)		0.01	SM 4500 P-E
Total Kjeldahl Nitrogen (mg/L)		0.5	SM 4500 NH3-C
Zinc (µg/L)		20	EPA 200.8
Cadmium (µg/L)		2	EPA 200.8
Copper (µg/L)		2	EPA 200.8
Lead (µg/L)		2	EPA 200.8
Chromium (µg/L)		2	EPA 200.8
Nickel (µg/L)		2	EPA 200.8
Hardness (mg/L)		1	SM 2340 B

3.1.3 Floatables

Floatables monitoring is be carried out at each wet weather screening location at the same sampling point (i.e., in-line storm sewer pipe) as the water quality sampling. Field teams install netting apparatus similar in design to a Net Tech (Kristar Enterprises, Inc., Santa Rosa, CA) gross pollutant trap. The trap consists of a support ring and removable net with 4.75 mm mesh (Environmental Water Resources Institute 2007). The net may be attached directly to the scissors ring (described above) to provide an anchor and support. The net apparatus is adjustable to enable deployment in conduits of varying standard sizes.

Floatable debris is collected from the net after each rain event. Collected floatables are weighed to obtain total mass of material and then sorted into categories and counted. Counts of material are recorded on a field data sheet.

3.2 ANALYTES

Pollutants to be tested consist of nutrients, hydrocarbons, metals, bacteria, and sediment. Each category consists of specific pollutants that provide information about suspended material transport, contamination of impervious surfaces from heavy metals, and deposition and mobilization of nutrients commonly used in detergents and fertilizers.

3.3 SAMPLING FREQUENCY

The County's permit does not specify the sampling frequency or duration of areas of interest. Wet weather sampling of MS4 service areas is intended as a screen, not as a long-term monitoring effort at a particular site. Under this protocol, screening will be performed quarterly during one year at two selected non-permitted industrial or commercial facilities that are thought to be contributing excessive levels of pollutants to its MS4 (Table 3-2). One of the sites will include the Four Mile Run industrial area. Each quarter, two areas identified on the priority list will be screened.

Table 3-2. Schedule of Arlington County wet weather screening.	
Site	Screening Window
HSI-006 Strip Shopping Center, 2611 Columbia Pike	July 1, 2014 – June 30, 2015
HSI-032 Various auto repair businesses; 4068-4080 S. Four Mile Run Dr.	
HSI-010 Columbia Pike Shopping Center, 5027 Columbia Pike	July 1, 2015 – June 30, 2016
HSI-029 Comfort Inn Pentagon, 2480 S. Glebe Rd.	
HSI-022 Le Auto Services, 6970 Fairfax Dr.	July 1, 2016 – June 30, 2017
HSI-033 David's Car Wash, 4148 S. Four Mile Run Dr.	
HSI-003 Alamo Rental, 2780 Jefferson Davis Hwy.	July 1, 2017 – June 30, 2018
HSI-031 Shirlington Self-Storage, 2710 S. Nelson St.	

3.4 ANTECEDENT DRY PERIOD AND RAINFALL CRITERIA

Sampling after a dry period is beneficial because it reduces the possibility that an effort will be made to sample immediately after surfaces have been "washed" by a prior storm. Antecedent dry periods required by discharge permits typically range from 48 hours for BMP effectiveness studies to 72 hours for standard discharge permit monitoring programs (U.S. EPA 1992). A 72-hour antecedent dry period (rainfall < 0.03") will be observed in Arlington County's wet weather screening program.

Storms that are forecast to deliver 0.3 in. or more of rain within 24 hours are eligible for monitoring. A rainfall depth of 0.3 in. represents a moderate quantity that should produce sufficient runoff to allow automated sampling. Since the goal of the program is to sample a short distance down-network from a selected facility, a moderate quantity of rain may be needed to deliver sufficient runoff. The minimum rainfall depth may be revised if it affords insufficient runoff for automated sampling.

Eligible storms will be identified by staff meteorologists. Meteorologists will notify field staff when an anticipated storm is expected to deliver at least 0.3 in. of rainfall at a targeted site. Rainfall depth will be estimated from regional rainfall accumulation as determined by Doppler radar or from a local rain gauge identified by the County.

3.5 HEALTH AND SAFETY

Ensuring the health and safety of field personnel is the responsibility of every member of the staff for the project. The collective effort of all staff members in providing a healthy and safe work environment will minimize or eliminate the potential for accidents. In general, the following safety protocol will be followed to protect the field staff:

1. Bring and wear appropriate personal protective equipment (safety vests, eye protection, steel-toed shoes).
2. Perform field work in teams of at least two.
3. Bring cell phone and first aid kit on all field site visits.
4. Exercise caution when encountering any wildlife, off-leash pets, and hazardous plants. In addition, many outfalls are located in remote areas that may be near gathering places for homeless or transient individuals. Do not enter a potentially hostile area. Exercise caution when accessing manholes and outfall areas and when encountering uneven or slippery terrain (rip rap), steep slopes, and possible sharp objects such as broken glass, gabion baskets, metal, fencing, needles, or any debris with sharp or pointed edges or corners.
5. Use common sense during electrical storms and/or when severe conditions (e.g., high wind, hail) develop. The safety of field staff overrides all other considerations.
6. Storm sewers contain a variety of water-borne bacteria and other harmful chemicals. Wash hands or use anti-bacterial wipes or hand gels liberally, especially prior to lunch breaks, etc.
7. Any work in confined spaces will be performed by technicians who are appropriately trained and certified for such work.

Additional information on Health and Safety may be found in Appendix C, including information on field staff conduct, personal protective equipment, confined space entry, dangerous flora and fauna, unknown hazardous substances and wastes, bloodborne pathogens, remote areas, hand tool safety, weather-related hazards, and heat and cold stress.

4.0 DATA MANAGEMENT/QUALITY CONTROL

4.1 DOCUMENTATION OF FIELD MONITORING

Documentation of wet weather screening efforts will consist of the following:

- results of field reconnaissance in preparation for the wet weather screening
- construction, orientation, and size of the MS4 conduit that is being used as the sampling point for the site of interest
- the unique ID and physical location of the manhole that is being accessed (if any)
- GPS coordinates of the manhole being accessed if it is not on Arlington County's stormwater infrastructure GIS layer
- description of hardware inserted into the pipe at sampling point

For storm events, a dedicated data sheet (Appendix D) will be used to document sample location, rainfall depth, date of sampling initiation, serial numbers of automated sampler and flow module, names of field crew, discrete sample interval, discharge volume represented by each discrete sample, proportional aliquot of discrete sample used in compositing, date and time of sample composite.

For floatables monitoring, a dedicated field data sheet is used to document the quantity and count of captured floatable material for a given event. The field data sheet contains similar storm characteristic information as for water quality monitoring.

4.2 CHAIN OF CUSTODY

Chain of custody (COC) forms, used for all samples, are a permanent record of transfer of sample custody. Custom COC forms for this project are preprinted with the analytes and partial laboratory numbers particular to the activity at hand (e.g., composite; Appendix D). Field staff need only to complete the laboratory numbers, complete the columns designated for other information, line out any samples that will not be submitted, and sign the form. When picking up the samples for delivery to the laboratory, the laboratory courier signs and dates the COC form in the "Received By" box and leaves a photocopy for project records.

4.3 ISCO MODEL 6712C PORTABLE AUTOMATED SAMPLER

The sampler assembly consists of a keypad, pump, tubing, and sample bottle container which holds 24 plastic bottles. The 24 bottles are used to contain the discrete samples collected at intervals throughout the storm. Required maintenance involves checking the integrity of the suction tubing, checking to see that suction tubing is securely attached to the pump tubing (when

sampler is attached), making sure that pump tubing is properly threaded through the distributor arm, running the internal electronic maintenance cycle (includes electronic tests of RAM and ROM, mechanical tests of sample pump and distributor arm), and making sure the knurled knob that holds the distributor arm to the frame is tight. Monthly maintenance consists of running the sample pump to check for suction line integrity. The suction line at a sampling point is replaced when the apparatus is moved to a new site upon completion of sampling. The pump tubing is replaced annually.

5.0 NOTIFICATION

Appropriate staff of Arlington County's Department of Environmental Services, Office of Sustainability and Environmental Management (OSEM) will be notified when analytes exceed surface water criteria established in this plan (Table 5-1) or otherwise suggest substantial pollutant discharges from a site. OSEM will be notified by field personnel in a timely fashion when results are available. A description of the location of the facility, chemical results, and date and time of screening will be conveyed first to OSEM by phone and e-mail to Diana Handy (703-228-0772, Dhandy@arlingtonva.us). OSEM will contact DEQ and other county agencies subsequently by phone, e-mail, and/or letter, as necessary.

Note: If a hazardous material spill is suspected, staff will immediately call the County's Fire and Police Non-emergency service (703-558-2222) and OSEM.

Table 5-1. Laboratory analytes and detection limits for Arlington County's wet weather screening and industrial/high risk monitoring program		
Parameter	Detection Limit	Exceedance Criterion
<i>E. Coli</i> ^(a)	1 col/100mL	1173 col/100mL*
TPH ^(b)	5 mg/L	15 mg/L
Nitrate and nitrite ^(b)	0.02 mg/L	0.68 mg/L
Ammonia ^(b)	0.2 mg/L	19 mg/L
TSS ^(b)	1 mg/L	100 mg/L
COD ^(b)	10 mg/L	120 mg/L
Total phosphorus ^(b)	0.01 mg/L	2 mg/L
Total Kjeldahl nitrogen ^(b)	0.5 mg/L	1.5 mg/L
Zinc ^(a)	20 µg/L	120 µg/L
Cadmium ^(a)	2 µg/L	3.9 µg/L
Copper ^(a)	2 µg/L	13 µg/L
Lead ^(a)	2 µg/L	120 µg/L
Chromium ^(a)	2 µg/L	570 µg/L
Nickel ^(a)	2 µg/L	180 µg/L
Hardness	1 mg/L	N.A.
pH ^(b)		< 6 or > 9 pH units
Specific Conductivity		N.A.
^(b) Virginia State Water Control Board 2009 ^(a) Virginia State Water Control Board 2011 * Value cannot be exceeded in more than 10% of samples in assessment period N.A. = No EPA or Virginia acute standard available		

6.0 REFERENCES

- Environmental Water Resources Institute. 2007. ASCE Guideline for Monitoring Stormwater Gross Solids. American Society of Civil Engineers, Reston, VA. Draft, June.
- USEPA. 2005. Unified Subwatershed And Site Reconnaissance: A User's Manual, Version 2.0, Prepared for Office of Water Management, U.S. Environmental Protection Agency by Center for Watershed Protection, Ellicott City, MD.
- USEPA. 2002. Urban Stormwater BMP Performance Monitoring: Guidance Manual for Meeting the National Stormwater BMP Database Requirements. EPA-821-B-02-001. U.S. Environmental Protection Agency, Office of Water, Washington D.C. April.
- USEPA. 1992. NPDES Storm Water Sampling Guidance Document. EPA 833-B-92-001. U.S. Environmental Protection Agency, Office of Water, Washington D.C. July.
- Virginia State Water Control Board. 2009. General VPDES Permit for Industrial Activity Storm Water Discharges, Permit No. VAR05 Fact Sheet. Virginia Department of Environmental Quality, Richmond, VA. April.
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APPENDIX A
FIELD RECONNAISSANCE
DATA SHEET

Hotspot Site Investigation
HSI

WATERSHED:		SUBWATERSHED:		UNIQUE SITE ID:	
DATE: ____/____/____		ASSESSED BY:		CAMERA ID:	
MAP GRID:		LAT ____° ____' ____" LONG ____° ____' ____"		LMK #	
A. SITE DATA AND BASIC CLASSIFICATION					
Name and Address: _____		Category: ☐ Commercial ☐ Industrial ☐ Miscellaneous		INDEX*	
_____		☐ Institutional ☐ Municipal ☐ Golf Course			
_____		☐ Transport-Related ☐ Marina ☐ Animal Facility			
SIC code (if available): _____		Basic Description of Operation: _____			
NPDES Status: ☐ Regulated					
☐ Unregulated ☐ Unknown					
B. VEHICLE OPERATIONS ☐ N/A (Skip to part C)				Observed Pollution Source? ☐	
B1. Types of vehicles: ☐ Fleet vehicles ☐ School buses ☐ Other: _____					
B2. Approximate number of vehicles: _____					
B3. Vehicle activities (circle all that apply): Maintained Repaired Recycled Fueled Washed Stored ○					
B4. Are vehicles stored and/or repaired outside? ☐ Y ☐ N ☐ Can't Tell ○					
Are these vehicles lacking runoff diversion methods? ☐ Y ☐ N ☐ Can't Tell					
B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☐ N ☐ Can't Tell ○					
B6. Are uncovered outdoor fueling areas present? ☐ Y ☐ N ☐ Can't Tell ○					
B7. Are fueling areas directly connected to storm drains? ☐ Y ☐ N ☐ Can't Tell ○					
B8. Are vehicles washed outdoors? ☐ Y ☐ N ☐ Can't Tell ○					
Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☐ Can't Tell					
C. OUTDOOR MATERIALS ☐ N/A (Skip to part D)				Observed Pollution Source? ☐	
C1. Are loading/unloading operations present? ☐ Y ☐ N ☐ Can't Tell ○					
If yes, are they uncovered and draining towards a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell					
C2. Are materials stored outside? ☐ Y ☐ N ☐ Can't Tell If yes, are they ☐ Liquid ☐ Solid Description: _____ ○					
Where are they stored? ☐ grass/dirt area ☐ concrete/asphalt ☐ bermed area					
C3. Is the storage area directly or indirectly connected to storm drain (circle one)? ☐ Y ☐ N ☐ Can't Tell ○					
C4. Is staining or discoloration around the area visible? ☐ Y ☐ N ☐ Can't Tell ○					
C5. Does outdoor storage area lack a cover? ☐ Y ☐ N ☐ Can't Tell ○					
C6. Are liquid materials stored without secondary containment? ☐ Y ☐ N ☐ Can't Tell ○					
C7. Are storage containers missing labels or in poor condition (rusting)? ☐ Y ☐ N ☐ Can't Tell ○					
D. WASTE MANAGEMENT ☐ N/A (Skip to part E)				Observed Pollution Source? ☐	
D1. Type of waste (check all that apply): ☐ Garbage ☐ Construction materials ☐ Hazardous materials ○					
D2. Dumpster condition (check all that apply): ☐ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☐ Overflowing ○					
D3. Is the dumpster located near a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell ○					
If yes, are runoff diversion methods (berms, curbs) lacking? ☐ Y ☐ N ☐ Can't Tell					
E. PHYSICAL PLANT ☐ N/A (Skip to part F)				Observed Pollution Source? ☐	
E1. Building: Approximate age: _____ yrs. Condition of surfaces: ☐ Clean ☐ Stained ☐ Dirty ☐ Damaged ○					
Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☐ N ☐ Don't know ○					

*Index: ○ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)



HSI

A-4

APPENDIX B

**EQUIPMENT INSTALLATION, OPERATION,
AND SAMPLING PROCEDURES**

WET WEATHER SCREENING EQUIPMENT

The automated sampler to be employed will be an ISCO Model 6712C compact portable sampler capable of collecting up to 24 500-mL water samples in polyethylene bottles. The size of the samples and number of bottles will assure that several bottles will be filled corresponding to all portions of the storm event hydrograph. The automated sampler will be transported to the sampling sites prior to the storm event and removed after event conclusion. This sampler is of a size and configuration that will allow it to be inserted and retrieved from a manhole and suspended using a pro-hanger and appropriate harness (for manholes 18 to 24 inches in diameter). Alternatively, the samplers may be secured using rebar loops inserted into the ground and combination bicycle locks to discourage theft. During the event, each sampler will be covered by a lid to protect it from the effects of weather. The samplers will be powered by 12-volt Ni-Cd rechargeable batteries.



Figure B-1. Automated sampler placed in manhole using hanger and spring ring

Attached to all automated samplers will be an ISCO Model 730 bubbler flow module that will log the water flow rate in the pipes of interest. The flow module measures water level within the pipe based on overlying water pressure exerted on bubbles pumped from the module that exit the bubbler tubing at the base of the pipe. Flow rates are calculated from the water level measurements based on Manning's Equation. The bubbler line is mounted to a "spring ring" that is secured within the pipe.

B1. ON-SITE EQUIPMENT INSTALLATION

Materials, Equipment and Supplies:

1. Confined Spaces entry apparatus (if necessary) consisting of tripod, winch, lanyard, harness, oxygen meter.
2. Scissors ring or spring ring with appropriate extensions, where applicable
3. Remote installation tool
4. Bubbler line
5. Suction line and stainless steel low-flow strainer
6. Thel-mar weir
7. Ratchet set, English
8. Sensor carrier
9. Cable ties

Confined-spaces entry-certified personnel (see Appendix C) and apparatus are to be used if installation is to be within a pipe inlet to a below-grade junction (pipes greater than > 15" diameter only; for pipes less than 15", see step 3).

1. Measure outfall pipe and assemble scissors ring with designated extensions. Retract brace by rotating nut counter-clockwise with ratchet.
2. Install sensor carrier and attach bubbler line to sensor carrier. Attach suction line to low-flow strainer and attach strainer to sensor carrier using cable ties. Insert scissors ring in pipe just upstream of outlet orifice; orient scissors ring so that metal bubbler line outlet is in the invert of pipe, pointing downstream.
3. In the case of 15" diameter or less pipes, a remote, street-level installation tool can be used. Sensor carrier, strainer, and tubing are to be attached as described above.
4. The tubing can be tied off at the upper step of the closed manhole or threaded through manhole cover and secured on nearby brush until such time as storm event is monitored.

B2. PREPARATION FOR STORM EVENT

Materials, Equipment, and Supplies:

1. Programmable, automated sampler equipped with flow module
2. 24 500-mL polypropylene bottle configuration
3. Pro-hanger and harness for automated sampler
4. Ice

5. Bike locks or chain and padlocks
6. Ni-Cd battery
7. Floatables monitoring support & net.

Meteorology

Obtain storm forecast from staff meteorologist. The meteorologist should be, beforehand, made aware of antecedent dry-time criteria; minimum rainfall depth requirement; and lead time required to gather sampling equipment, travel to the site, obtain ice, and place and program sampler. Such lead time will vary with distance from equipment storage.

Deployment

1. Attach bubbler line and suction tubing to sampler. Attach suction line (other end) to low-flow strainer in pipe (if not already).
2. Attach floatables capture net to stainless steel ring support. Extend net slack down-conduit in the same direction as stormwater flow path.
3. Place ice in center of sampler. Make sure sampler is level.
4. When putting sampler back on top of bottom, make sure straps are outside, so distributor arm doesn't catch (or slip straps between bottle carrier and sampler bottom)
5. Program sampler to capture entire flow event. Program duration should reflect both the duration of the rain and estimated time allowance for sampling of trailing limb (rule of thumb for highly impervious catchments: 4 hours). To determine sample interval in minutes, multiply sum of the rainfall and trailing limb allowance in hours by 2.5.
6. Secure samplers to fencing or manhole steps using bike lock. Stabilize with line if necessary.
7. Attach sampler covers. Be sure that neither the suction line nor the bubbler tubing is pinched between the cover and sampler body. Also check the lines to be sure there are no holes.
8. If placing sampler in manhole using pro-hanger and harness, replace manhole cover by gently sliding horizontally over the hole. If the angle of the manhole is too great as it nears seating, it may press down on the pro-hanger with enough force to dislodge it and cause the sampler to drop to the bottom of the manhole.

B3. STORM SAMPLE COMPOSITING



Figure B-2. Discrete samples collected by automated sampler

Materials, Equipment, and Supplies:

1. Laptop PC running Flowlink software
2. Discrete sample bottle caps
3. Ice
4. Graduated cylinders (100-mL and 500 mL)
5. Scale

Methodology

Automated Sampler

1. Open sampler body and examine bottles for presence of liquid. Cap each discrete bottle if containing liquid. Replenish with ice if necessary. Close sampler body and transport it to office/laboratory for sample processing.
2. Download sampler data to laptop PC. Create hydrograph of downloaded level data covering the time that the sampler was onsite in the field. Convert continuous level

- data to flow rate using Manning's equation and input appropriate coefficients for the specific pipe.
3. Export combined level and flow rate data into .csv file (e.g., "sitename levelflow [date of storm].csv").
 4. Import level and flow rate data (name of level & flow files will appear as sites).
 5. Construct table of discharges in the usual way, using flow rate data just imported and appropriate sample interval.
 6. Export table of discharges to another .csv file (e.g., "sitename discharge [date of storm].csv").
 7. Open discharge export file in spreadsheet. Copy 1st 24 bottles and times to template file. The template file will automatically calculate discrete volumes (volumes to add to composite bottle) once the formula is corrected to reflect volume at peak discharge [discrete volume = 500 mL for compact sampler].
 8. Save the discrete volume file just created in Excel as a new file (e.g., "sitename discrete [date of storm].xls"). Print the spreadsheet and refer to it when compositing. Reduce discrete volumes by a proportional amount if the total volume is greater than the capacity of the 4-L bottle.
 9. Use graduated cylinders to measure discrete aliquots.
 10. After compositing, wash and rinse plastic bottles with soap, 10% nitric acid solution, and distilled water.

Note: because of variations in water level in pipe over time, a discrete sample may be low or nonexistent despite a measurable discharge volume represented by the discrete sample as measured by the flowmeter. This is due to the fixed time frame that the sampler takes samples. At the time that the sampler takes the sample, there may be insufficient water in the pipe despite the fact that there was sufficient water at a different time during the interval between discrete samplings.

Floatables

1. Detach net from supporting ring.
2. Note presence of scum or oily residue at water line of pipe.
3. In water quality laboratory, measure gross weight of net and contents.
4. Remove contents of net and place onto stainless steel analysis tray.
5. Determine weight of bedload items.
6. Count and record quantity of floatable objects of each type (e.g., aluminum cans, pieces of plastic, paper, etc.).
7. Rinse net with distilled water and obtain tare weight.

APPENDIX C

**HEALTH AND SAFETY GUIDANCE FOR
WET WEATHER SCREENING FIELD WORK**

GENERAL

Health and safety responsibility and accountability involves every employee. The collective effort of all employees in providing a healthy and safe work environment will minimize or eliminate the potential for accidents. In general, field sampling will require the following safety protocol to protect the field staff:

1. Perform field work in teams of at least two.
2. Bring cell phone and first aid kit on all field site visits.
3. Exercise caution when encountering any wildlife and hazardous plants. In addition, many outfalls are located in remote areas that may be near gathering places for homeless or transient individuals. Do not enter a potentially hostile area.
4. Use common sense during electrical storms and/or when severe conditions (e.g., high wind, hail) develop. The safety of field staff overrides all other considerations.
5. Storm sewers contain a variety of water-borne bacteria and other harmful chemicals. Wash hands or use anti-bacterial wipes or hand gels liberally, especially prior to lunch breaks, etc.

C1. CONDUCT

All field staff are expected to:

- Understand and comply with health and safety policies. Each employee is not only responsible and accountable for his/her own actions, but for those others around him/her.
- All employees shall show professional courtesy to fellow employees, clients, subcontractors, regulators, and visitors.
- Understand and follow good health and safety practices.
- Horseplay, practical joking, inattention to work or other inappropriate accident-causing behavior will not be tolerated.
- Smoking, eating, drinking and chewing shall be conducted only in designated areas.
- Use of alcohol or controlled substances is prohibited.
- While traveling to and from the job site, employees shall: obey all federal, state and local regulations regarding seat belt use, all traffic laws, and any other laws regarding proper conduct in public areas.

C2. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Engineering and administrative controls will be used as the primary means of exposure control, as required by OSHA standards. However, PPE may also be necessary to further minimize potential employee exposure. All employees shall dress appropriately for the tasks to be

performed. Specialized health and safety equipment, including personal protective equipment, monitoring equipment, and other devices designed to protect the employee shall be issued to the employee on an as-needed basis.

Employees performing field activities and certain laboratory functions have the potential of coming in contact with hazardous materials. Many of these hazardous materials can cause significant injury or illness through acute or chronic exposures. For field work (including industrial operations), all field employees are required to wear the following basic PPE:

- Appropriate work clothing
- ANSI-approved steel-toed, steel-shank boots
- ANSI-approved safety glasses
- ANSI-approved hard hat (when overhead hazards exist)
- Hearing Protection (when appropriate)
- Rain Gear (when appropriate)

C3. CONFINED SPACE ENTRY PROGRAM

A confined space is any location not intended for human occupation, has limited or no ventilation, has the potential for containing dangerous or lethal atmospheres, and has limited ingress/egress. OSHA has addressed confined space entry requirements and procedures in 29 CFR 1910.146 (Permit Required Confined Spaces) and 1926.651 (Excavations). Confined space entry, if necessary, will be performed in accordance with OSHA confined space entry procedures, industry-standard practices, and will be performed by confined space trained personnel.

The Team Leader will provide ongoing, real time ambient air monitoring of the locations to be sampled to determine the need for personal protection. Entry of the sampling personnel will be allowed if the following criteria are met:

- Oxygen level greater than 19.5%. Atmospheres with oxygen concentrations less than 19.5% are considered oxygen deficient and must be treated as Immediately Dangerous to Life and Health (IDLH) atmospheres.
- Lower explosive limit (LEL) reading is less than 3%

C4. DANGEROUS FLORA AND FAUNA

During the course of field activities, employees may come in contact with a wide range of dangerous or toxic animals and plants. Dangerous animals may include: black widow and brown recluse spiders; fire ants; mosquitoes and biting flies; bees, wasps and hornets; ticks and chiggers; microbial organisms (e.g., found in water, soil, and air and on carrier/host organisms); rabid mammals; and poisonous snakes. Dangerous plants may include: thorny plants; poison ivy, oak, and sumac; and molds, mildews, and fungi (which may cause allergic reactions). Contact with these organisms can cause effects from simple discomfort (such as from thorny bush

scratches) to severe allergic reactions and possibly death. If interactions do occur, take appropriate actions related to specific interaction and individual response to interaction.

C5. UNKNOWN HAZARDOUS SUBSTANCES AND WASTES

The nature of environmental consulting often times requires the investigation of hazardous substances or wastes whose identity is not known. Because of the serious personal and environmental consequences of unintentional release of chemicals, very specific health and safety procedures must be implemented to monitor ambient conditions, mitigate releases to the environment, and protect workers from exposure. Most of these procedures dovetail with site investigation, sampling, and remediation techniques outlined by EPA policy and should be included in the project comprehensive work plan.

C6. BLOODBORNE PATHOGENS

Exposure to bloodborne pathogens (BBP) is possible in the case of certain emergency situations. Personnel may be exposed to body fluids such as blood, saliva, vomit, mucus or others. These fluids could contain pathogens that have the potential for causing disease in humans. Should personnel be required to administer life saving procedures, such as CPR, the following procedures will be followed to minimize the potential for exposure:

- 1) Wear disposable gloves when hand contact with blood, mucus membranes, non-intact skin or other potentially infectious materials could be involved;
- 2) Use disposable mouthpieces, pocket masks or other ventilation devices for administering artificial ventilation;
- 3) Wash hands with soap and water after administering first aid;
- 4) In the case of eye contact, flush eyes using an eye wash for at least 15 minutes;
- 5) Remove garments contacted by blood or other body fluids as soon as possible;
- 6) Do not eat, drink, smoke or handle contact lenses in areas with possible BBP exposure; and
- 7) Persons cleaning up an accident scene should not pick up broken glass or other sharp objects by hand. All clothes and other items at the first aid scene should be safely secured prior to leaving.

Employees who may have been exposed to BBPs should report the incident at once.

C7. REMOTE AREAS

The sampling team may be located in areas not readily accessible by vehicle. Radio communication will be maintained from the sampling team to a base station in the event of an emergency.

C8. HEAVY LIFTING

It may be necessary to carry sampling equipment (e.g., coolers, sampling containers, and equipment) during the course of the field activities. Care must be taken to avoid injury while carrying equipment to the sampling locations.

C9. HAND TOOLS

Some of the field activities and sampling procedures may require the use of hand tools with sharp edges including machetes, scissors, clippers, knives, and razor blades. Care must be taken during their use to prevent injuries from cuts.

C10. WEATHER-RELATED HAZARDS

Weather-related hazards include the potential for heat or cold stress, electrical storms, treacherous weather-related working conditions, high winds, and limited visibility. These hazards correlate with the season in which site activities occur. In the event of adverse weather conditions, the Field Team Leader will determine if work can continue without endangering the health and safety of site personnel.

C11. HEAT AND COLD STRESS

This section is applicable to all personnel involved in field work as well as any other workers who may be exposed to temperature stress conditions.

C11.1 HEAT STRESS

Heat stress is a significant potential hazard during the warmer months. Heat stress manifests itself as one of three conditions: heat cramps, heat exhaustion, or heat stroke. Heat cramps are brought about by a prolonged exposure to heat. As an individual sweats, water and salts are lost by the body, triggering painful muscle cramps. The signs and symptoms of heat cramps include:

- Severe muscle cramps, usually in the legs and abdomen;
- Exhaustion, often to the point of collapse; and
- Dizziness or periods of faintness.

First aid treatment includes shade, rest, and fluid replacement. The individual will drink electrolyte-replacement fluids (e.g., Gatorade, Squencher, 10-K), which will be made available to field personnel. If the individual has not recovered within ½ hour, then he/she will be transported to the hospital for medical attention.

Heat exhaustion usually occurs in a healthy individual who has been exposed to excessive heat while working or exercising. Blood collects near the skin in an effort to rid the body of excess heat. The signs and symptoms of heat exhaustion include:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin, with heavy perspiration;
- Skin appears pale;
- Fatigue, weakness, and/or dizziness; and
- Elevated body temperature.

First aid treatment includes cooling the victim, elevating the feet, and replacing fluids. If the individual has not recovered within ½ hour, he/she will be transported to the hospital for medical attention.

Heat stroke occurs when an individual is exposed to excessive heat, and their body systems become overwhelmed by heat and begin to stop functioning. This condition is a medical emergency, requiring the immediate cooling of the victim and transport to the hospital immediately. The signs and symptoms of heat stroke include:

- Victim has stopped sweating;
- Dry, hot, red skin;
- Body temperature approaching or above 105° F;
- Dilated (large) pupils; and
- Loss of consciousness; victim may lapse into a coma.

Local weather conditions may produce an environment which will require restricted work schedules in order to protect employees. The Field Team Leader will observe workers for any potential symptoms of heat stress. Adaptation of work schedules and training in recognition of heat stress conditions will help prevent heat-related illnesses from occurring.

C11.2 COLD STRESS

Cold stress is a danger at low temperatures and when the wind chill factor is low. Cold stress is generally described as a local cooling (frost nip, frost bite, and freezing) or a general cooling (hypothermia). Personnel working outdoors in temperatures at or below freezing may be subject to local cooling. Areas of the body that have a high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. The three categories of local cooling include:

- Frost nip - characterized by a blanching or whitening of the skin;
- Frost bite - skin has a waxy or white appearance and is firm to the touch, but the tissue beneath is resilient; and
- Freezing - skin tissue is cold, pale, and solid.

Frost nip and frost bite first aid includes covering the affected area with warmth and retreating to a warm area. Frozen tissue is a medical emergency, and the victim will be transported to the hospital immediately.

General cooling (hypothermia) occurs when exposure to cold reduces body temperature. With prolonged exposure, the body becomes unable to maintain its proper internal temperature. Without treatment, hypothermia will lead to stupor, collapse, and death. The signs and symptoms of mild hypothermia include:

- Shivering;
- Numbness; and
- Drowsiness.

First aid for mild hypothermia includes using heat to raise the individual's body temperature. Heat may be applied to the victim in the form of heat packs, hot water bottles, and blankets.

The signs and symptoms of severe hypothermia include:

- Unconsciousness;
- Slowed respiration or respiratory arrest;
- Slowed pulse or cardiac arrest;
- Irrational or stuporous state; and
- Muscular rigidity.

First aid for severe hypothermia includes handling the victim very gently; rough handling may set off an irregular heart beat. Do not attempt to re-warm the severely hypothermic victim; re-warming may cause the development of an irregular heart beat. Severe hypothermia is a medical emergency, and the victim will be transported to the hospital immediately.

Prevention of cold stress is a function of whole body protection. Adequate insulated clothing will be worn when the air temperature drops below 50 °F. Reduced work periods may be necessary in extreme conditions to allow adequate periods in a warm area.

APPENDIX D

WET WEATHER SCREENING

FIELD DATA SHEETS

STORM EVENT
ARLINGTON COUNTY WET WEATHER SCREENING FIELD DATA

CREW		STATION	SVC AREA ID: _____	YEAR MONTH DAY							
Setup	Comp.										
STORM DURATION (hr)			SAMPLE INTERVAL (min)			SAMPLE BEGIN			TIME		
TOTAL STORM PRECIP (in)						SAMPLE END					

SLOPE: _____ DIAMETER: _____

SAMPLE COLLECTION DATA:

CONSTRUC. MAT'L: _____ ROUGHNESS: _____

FIRST FLUSH SAMPLES
DATE/TIME OF COLLECTION _____

HYDROGRAPH/COMPOSITE INFORMATION:

COMPOSITE SAMPLES
DATE/TIME OF COLLECTION _____

Bottle	Time	Interval discharge (cf)	Discrete vol
1 1			
2			
3			
4			
5			
6			
7			
8			
9			
1 0			
1 1			
1 2			
1 3			
1 4			
1 5			
1 6			
1 7			
1 8			
1 9			
2 0			
2 1			
2 2			
2 3			
2 4			

A	R					S	T					G	W	Q
---	---	--	--	--	--	---	---	--	--	--	--	---	---	---

INSERT TYPE: _____

MANHOLE ID: _____

LATITUDE: _____

LONGITUDE: _____

SAMPLER SERIAL: _____

MODULE SERIAL: _____

REVIEWED BY _____ DATE: _____

TSJ 04/14

ARLINGTON COUNTY WET WEATHER SCREENING

FLOATABLES MONITORING

Sample Collection Crew ____ / ____ Date/Time: _____

Site 1 Name/Address: _____

Site 2 Name/Address: _____

Gross Characterization of Net Contents

	Total Wt.	Tare Wt.	# Al cans	# Glass bottles	# Plastic bottles	# Plastic bags
Site 1						
Site 2						
	# plastic pieces	# Styrofoam & paper	Est. Wt. organic debris (seeds, leaves, sticks, bark; kg)		Est. Wt. bedload material (kg)	
Site 1						
Site 2						

Photodocumentation

Site 1 _____

Site 2 _____

Pipe characterization

Scum _____ Oil _____ Other floatable material not captured by net _____

Comments:

APPENDIX E
CHAIN OF CUSTODY FORM

MARTEL *CHAIN OF CUSTODY / SAMPLE INFORMATION FORM*
 Martel Laboratories JDS Inc. • 1025 Cromwell Bridge Road • Baltimore, MD 21286 • (410) 825-7790 • FAX (410) 821-1054

--	--

MARTEL Log # _____	Client Code _____	Sampler _____
Client Name/Phone/FAX _____		Project Name/# _____
Client Address _____		Contract/P.O Number _____
Invoice Address _____		Sample Turnaround Time _____

[illegible]

Transferred by:	Received by:	Date	Time	Cooler Receipt Information (LAB USE ONLY) Sufficient ice? - Yes/No If No, temp.= _____ Sample containers pres'd? - Yes/No If No, explain _____ Custody Seal present/intact? - Yes/No Initials: _____ Date: _____
Transferred by:	Received by:	Date	Time	
Transferred by:	Received by:	Date	Time	

Appendix I

MS4 Service Area Delineation Method

Appendix A – Method Used to Determine MS4 Service Area

Arlington County has estimated its MS4 Service area using the County Boundary in the Geographic Information System (GIS) and subtracting the following in accordance with DEQ guidance:

1. Permitted Facilities (including VDOT)
2. Other State, and Federal owned land (not permitted)
3. Forests and direct drainage into streams

Summary table, lands subtracted from MS4 service area:

Category	Total Area (Acres)	Impervious Area (Acres)	Pervious Area (Acres)
Arlington County Area	16,701.04	7,016.04	9,685.00
Permitted	3,316.00	1,578.60	1,737.4
State/Federal	720.85	126.15	594.7
Direct Drainage	1,337.63	89.81	1,207.22
MS4 Service Area	11,326.56	5,221.48	6,145.68

1. Permitted Facilities –

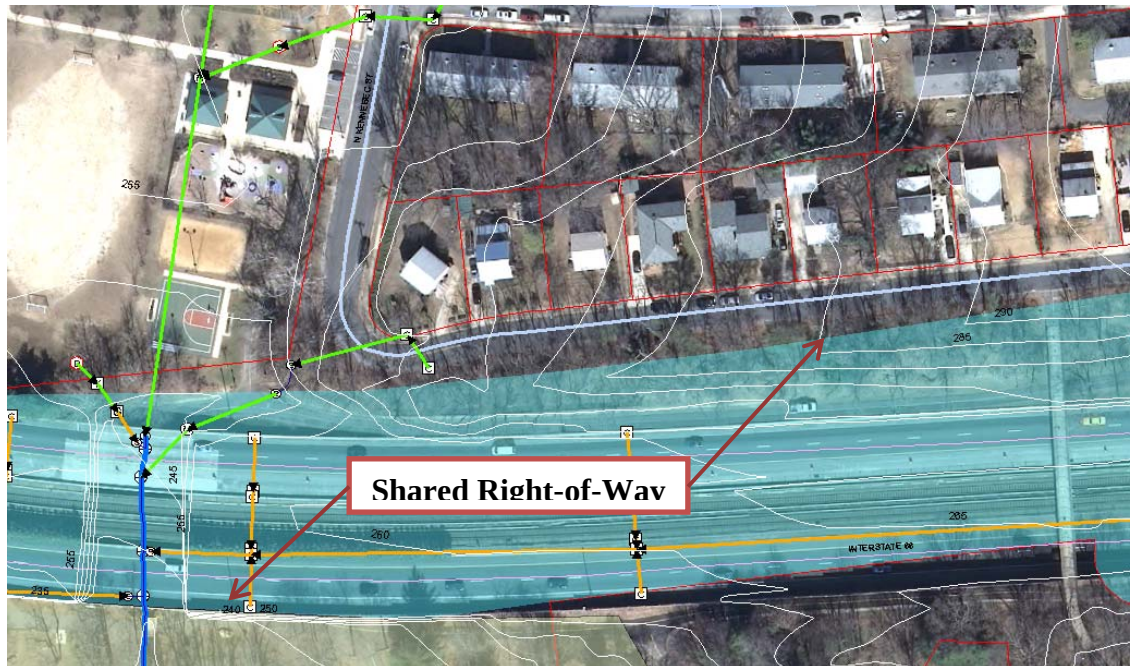
- a. Parcels were identified in the tax records and the entire parcel area was subtracted from the service area, regardless of drainage patterns.

Facility	Site Area (Acres)	Impervious Area (Acres)	Pervious Area (Acres)
Arlington County Water Pollution Control Facility	41.29	18.95	22.34
Arlington Hall / NFATC	84.94	29.89	55.05
George Mason University - Ballston Campus	7.59	4.64	2.95
George Washington Memorial Parkway	626.56	95.53	531.02
Joint Base Myer - Henderson Hall	280.79	132.31	148.48
NVCC Arlington	1.89	1.61	0.28
Red Top Cab - Transportation Incorporated	0.32	0.27	0.05
Ronald Reagan National Airport	723.07	440.06	283.01
US Department of Defense - Pentagon	232.74	157.12	75.62
US NPS - George Washington Memorial Pkwy Maint	4.78	3.19	1.59
Virginia Concrete Company Inc - Shirlington	3.05	1.81	1.23
WMATA - Four Mile Run Bus Garage	7	6.7	0.29
Arlington County Schools	358.33	140.93	217.4
Total	2,372.35	1,033.01	1,339.31

- b. Virginia Department of Transportation - In most cases VDOT areas are defined as the area within the right-of-way, except in areas where the right-of-way includes both VDOT and Arlington County roadways and VDOT and Federal roadways. In the case of shared right-of-way, VDOT's portions were determined with heads-up digitizing using the 2011 topography to determine the area draining into VDOT network.

Site Area (Acres)	Impervious Area (Acres)	Pervious Area (Acres)
943.68	545.63	398.04

Examples of each type of VDOT areas:





2. Other State and Federal owned land (not permitted)

Parcels were identified in the tax records and the entire parcel area was subtracted from the service area, regardless of drainage patterns for the following ownership:

Facility	Site Area (Acres)	Impervious Area (Acres)	Pervious Area (Acres)
Commonwealth	10.33	6.85	3.48
Federal*	710.52	119.3	591.22
Total	720.85	126.15	594.7

* Includes Arlington National Cemetery

3. Direct drainage into streams

Direct drainage into streams was determined with heads-up digitizing using the 2011 topography to determine the areas. Direct drainage is broken into three categories:

- a. Direct drainage Forest Streams – forested area that drains directly into streams¹.
- b. Direct Drainage Streams– non-forested area that drains directly into streams and does not drain into any portion of Arlington County’s MS4 system.
- c. Direct Drainage Private Streams – Areas that have privately owned storm sewer systems that drain directly into a stream and does not drain into any portion of Arlington County’s MS4 system.

Facility	Site Area (Acres)	Impervious Area (Acres)	Pervious Area (Acres)
Forest	.6	0	0
DD Forest Streams	484.75	6.36	478.39
DD Streams	548.57	38.25	480.32
DD Private Streams	303.71	45.20	248.51
Total	1337.63	89.81	1207.22

¹ Although DEQ guidance states that any forest land, including forest land that drains to the MS4, can be excluded from the MS4 service area, this situation does not exist in Arlington. Arlington’s forest lands are in stream valleys with direct drainage to the stream. There is a very small portion (<1 acre) of forest land that drains to the GW Parkway (a permitted property), and this small forest area is included in the numbers above for simplicity.

Examples of each type of direct drainage:

Direct drainage Forest Streams – forested areas that drain directly into streams.
Example shown below:



Direct Drainage Streams – non-forested area that drains directly into streams and does not drain into any portion of Arlington County's MS4 system.



Direct Drainage Private Streams – Areas that have privately owned storm sewer systems that drain directly into a stream and does not drain into any portion of Arlington County's MS4 system.

