

Crediting Nutrient Discharges from Grey Infrastructure



Today's Agenda

- Setting the Stage
- Basics About Nutrient Discharges
- The Expert Panel and Major Findings
- The Programmatic Credit
- Crediting Individual Nutrient Discharges

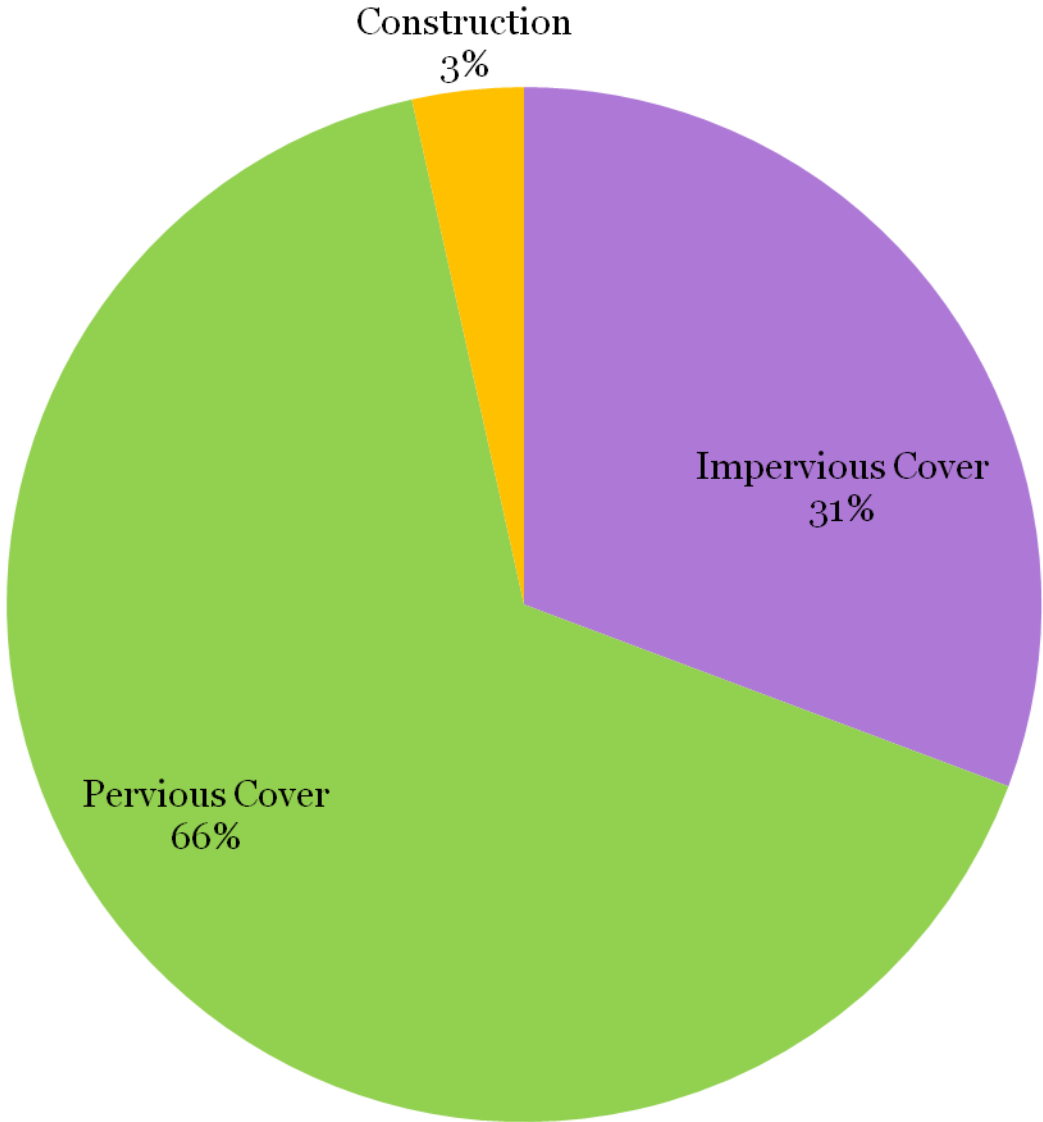
How Urban Land Cover is Represented in the Current Version of CBWM

	Impervious Cover	Pervious Cover
Acres in Watershed ¹	1,269,030	3,398,732
Average TN Load ² (lbs/ac/yr)	15.5	12.4
Total (lbs/yr)	19,669,965.00	42,144,276.80

¹ Acres as reported in most recent CBWM version 5.3.2

² Average values, as reported in Tetra Tech 2014a and ESC EP, 2014 (construction sites), although actual values are regionally variable

Nitrogen Loads from Urban Land in Chesapeake Bay Watershed



Major Findings

- Conclusive evidence that ND's increase N and P levels in dry weather urban stream flow
- Dry weather NDs collectively account for as much as 20 to 40% of the annual nutrient load in urban watersheds, depending on the age and condition of its grey infrastructure.
- NDs comprise 1 to 2% of the total urban wet weather load, particularly during intense or extreme storms.

Elimination of Discovered Nutrient Discharges From Grey Infrastructure

Findings: Expert Panel Final Report



Nutrient Discharges

- Refers to the complex range of non-stormwater flows that deliver nutrients into urban receiving waters during dry and/or wet weather caused by spills, leaks, and overflows from grey infrastructure.
- These discharges are created by:
 - the interaction of pollutant generating activities/sources
 - with aging grey infrastructure (sanitary sewers, drinking water pipes and storm sewers)
 - via stormwater runoff and groundwater migration.

Discovered Nutrient Discharge



Reported Nutrient Discharge



Photo credit: The Washington Post

Discharge Detectives

- Need to use **nutrient-based indicators** during routine outfall screening
- Once a discharge is found, other discovery methods are needed to track it back to its source



Discharge Detective Work



- Trained Sewage Sniffing Dogs
- Flow Chart Method to Screen Small Diameter Pipes
- GIS Analysis of Storm and Sewer Pipe Interactions
- Sewer pipe flow metering
- Continuous tracers in sewers
- Nitrate Isotopes
- Human Markers (e.g., caffeine)
- Smoke and Dye Testing
- CCTV Pipe Investigation



Credit for Advanced MS4 Nutrient Discovery Programs



**AVAILABLE
NOW!!**

Program Credit Defined

Annual credit equivalent to a maximum of 1% of the dry weather nutrient load within the jurisdiction, which in turn, is defined as 20% of the total annual N and P load discharged from the urban pervious land in which advanced nutrient reduction programs are targeted.

= a 0.2% percent reduction in annual nutrient load discharged from urban pervious land targeted by the programs.

Qualifying Criteria for Advanced Programs

The locality will provide justification to indicate that they are operating at an advanced level. At a minimum, they will document the following in their annual MS4 permit report:

1. Methods used to analyze dry weather stream monitoring data to prioritize the catchments and/or sewer-sheds with the highest risk for nutrient and bacteria discharge that warrant targeted investigation.



Qualifying Criteria for Advanced Programs

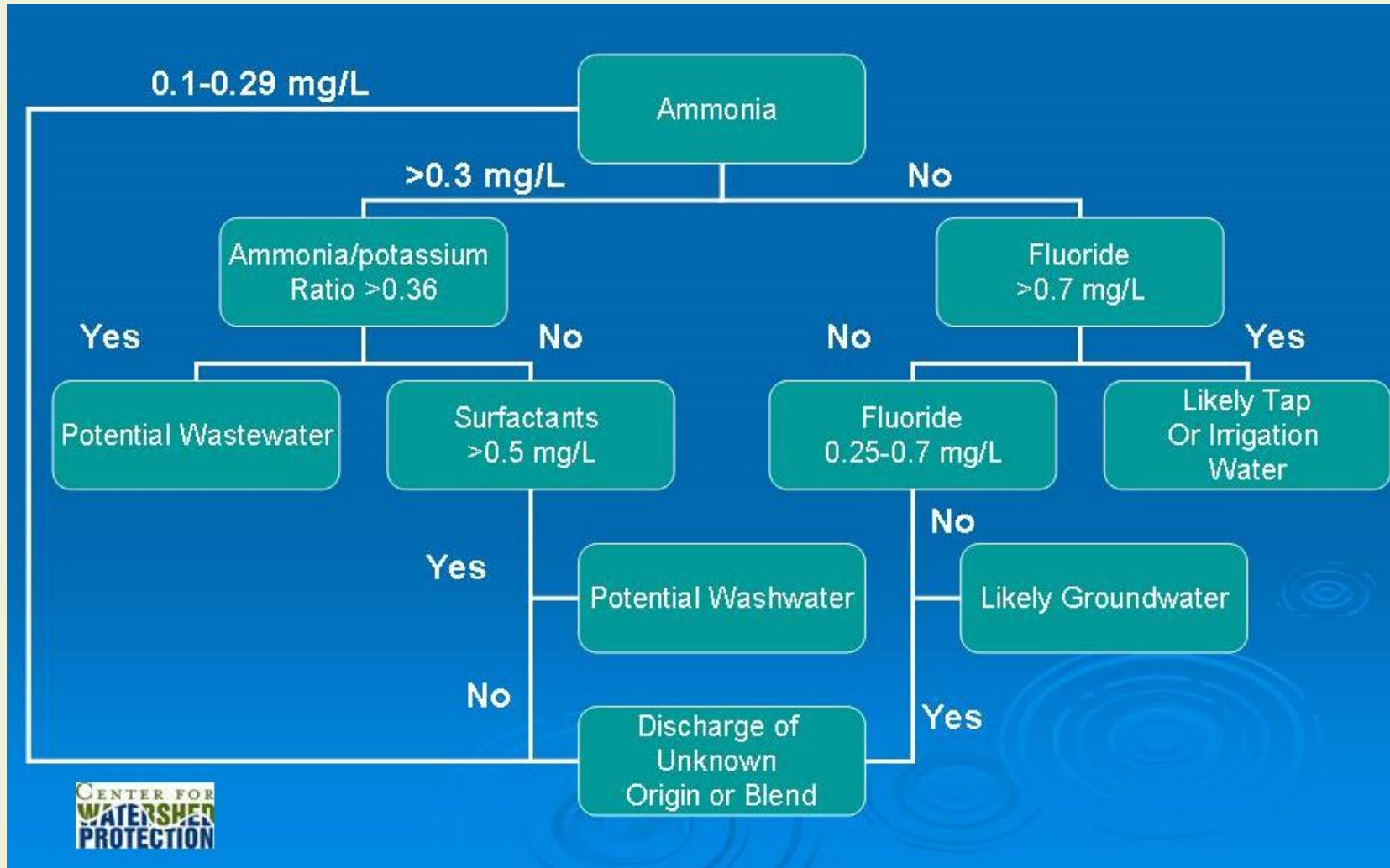
2. Number of outfalls in the priority catchments/sewer-sheds identified during the Outfall Reconnaissance Inventory (ORI) as described in (Brown et al 2004).

Qualifying Criteria for Advanced Programs

3. Number of outfalls in the priority catchments/sewer-sheds that were subject to nutrient testing, using the Flow Chart Method (Brown et al 2004) or equivalent. The testing must focus on outfalls of all diameters. Nutrient testing should be conducted on at least 10% of flowing outfalls (as determined during the ORI) annually.

IDDE Flow Chart

Modified from Brown et al, 2004



Qualifying Criteria for Advanced Programs

4. Specific methods and techniques they use to track a suspect illicit discharge to its source in the storm drain network (Table 3).

Table 3
Summary of Methods to Discover Nutrient Discharges from Grey Infrastructure

<ul style="list-style-type: none">• Visual Inspection and Outfall Screening• Flow Chart Method to Sample Suspect Outfalls• Source Tracking• Smoke Testing• Dye Testing• Optical Brightener Testing• Closed Circuit Television• HVAC testing	<ul style="list-style-type: none">• Trained Sewage Sniffing Dogs• Stream Walks to Look for Small Diameter Pipes• GIS Analysis of Storm and Sewer Pipe Interactions• Sewer pipe flow metering• Continuous tracers in sewers• Nitrate Isotopes• Human Markers (caffeine, Bifidobacterium)• Overflow reporting• CMOM and other sewer asset programs
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Qualifying Criteria for Advanced Programs

5. Number and type of illicit discharges that were discovered and actually eliminated each year.

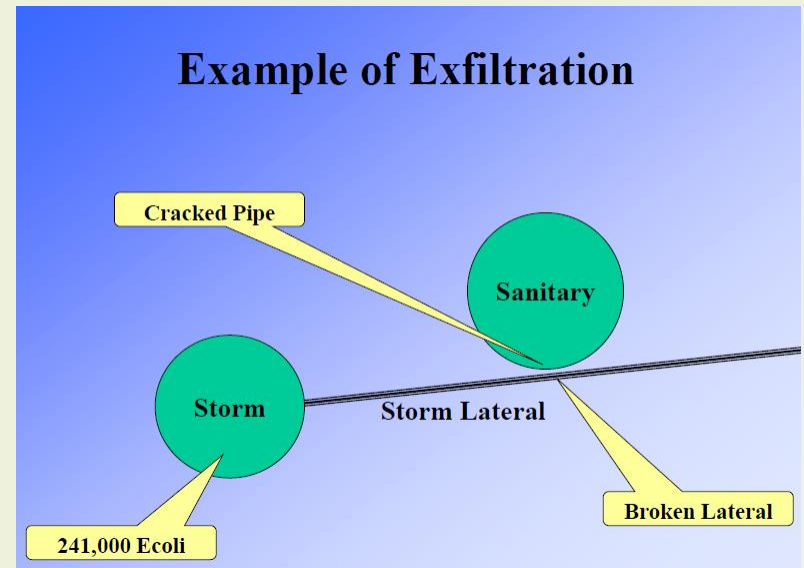


Photo credit: Arlington County, DES

Additional Qualifying Criteria

In addition, localities will need to document that they are conducting **at least two** of the following activities to discover and or prevent nutrient discharges to receive credit:

1. GIS assessments of storm and sanitary sewer network to identify high risk segments for cross-connections or exfiltration



Additional Qualifying Criteria

2. Dry weather stream monitoring is used to prioritize the stream segments with the highest nutrient and bacteria levels that warrant further investigation
3. CCTV inspections, dye testing or other methods to investigate for sewer leaks in problem storm drain systems.
4. Targeted inspection and outreach to businesses and/or industrial facilities subject to high risk for illicit discharges or sewer clogging (e.g. restaurants, car rental agencies, etc.)

Additional Qualifying Criteria

5. Detailed field assessments of the sewer network to identify segments with high risk of nutrient discharge due to exfiltration and/or dry weather overflows (i.e., sewer modeling and metering tools).



Q: So I can get credit for my basic IDDE program??



A: No! MS4s that are currently in compliance with their minimum control measure for illicit discharge detection and elimination (IDDE) in their current stormwater NPDES permit get no credit

Zero Credit for Basic IDDE Program

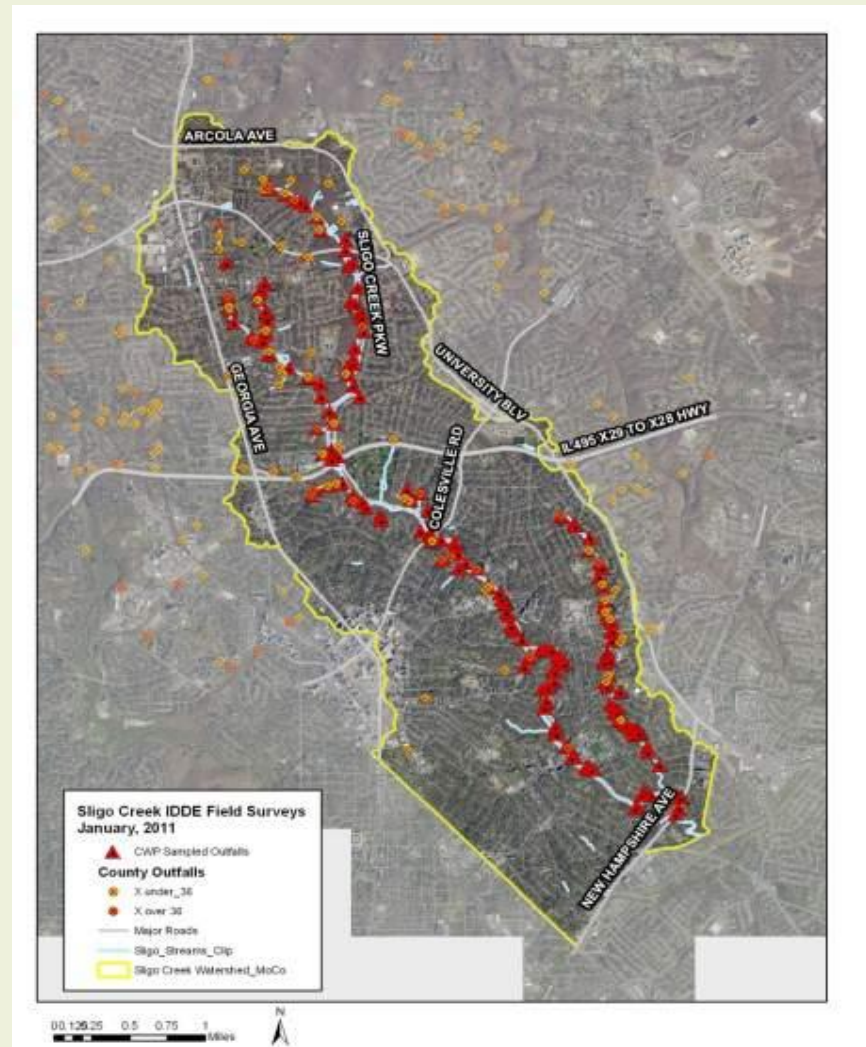
MS4s that are currently in compliance with their minimum control measure for illicit discharge detection and elimination (IDDE) in their current stormwater NPDES permit get no credit

- Adopt a local ordinance to prohibit illicit discharges to the storm drain system
- Develop a storm drain map, including all outfalls 36 inches in diameter or larger
- Provide IDDE education and outreach to public employees, businesses and the general public
- Use visual indicators to screen outfalls for presence of illicit discharges
- Develop and implement appropriate enforcement procedures to correct illicit discharge when they are discovered.

Programmatic Credit Design Example

Bay Village elects to transition to a nutrient based outfall screening program in two priority catchments within its jurisdiction -- Icky Creek and Filthy Run. Together, the two catchments are 3,600 acres in size, and average 64% urban pervious land.

Bay Village documents in its annual MS4 report that it has met or exceeded the program metrics outlined in the report. The nutrient reduction credit for modifying their program is computed as follows.



Programmatic Credit Design Example

Step 1: Determine the unit area nutrient load for pervious land from CAST or state equivalent, and multiply by 0.20.

Staff determine unit area TN and TP loads are 10.43 and 0.43 lbs/acre/year, respectively, within their jurisdiction.

These are multiplied by the dry weather baseline multiplier of 0.2, which yields 2.09 lbs TN/ac/yr and 0.086 lbs TP/ac/yr.

Step 2: Multiply these unit loads by the qualifying acres of pervious land in Icky Creek and Filthy Run (3,600 acres*64% = 2,304 ac), which yields:

4815 lbs/yr of TN and 198.1 lbs/yr of TP

Step 3: Multiply these loads by the 0.01 to determine final nutrient reduction credit for the program change.

48.2 lbs/yr of TN and 1.98 lbs/yr of TP

Reporting, Tracking and Verification of Advanced Program Credit

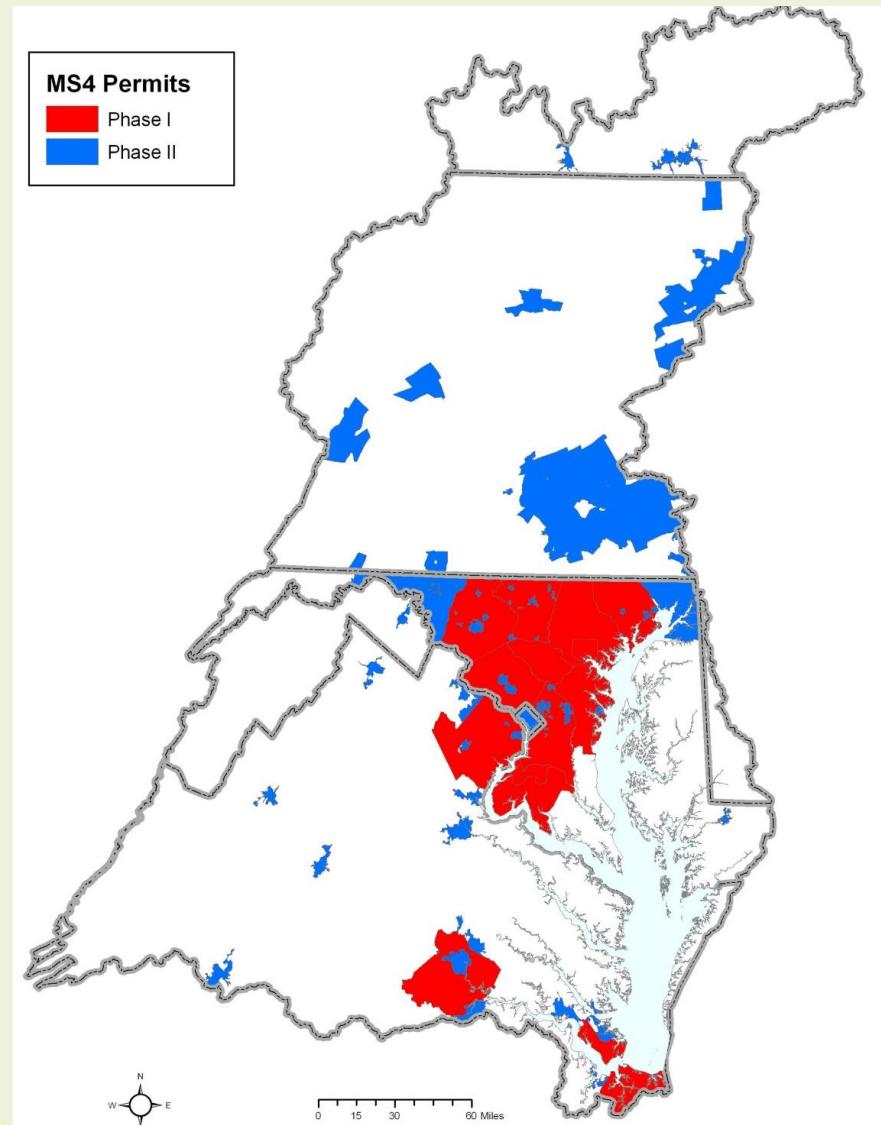
- Localities Typically Submit to States in MS4 Permit Annual Reports
- Appendix E Outlines the NEIEN Reporting Information
- Localities eligible for credit in 2015, assuming they meet qualifying conditions (most MS4's won't immediately qualify)

Reporting, Tracking and Verification of Advanced Program Credit

- The acres subject to the program credit lapse five years after the first year in which they are reported
- Additional acres in succeeding years if they elect to target additional storm/sewersheds for intensive nutrient discovery
- Eventual shift to reporting individual nutrient discharge credits in 2018
- Cannot take credit for program and individual credits at same time

Management Significance

- More than a thousand Bay communities are required to have an IDDE program (although very few have nutrient-based outfall screening)
- Thousand of dry weather overflows occur each year across the Bay but no local incentives to reduce the systematic causes of the problem
- Enlisting potential new partners in reducing nutrients from the urban sector





Crediting for Individual Discharges



8 Individual Nutrient Discharges Credited

No.	Discharge Type
N-1	Laundry Wash Water
N-2	Commercial Car Wash
N-3	Floor Drains
N-4	Misc. High Nutrient Discharges
N-5	Sanitary Direct Connection
N-6	Sewer Pipe Exfiltration
N-7	Drinking Water Transmission Loss
N-8	Dry Weather Sanitary Sewer Overflows

Non-Eligible Nutrient Discharges

- Unexpected nutrient discharges from pipe breaks, spills, leaks and overflows that are reported to the local authority by the public or first responders and require immediate emergency repairs to stop the discharge.
- Residential car washing
- Transitory illicit discharges associated with power-washing, dumpster juice, transport accidents, and illegal sewage disposal by boats and RVs.
- Wet Weather Sanitary Sewer Overflows
- Catastrophic wet weather sanitary sewer overflows that exceed the sewer design capacity
- Combined Sewer Overflows *
- Septic field discharges caused by system failure *

The Crediting Approach

The guiding principle is that elimination of a discovered nutrient discharge could only be considered as a urban BMP, if they:

- Are detected and physically eliminated
- On-site sampling of the discharge that has been eliminated to define one or more of the following parameters -- nutrient concentration, flow rate and duration
- Subsequent inspections and/or monitoring verify or otherwise confirm that discharge no longer exists

Empirical Approach to Crediting



Data Requirements to Compute the Credits

Table 5
Data Requirements to Compute Reduction Credits

No.	Discharge Type	Method	Nutrients	Flow Volume	Flow Duration
N-1	Laundry Wash Water	1	S or D	E or M	E
N-2	Commercial Car Wash	1	S	E or M	E
N-3	Floor Drains	1	S	E or M	E
N-4	Misc. High Nutrient Discharges	1	S	E or M	E
N-5	Sanitary Direct Connection	1	S or D	E or M	E
N-6	Sewer Pipe Exfiltration	2	S or D	M	E
N-7	Drinking Water Transmission Loss	2	S or D	M	E
N-8	Dry Weather SSOs	3	S or D	E	M

KEY: S= SAMPLE, D=Use DEFAULT VALUE, E=ESTIMATE, M= MEASURE

N-8: Dry Weather SSOs



Definition: A sanitary sewer overflow that occurs during dry weather periods as a function of either a blockage or failure of the sanitary sewer system.

DISCHARGE CHARACTERISTICS

- Transitory
- Regulated by NPDES WW permit
- Multiple Elimination Methods:
 - FOG Reduction Programs
 - Pretreatment Requirements
 - Sewer Realignment
 - Pipe Replacement
 - Manhole Casing
- Protocol 3 used to calculate credit
- 2 years of before and after tracking of the number and flow volume of overflows within the sewershed
- Verification includes:
 - See confirmation monitoring above

Questions

