



# Common Illicit Discharges & Water Quality

October 24, 2017  
CapCOG Training

CENTER FOR  
**WATERSHED**  
**PROTECTION**

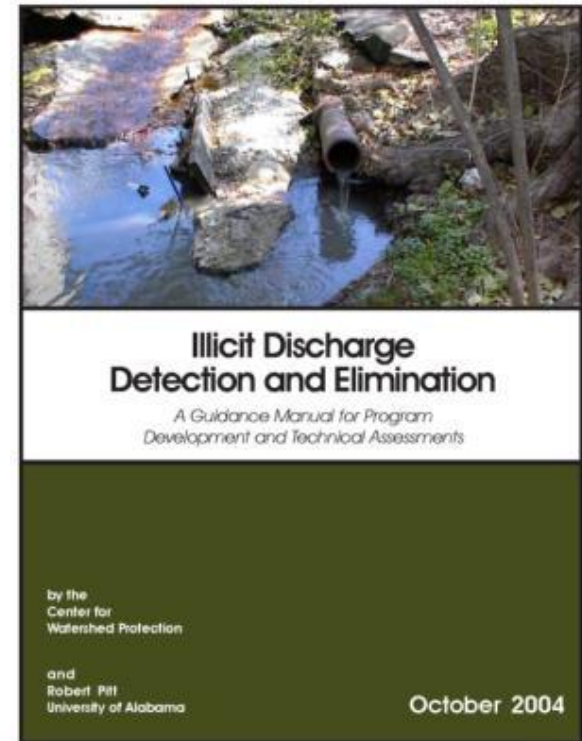


# How You Know An IDDE Investigator?



# IDDE Guidance Manual

- Joint EPA-funded project between CWP and University of Alabama
- 8 Program Components
- Desktop Methods
- Field and Lab Protocols
- Model Ordinance
- Technical Appendices
- Download at [www.cwp.org](http://www.cwp.org) or <http://cfpub.epa.gov/npdes/>





# What is an Illicit Discharge?

A dry weather discharge to the storm sewer system that contains pollutants except:

- i. discharges pursuant to a NPDES permit and
- ii. discharges resulting from fire fighting activities (40 CFR 122.26)





# “Dry Weather” Flows

- At least 48 hours after precipitation (runoff-producing rain event)
- During period of low groundwater



# What are common illicit discharges?

## **Sewage:**

- Broken or leaking sanitary sewer line
- Sewer cross-connections
- Connection of floor drains to storm sewer
- Sanitary sewer overflows
- Pump station failure
- Straight-pipe sewer discharge
- Failing septic systems

## **Miscellaneous**

- Concrete washout water
- Illegal dumping practices: motor oil, paint
- Restaurant grease

## **Wash Water**

- Laundry wash water
- Commercial car washing
- Floor drains connected to stormwater pipes



# Sources of Illicit Discharges

- Illegal dumping practices (95%)
- Broken sanitary sewer line (81%)
- Cross-connections (71%)
- Connection of floor drains to storm sewer (62%)
- Sanitary sewer overflows (52%)
- Inflow / infiltration (48%)
- Straight pipe sewer discharge (38%)
- Failing septic systems (33%)
- Improper RV waste disposal (33%)
- Pump station failure (14%)



# Discharge Frequency

- Continuous discharges
- Intermittent discharges
- Transitory discharges





# Continuous Discharges

- Occur all or most of the time
  - Broken sewage pipes
  - Direct connections (sometimes)
- Worst pollutant source
- Easiest to find
- *Best way to find them:  
comprehensive outfall surveys  
and tracking to source*



# Sanitary Sewer Cross Connections

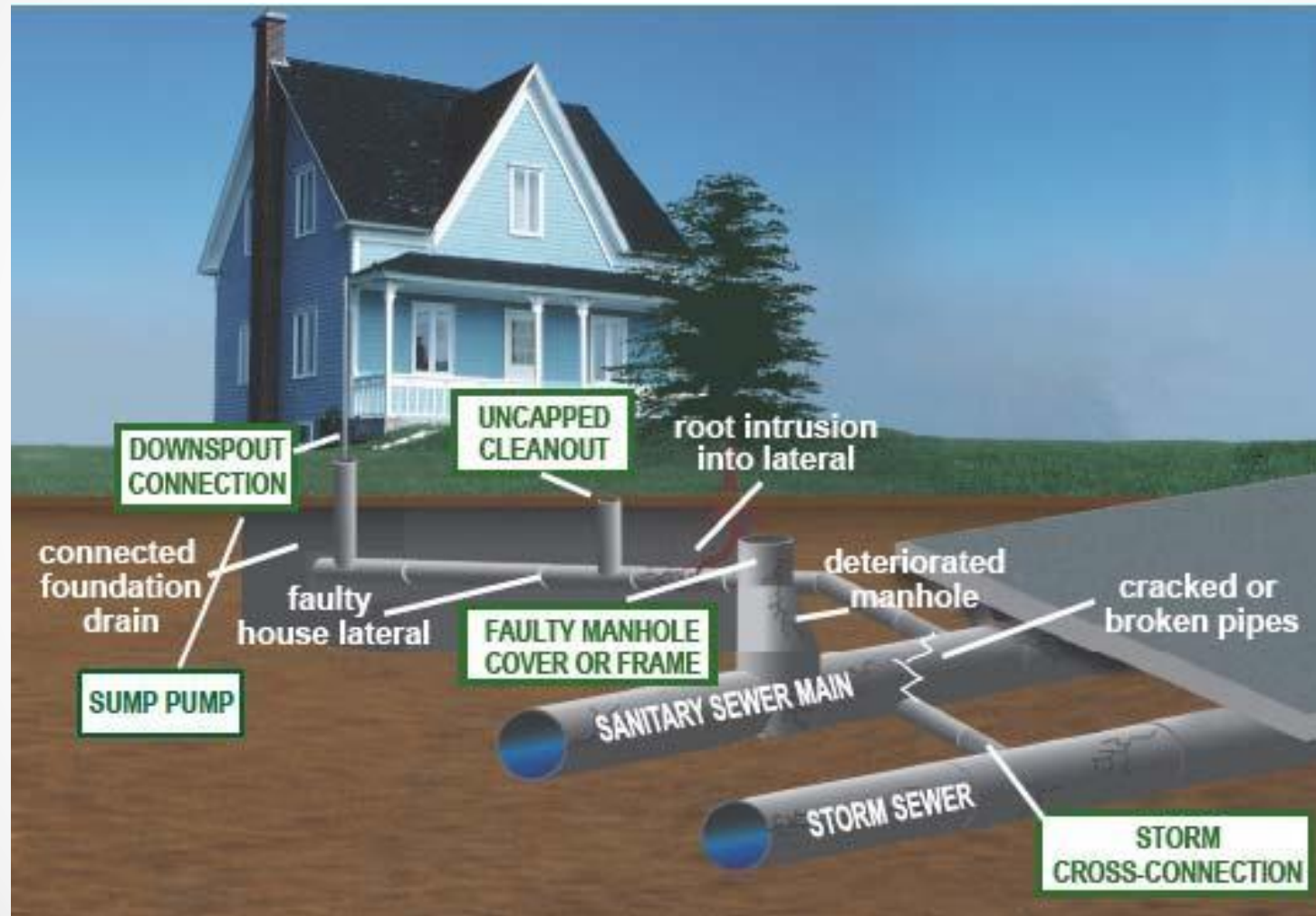


Image credit: Amick and Burgess (2000)



# Sewer Pipe Leakage



# Sewer Pipe Leaks





# Intermittent Discharges

- Occur over a *shorter period of time* (e.g., a few hours per day or a few days per year)
- Likely to come back
- May “miss them” if you don’t look for clues and patrol regularly
- *Best way to find them: Look for signs of past flow; look at different hours/days; use hotlines or citizen reporting*

# Laundry Washwater

- Laundry water directly or indirectly connected to storm drain system



# Commercial Car Washing

- Wash water drains to the stormdrain system



Raleigh, NC



# Mop Water Dumping



# Other Pollutants: Air Conditioner Condensate...??

(Credit: Lori A. Lilly Environmental Solutions)

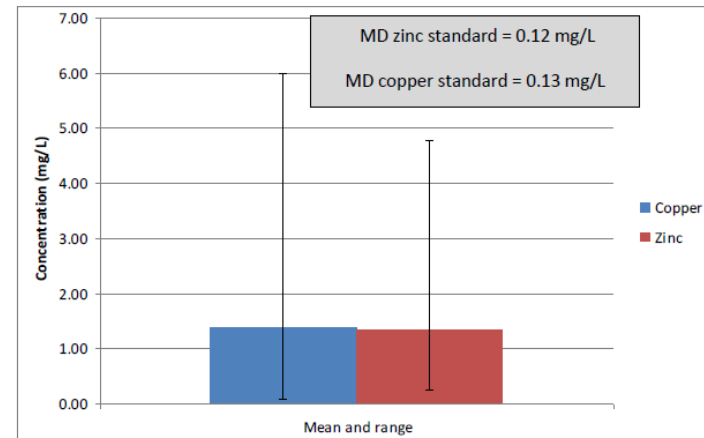


Figure 3. Heavy metal concentrations from HVAC discharges (n = 9).

- > 86 sites visited
- > 38% of sites had a discharge
- > All discharges (n=33) exceeded ammonia threshold of 0.2 mg/l, 58% > 5.0 mg/L
- > All samples (n=9) exceeded water quality standards for zinc and copper

# Sources of Contamination in HVAC Discharges

- Microbial biocides
- Illicit cooling tower water
- Copper piping
- Refrigerant leaks

**Drain Guard II: Safe, Functional Design**

Drain Guard II is safe, stable and easy to handle. The never time to touch dangerous chemicals and... unlike other products... it doesn't leave a sticky, messy residue after use.

- Sealed, tamper-proof housing prevents skin contact with biocide
- Filter pad controls biocide for consistent, perfectly timed chemical release over three months
- Lightweight, so pieces stay in position, never float away
- Does not clog drain ports
- Low profile... fits most cooling equipment
- Can be placed vertically or horizontally

**Drain Guard II is a Snap to Install**

Simply place Drain Guard II under cooling coils in the middle of the pan length. That's all you do! The product begins working immediately and continuously upon contact with water - 24 hours a day for three months. It's that easy!

- 6 1/2" L x 1 1/2" W x 5/16" H
- For equipment up to 5 tons
- Fits easily into condensation pans with low profiles
- Safe, self-contained, tamper-proof packaging
- Mix and match units fit any size equipment
- EPA and NSF International registered
- Each unit stays effective for a full three months
- Unique design will not clog drain pan

**For cost saving preventative maintenance, you can't beat Drain Guard II. It's biocidal, inexpensive, efficient and EPA registered. For more information or to place an order, visit our website today at [www.precischemical.com](http://www.precischemical.com) or call us at 202-635-2233.**

**Precis Chemical & Equipment Ltd.**  
3790 2nd St. NE, Washington, DC 20011  
Tel: 202-635-2233 • Fax: 202-269-0289  
[info@precischemical.com](mailto:info@precischemical.com) • [www.precischemical.com](http://www.precischemical.com)

**Drain Guard II can help.**

**Precis Chemical & Equipment Ltd.**

**Table 4. Measured pollutant load estimates from all discharges (n = 33).**

	50%–100% Annual Load, 150 Days (lb/year)
Total Nitrogen	14.0–28.0
Copper	0.6–1.1
Zinc	0.5–1.0

- 5-30% ammonium chloride  
- Kills bacteria that cause Legionnaires  
- Toxic to aquatic organisms and should not be released into the environment



# Transitory Discharges

- Occur once or infrequently
- Examples Include:
  - Spills
  - One-Time Dumping
- *Best way to deal with them:  
education, prevention, safety  
plans, hotlines*

# Paint wash

- Washing out brushes and buckets on the ground or into storm drains



# Chemical and oil leaks/dumping





# Concrete washout

- Washing out concrete truck without proper containment



# Concrete washout

The right way!



# Relationship To Good Housekeeping

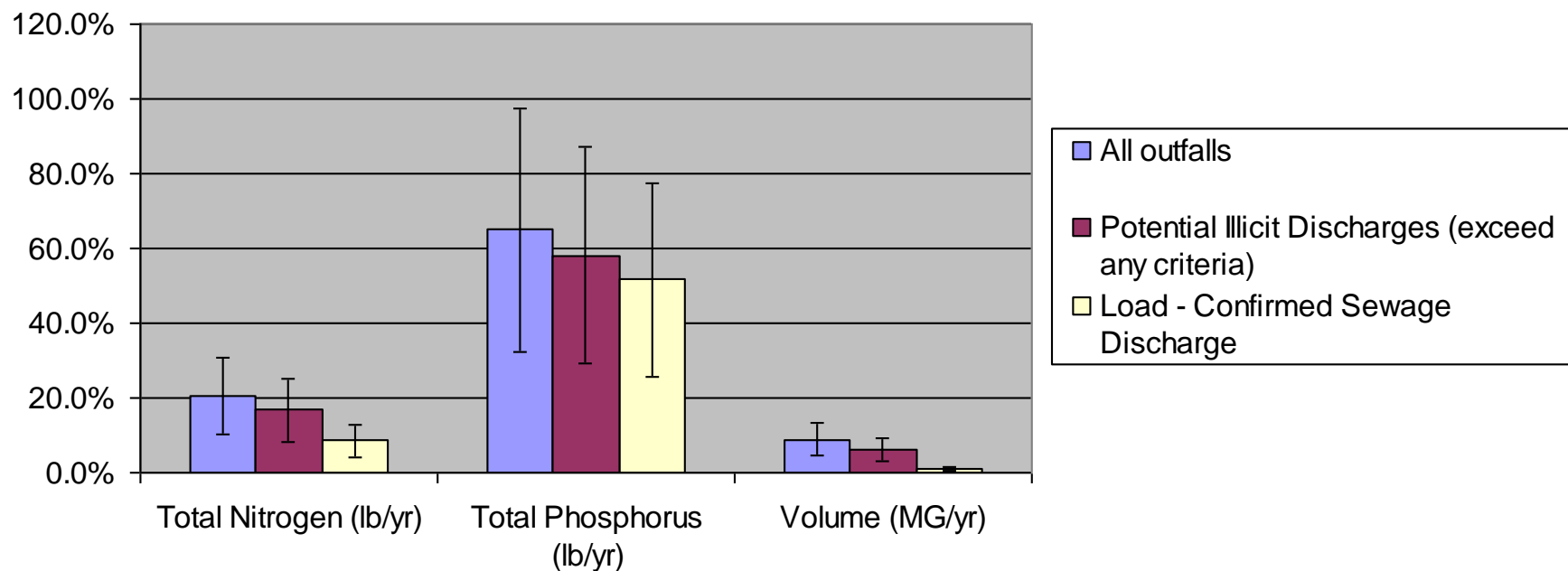
- Sites where routine operations can generate indirect discharges
- Discharges are generally intermittent or transitory
- Generating sites can be identified and discharges can be prevented





<u>Land Use</u>	<u>Generating Site</u>	<u>Example Discharges</u>
Residential	Apartments, multi-family, single family homes	Septic, dumping, swimming pools, car washing
Commercial	Car dealers, commercial laundry, marinas, restaurants	Outdoor washing, food waste disposal, vehicle maintenance and repair, power washing, dumpster juice
Industrial	Auto recyclers, metal plating, paper and wood, printing	Rinse, process, wash, and cooling water disposal; spills and leaks; leaking underground storage tanks
Institutional	Churches, hospitals, schools / universities	Vehicle maintenance and repair; power washing, outdoor storage, loading/unloading (washdowns / spills)
Municipal	Public works yards, airports, ports, landfills, municipal fleet storage areas	Outdoor fluid storage, vehicle maintenance and repair, power washing, dumping / spills

# Western Run Dry Weather Load from Flowing Outfalls as Percent of Instream Load



# Illicit discharges in pipes <36" in diameter (Lilly & Sturm, 2010)

- 45% of all potential illicit flows
- 100% of small pipes with dry weather flow exceeded 1 or more criteria
- Volume: 49-146 MG/yr
- TP: 26-78 lb/yr
- TN: 726-2,179 lb/yr
- Avg. E. coli concentration: 16,714 CFU/100ml





# Conclusions

- Illicit discharges have varying toxicity, modes of entry and frequency patterns.
- These factors determine their overall impact to water quality.
- Continuous discharges typically have the most impact, even with small volumes.
- Intermittent discharges can also have a big impact on water quality but can be much harder to track down.



# PA Phase II MS4 Requirements for IDDE

MIKE HICKMAN, THE CENTER FOR WATERSHED PROTECTION

# MCM #3 Illicit Discharge Detection and Elimination

- ▶ The permittee shall develop, implement and enforce a program to detect and eliminate illicit discharges into the permittee's regulated small MS4.



# BMP #1: The Written Program

- ▶ Procedures for identifying priority areas. These are areas with a higher likelihood of illicit discharges, illicit connections or illegal dumping.
- ▶ Procedures for screening outfalls in priority areas.
- ▶ Procedures for identifying the source of an illicit discharge when a contaminated flow is detected at a regulated small MS4 outfall.
- ▶ Procedures for eliminating an illicit discharge.
- ▶ Procedures for assessing the potential for illicit discharges caused by the interaction of sewage disposal systems (e.g., on-lot septic systems, sanitary piping) with storm drain systems.
- ▶ Mechanisms for gaining access to private property to inspect outfalls (e.g., land easements, consent agreements, search warrants) and for investigating illicit connections and discharges.
- ▶ Procedures for program documentation, evaluation and assessment. Records shall be kept of all outfall inspections, flows observed, results of field screening and testing, and other follow up investigation and corrective action work performed under this program.
- ▶ Procedures for addressing information or complaints received from the public.

# BMPs #2 and #3: Mapping (Easy Part)

- ▶ Develop and maintain map(s) that show:
  - ▶ permittee and urbanized area boundaries
  - ▶ the location of all outfalls (and/or observation points)
    - ▶ outfalls and observation points shall be numbered on the map(s).
  - ▶ the locations and names of all surface waters that receive discharges from those outfalls

# BMPs #2 and #3: Mapping (the Hard Part)

- ▶ The entire storm sewer collection system within the permittee's jurisdiction that are owned or operated by the permittee:
  - ▶ Including: roads, inlets, piping, swales, catch basins, channels, and any other components of the storm sewer collection system,
  - ▶ Including: privately-owned components of the collection system where conveyances or BMPs on private property receive stormwater flows from upstream publicly owned components



# BMP #4 Outfall Screenings

- ▶ The permittee shall conduct dry weather screenings:
- ▶ If any illicit discharges are present:
  - ▶ identify the source(s) and take appropriate actions to remove or correct any illicit discharges.
  - ▶ respond to reports received from the public or other agencies of suspected or confirmed illicit discharges
    - ▶ take enforcement action as necessary
  - ▶ immediately report to DEP illicit discharges that would endanger users downstream from the discharge, or would otherwise result in pollution or create a danger of pollution or would damage property, **in accordance with Part A III.D.4 of this General Permit.**

# General Permit Part A III.D.4 (this is a brand new requirement)

## Unanticipated Non-Compliance or Potential Pollution Reporting

- ▶ a. Immediate Reporting - The permittee shall immediately report any incident causing or threatening pollution in accordance with the requirements of 25 Pa. Code §§ 91.33 and 92a.41 (b) listed below:
  - ▶ (i) If, because of an accident, other activity or incident a toxic substance or another substance which would endanger users downstream from the discharge, or would otherwise result in pollution or create a danger of pollution or would damage property, **the permittee shall immediately notify DEP by telephone of the location and nature of the danger. Oral notification to the Department is required as soon as possible, but no later than 4 hours after the permittee becomes aware of the incident causing or threatening pollution.**
  - ▶ (ii) **If reasonably possible to do so, the permittee shall immediately notify downstream users** of the waters of the Commonwealth to which the substance was discharged. Such notice shall include the location and nature of the danger.
  - ▶ (iii) **The permittee shall immediately take or cause to be taken steps necessary to prevent injury to property and downstream users of the waters from pollution or a danger of pollution and, in addition, within 15 days from the incident, shall remove the residual substances contained thereon or therein from the ground and from the affected waters of this Commonwealth to the extent required by applicable law.**

# General Permit Part A III.D.4 (this is a brand new requirement)

- ▶ b. The permittee shall report any non-compliance which may endanger health or the environment in accordance with the requirements of 40 CFR § 122.41 (l) (6). These requirements include the following obligations:
  - ▶ (i) 24 Hour Reporting - **The permittee shall orally report any non-compliance with this permit which may endanger health or the environment within 24 hours from the time the permittee becomes aware of the circumstances.**
  - ▶ (ii) Written Report - **A written submission shall also be provided within 5 days of the time the permittee becomes aware of any non-compliance which may endanger health or the environment.** The written submission shall contain a description of the non-compliance and its cause; the period of non-compliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the non-compliance.
  - ▶ (iii) Waiver of Written Report - **DEP may waive the written report on a case-by-case basis if the associated oral report has been received within 24 hours from the time the permittee becomes aware of the circumstances** which may endanger health or the environment. Unless such a waiver is expressly granted by DEP, the permittee shall submit a written report in accordance with this paragraph. (25 Pa. Code § 92a.3(c) and 40 CFR § 122.41 (l) (6) (iii))



# BMP #4 Outfall Screening

- ▶ For new permittees, all of the identified regulated small MS4 outfalls shall be screened during dry weather at least twice within the 5-year period
- ▶ For existing permittees, each of the identified regulated small MS4 outfalls shall be screened during dry weather at least once by March 15, 2023.
  - ▶ PLEASE NOTE HOWEVER.....
  - ▶ For areas where past problems have been reported or known sources of dry weather flows occur on a continual basis, **outfalls shall be screened annually during each year of permit coverage.**

# BMP #4 Outfall Screening – What to Inspect For

- ▶ If a discharge is observed from any outfall during dry weather screenings, the discharge shall be inspected for:
  - ▶ color,
  - ▶ odor,
  - ▶ floating solids,
  - ▶ scum,
  - ▶ sheen,
  - ▶ and substances that result in observed deposits in the surface waters.
- ▶ In addition, the discharge cannot contain substances that result in **deposits in the receiving water or produce an observable change in the color, odor or turbidity of the receiving water.**

# BMP #4 Outfall Screening – What to Do if a Discharge is Observed

- ▶ If a discharge exhibits any of the previous characteristics, contains any pollutants, or causes an observed change in the surface waters, the permittee shall sample the discharge(s) for field and/or laboratory analysis of one or more common IDD&E parameters in order to determine if the dry weather flow is illicit.
- ▶ Possible parameters include, but are not limited to:
  - ▶ pH, Conductivity, Fecal Coliform bacteria, Heavy Metals, Chemical Oxygen Demand (COD), 5-day Biochemical Oxygen Demand (BOD5), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), Oil and Grease, Total Residual Chlorine (TRC) and Ammonia-Nitrogen.
- ▶ Proper quality assurance and quality control procedures shall be followed when collecting, transporting or analyzing water samples. The permittee shall retain sample results with the inspection report in accordance with Part A III.B of this General Permit.



# Part A III.B of the General Permit

- ▶ Records Retention – All records of monitoring activities and results, copies of all plans and reports required by this General Permit, and records of all data used to complete the application for this General Permit **shall be retained by the permittee for at least 5 years from the date of the sample measurement, report or application.** Such records must be submitted to DEP upon request or as required for **annual reports. The permittee must make records available to the public at reasonable times during regular business hours.**

# BMP #4 Outfall Screening – What to Do if a Discharge is Observed

- ▶ Each time an outfall is screened, the permittee shall record outfall observations, **regardless of the presence of dry weather flow. All outfall inspections shall be documented on the MS4 Outfall Field Screening Report form (3800-FM-BCW0521), or equivalent.**
- ▶ The report must be signed by the inspector and be maintained by the permittee in accordance with Part A III.B of this General Permit.
- ▶ If an outfall flow is determined by the permittee to be illicit, **the actions taken to identify and eliminate the illicit flow shall also be documented.**

# Outfall Form

- Available in docx form at  
<http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-12798>

3800-FM-BCW0521 12/2015 MS4 Outfall Field Screening Report		COMMONWEALTH OF PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION BUREAU OF CLEAN WATER		
<b>MS4 OUTFALL FIELD SCREENING REPORT</b>				
<b>BACKGROUND INFORMATION</b>				
Permittee Name:		NPDES Permit No.: PA		
Date of Inspection:		Outfall ID No.:		
Land Uses in Outfall Drainage Area (Select All):		Latitude: ____° ____' ____"		
<input type="checkbox"/> Industrial <input type="checkbox"/> Urban Residential		Longitude: ____° ____' ____"		
<input type="checkbox"/> Commercial <input type="checkbox"/> Suburban Residential		Dry Weather Inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No		
<input type="checkbox"/> Open Space <input type="checkbox"/> Other:		Date of Previous Precipitation:		
		Amount of Previous Precipitation: ____ in		
Inspector Name(s):		Were Photographs Taken? <input type="checkbox"/> Yes <input type="checkbox"/> No		
		Are Photographs Attached? <input type="checkbox"/> Yes <input type="checkbox"/> No		
<b>OUTFALL DESCRIPTION</b>				
<b>TYPE</b>	<b>MATERIAL</b>	<b>SHAPE</b>	<b>DIMENSIONS</b>	<b>SUBMERGED</b>
<input type="checkbox"/> Closed Pipe	<input type="checkbox"/> RCP <input type="checkbox"/> CMP <input type="checkbox"/> PVC <input type="checkbox"/> HDPE <input type="checkbox"/> Steel <input type="checkbox"/> Other	<input type="checkbox"/> Circular <input type="checkbox"/> Single <input type="checkbox"/> Elliptical <input type="checkbox"/> Double <input type="checkbox"/> Box <input type="checkbox"/> Triple <input type="checkbox"/> Other <input type="checkbox"/> Other	Diameter: ____ in	<input type="checkbox"/> In Water <input type="checkbox"/> With Sediment
<input type="checkbox"/> Open Channel	<input type="checkbox"/> Concrete <input type="checkbox"/> Earthen <input type="checkbox"/> Rip-Rap <input type="checkbox"/> Other	<input type="checkbox"/> Trapezoid <input type="checkbox"/> Parabolic <input type="checkbox"/> Other	Depth: ____ in Top Width: ____ in Bottom Width: ____	
Dry Weather Flow Present at Outfall During Inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No (If No, skip to Certification Section)				
Description of Flow Rate: <input type="checkbox"/> Trickle <input type="checkbox"/> Moderate <input type="checkbox"/> Significant <input type="checkbox"/> N/A				
<b>DRY WEATHER FLOW EVALUATION</b>				
Does the dry weather flow contain color? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, provide a description below.				
Does the dry weather flow contain an odor? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, provide a description below.				
Is there an observed change in the receiving waters as a result of the discharge? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, provide a description below.				
Does the dry weather flow contain floating solids, scum, sheen or substances that result in deposits? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, provide a description below.				



# BMP #4 Outfall Screening – What to Do if a Discharge is Observed

- ▶ (5) The permittee shall summarize the results of outfall inspections and actions taken to remove or correct illicit discharges in Annual MS4 Status Reports.
- ▶ (6) If the permittee determines that an outfall cannot be accessed due to safety or other reasons, the permittee shall establish an “observation point” at an appropriate location prior to the outfall where outfall field screening shall be performed. If observation points are established by the permittee, such points shall be identified on the map required under BMP #2 of this section.
- ▶ (7) Permittees must ensure that outfalls are properly maintained in accordance with **Part C I.B.6.b of this General Permit.**

# BMP #5 – Ordinance Requirements

- ▶ BMP #5: Enact a Stormwater Management Ordinance or SOP to implement and enforce a stormwater management program that includes prohibition of non-stormwater discharges to the regulated small MS4.
- ▶ (1) Municipal permittees shall submit a copy of an ordinance that is consistent with DEP's 2022 Model Stormwater Management Ordinance (3800-PM-BCW0100j) as an attachment to an Annual MS4 Status Report by September 30, 2022 (existing permittees) or the fourth (4th) Annual MS4 Status Report following approval of coverage under this General Permit (new permittees).
- ▶ (2) Permittees that lack the authority to enact ordinances (non-municipal permittees and counties) shall develop and adopt an SOP that prohibits non-stormwater discharges consistent with this General Permit, and shall submit a copy of the SOP as an attachment to an Annual MS4 Status Report by September 30, 2022 (existing permittees) or the fourth (4th) Annual MS4 Status Report following approval of coverage under this General Permit (new permittees).
- ▶ (3) Notice must be provided to DEP of the approval of any waiver or variance by the permittee that allows an exception to non-stormwater discharge provisions of an ordinance or SOP. This notice shall be submitted in the next Annual MS4 Status Report following approval of the waiver or variance.



# Model Ordinance Comparison Old to New

## ARTICLE VII - PROHIBITIONS

### Section 701. Prohibited Discharges and Connections

- A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the waters of this Commonwealth is prohibited.
- B. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except (1) as provided in Subsection C below and (2) discharges allowed under a state or federal permit.
- C. The following discharges are authorized unless they are determined to be significant contributors to pollution a regulated small MS4 or to the waters of this Commonwealth:

- Discharges from firefighting activities	- Flows from riparian habitats and wetlands
- Potable water sources including water line flushing	- Uncontaminated water from foundations or from footing drains
- Irrigation drainage	- Lawn watering
- Air conditioning condensate	- Dechlorinated swimming pool discharges
- Springs	- Uncontaminated groundwater
- Water from crawl space pumps	- Water from individual residential car washing
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spill material has been removed) and where detergents are not used	- Routine external building wash down (which does not use detergents or other compounds)
- Diverted stream flows	

- D. In the event that the municipality or DEP determines that any of the discharges identified in Subsection C significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the municipality or DEP will notify the responsible person(s) to cease the discharge.

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- C. The following discharges are authorized unless they are determined to be significant contributors to pollution a regulated small MS4 or to the waters of this Commonwealth:
1. Discharges or flows from firefighting activities.
  2. Discharges from potable water sources including water line flushing and fire hydrant flushing, if such discharges do not contain detectable concentrations of Total Residual Chlorine (TRC).
  3. Non-contaminated irrigation water, water from lawn maintenance, landscape drainage and flows from riparian habitats and wetlands.
  4. Diverted stream flows and springs.
  5. Non-contaminated pumped ground water and water from foundation and footing drains and crawl space pumps.
  6. Non-contaminated HVAC condensation and water from geothermal systems.
  7. Residential (i.e., not commercial) vehicle wash water where cleaning agents are not utilized.
  8. Non-contaminated hydrostatic test water discharges, if such discharges do not contain detectable concentrations of TRC.
- D. In the event that the municipality or DEP determines that any of the discharges identified in Subsection C significantly contribute pollutants to a regulated small MS4 or to the waters of this Commonwealth, the municipality or DEP will notify the responsible person(s) to cease the discharge.



# 2022 Model Ordinance

## **Section 801. Right-of-Entry**

Upon presentation of proper credentials, the municipality or its designated agent may enter at reasonable times upon any property within the municipality to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

## **Section 805. Penalties**

- A. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction, shall be subject to a fine of not more than \$\_\_\_\_\_ for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.
- B. In addition, the municipality may institute injunctive, mandamus, or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus, or other appropriate forms of remedy or relief.

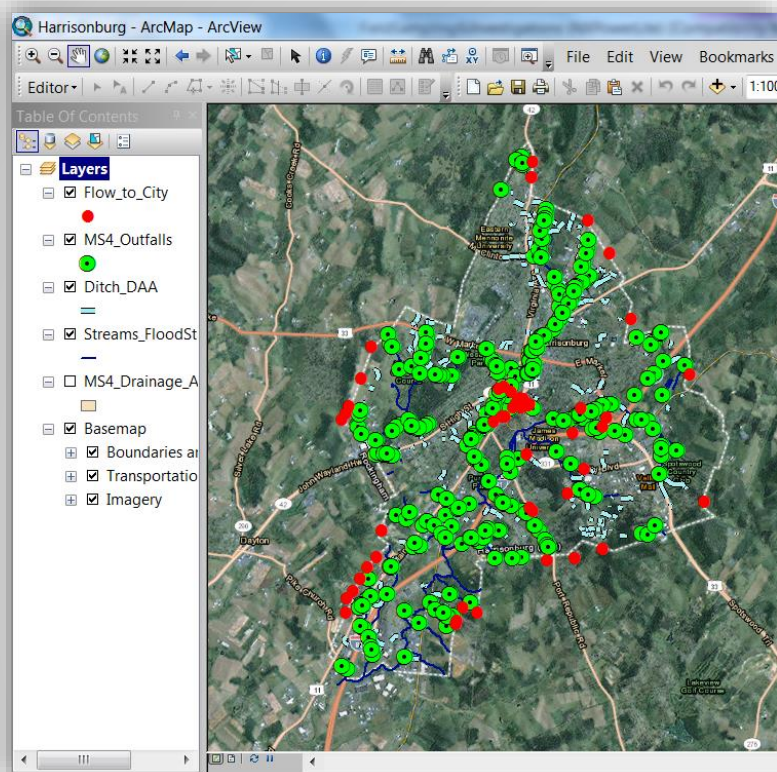
## **Section 806. Appeals**

- A. Any person aggrieved by any action of the Municipality or its designee, relevant to the provisions of this Ordinance, may appeal to the Municipality within 30 days of that action.
- B. Any person aggrieved by any decision of the Municipality, relevant to the provisions of this Ordinance, may appeal to the County Court of Common Pleas in the county where the activity has taken place within 30 days of the Municipality's decision.

# BMP #6 - Educational Outreach

- ▶ BMP #6: Provide educational outreach to public employees, business owners and employees, property owners, the general public and elected officials (i.e., target audiences) about the program to detect and eliminate illicit discharges.
- ▶ (1) During each year of permit coverage, appropriate educational information concerning illicit discharges shall be distributed to the target audiences using methods outlined under MCM #1. The permittee shall establish and promote a stormwater pollution reporting mechanism (e.g., a complaint line with message recording) by the end of the first year of General Permit coverage for the public to use to notify the permittee of illicit discharges, illegal dumping or outfall pollution. The permittee shall respond to all complaints in a timely and appropriate manner. The permittee shall document all responses, including the action taken, the time required to take the action, and whether the complaint was resolved successfully.
- ▶ (2) Educational outreach may include: distribution of brochures and guidance for target audiences including schools; programs to encourage and facilitate public reporting of illicit discharges; organizing volunteers to locate and visually inspect outfalls and to stencil storm drains; and implement and encourage recycling programs for common wastes such as motor oil, antifreeze and pesticides.





# Prioritizing Areas for IDDE Investigations

October 24, 2017  
CapCOG Training



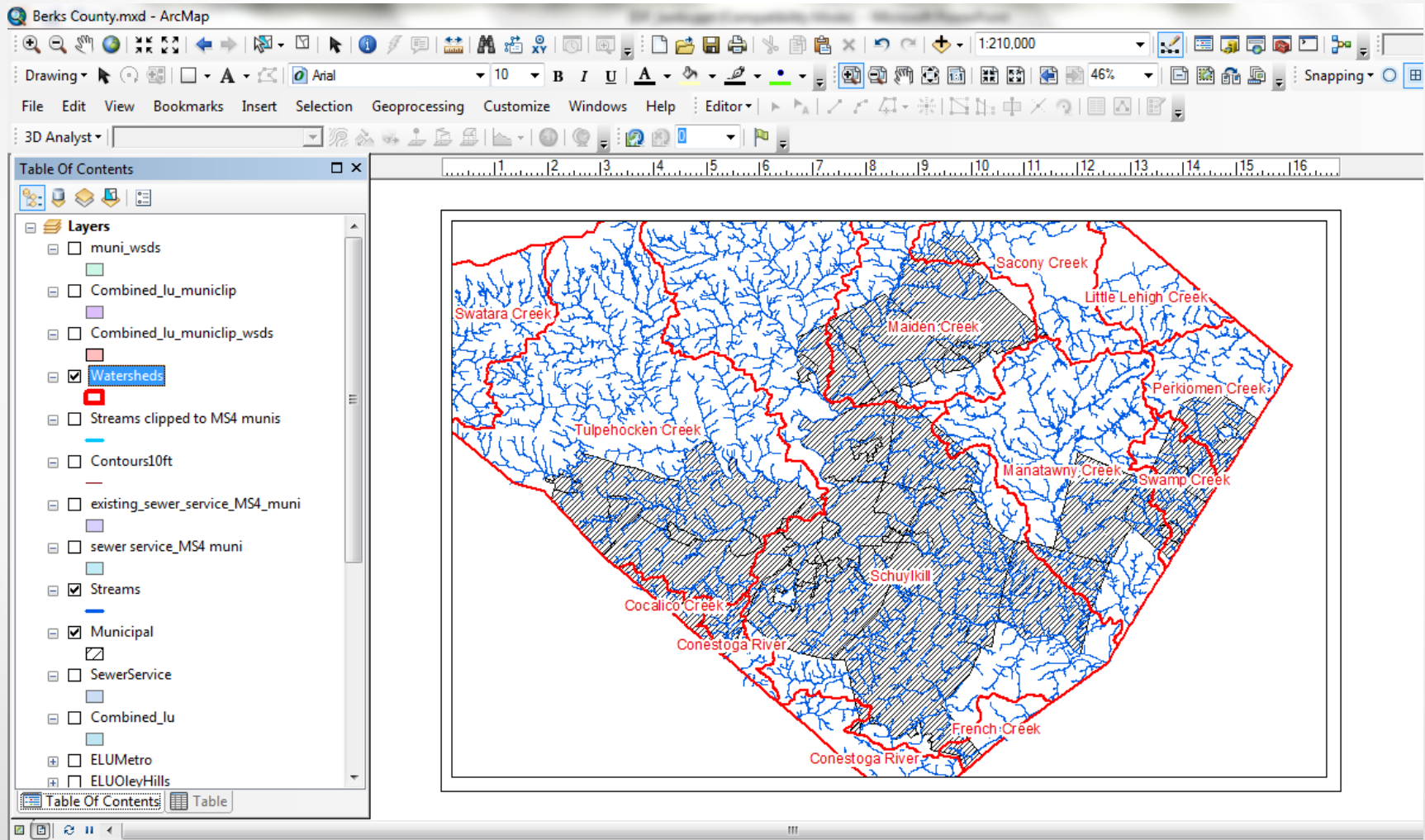
# Desktop Analysis of Illicit Discharge Potential (IDP)

- A method of developing a targeted approach to identify priority areas subject to a higher rate of illicit discharges, while using a GIS-based program
- Answers the question ... **“Where should we focus our resources?”**

# GIS-based Analysis:

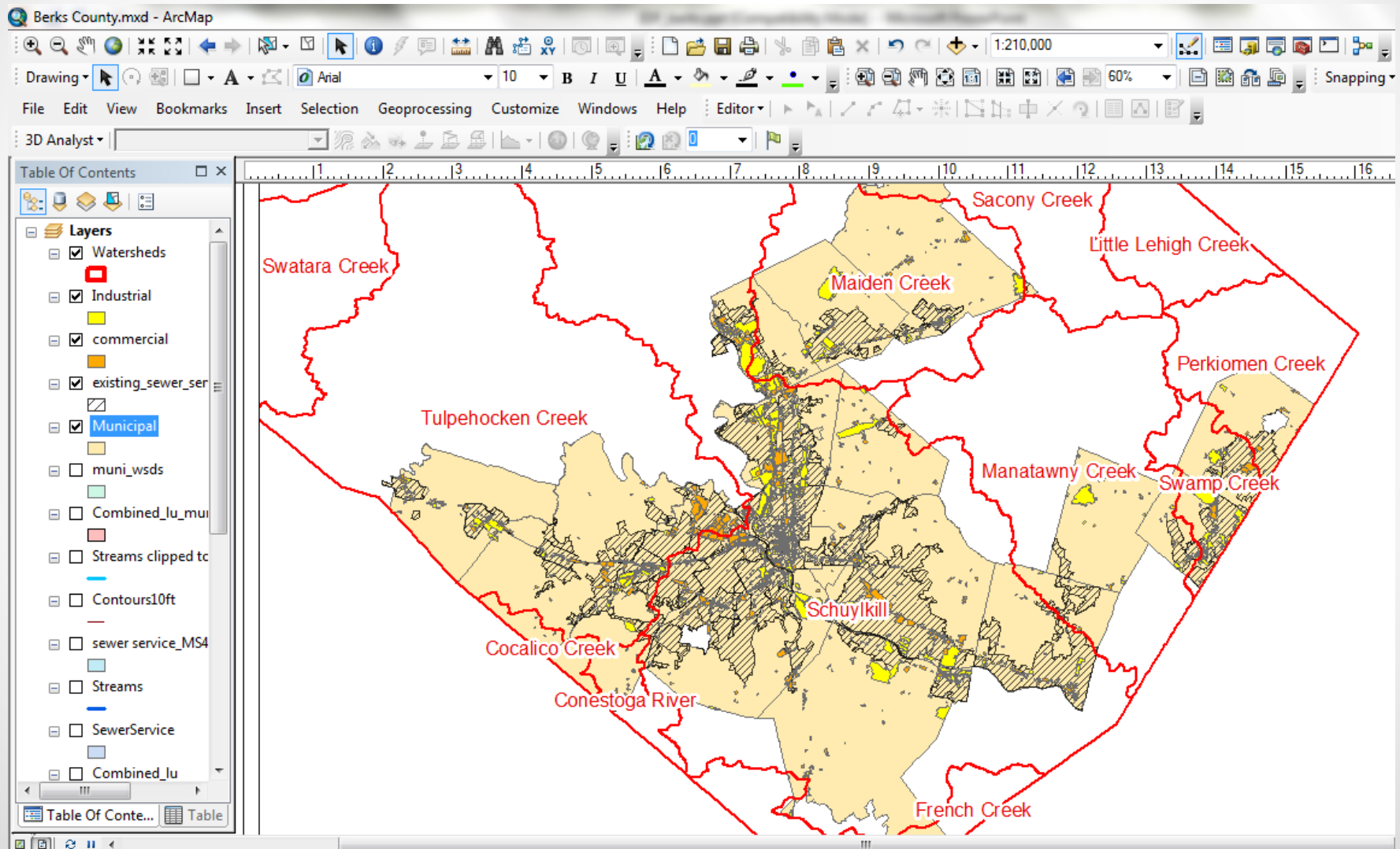
1. Delineate subwatersheds
2. Compile mapping and data
3. Compute discharge screening factors
4. Characterize IDP across subwatersheds
5. Generate maps to support field investigation

# 1. Delineate Subwatersheds





## 2. Available Data



# “Wish List” of GIS Data (Screening Factors)

- Past Discharge Complaints
- Poor Dry Weather Water Quality
- Density of Generating Sites
- Density of Industrial NPDES Permits
- Stormwater Outfall Density
- Age of Subwatershed Development
- Water Monitoring Data
- Former Combined Sewers
- Older Industrial Operations
- Aging or Failing Sewers
- Density of Older Septic Systems
- Past Sewer Conversions

**Collaborate to prioritize and develop a robust GIS dataset**

### 3. Calculate Discharge Screening Factors

Watershed Name	Commercial (Acres)	%	Industrial (Acres)	%	Total Wsd Acres in MS4
Cocalico Creek	1.97	0.07	7.21	0.24	2943.48
Conestoga River	37.42	1.46	3.77	0.15	2563.17
Maiden Creek	438.50	1.61	1129.77	4.15	27204.73
Manatawny Creek	104.04	0.68	341.26	2.24	15203.89
Perkiomen Creek	64.99	1.26	28.82	0.56	5162.45
Saony Creek	5.38	0.28	5.26	0.28	1910.62
Schuylkill	3700.19	3.97	4193.85	4.50	93148.72
Swamp Creek	286.04	3.88	610.16	8.28	7369.76
Tulpehocken Creek	1379.10	3.86	592.46	1.66	35701.74

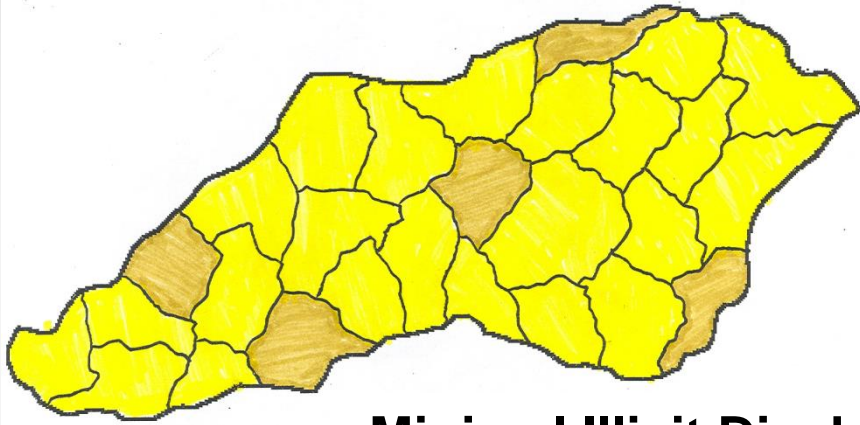


# 4. Prioritize Subwatersheds Using IDP Screening Factors

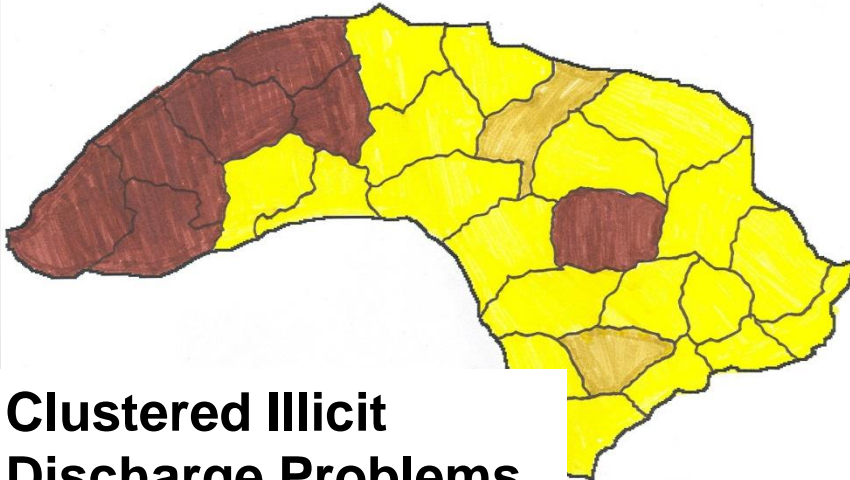
Subwatershed	Past discharge complaints	Poor dry weather WQ	Density of SW outfalls	Average age of dev.	Raw IDP score	Normalized IDP score
Subwatershed A	8 (2)	30% (2)	14 (2)	40 (2)	8	2
Subwatershed B	3 (1)	15% (1)	10 (2)	10 (1)	5	1.25
Subwatershed C	13 (3)	60% (3)	16 (2)	75 (3)	11	2.75
Subwatershed D	1 (1)	25% (1)	9 (1)	15 (2)	5	1.25

Basis for Assigning Scores...	1	2	3
Past discharge complaints/reports (total # logged)	< 5	5 - 10	> 10
Dry weather water quality (# times bacteria stds exceeded)	< 25%	25 - 50%	> 50%
Storm water outfall density (# outfalls / stream mile)	< 10	10 - 20	20
Average age of development (years)	< 25	25 - 50	> 50

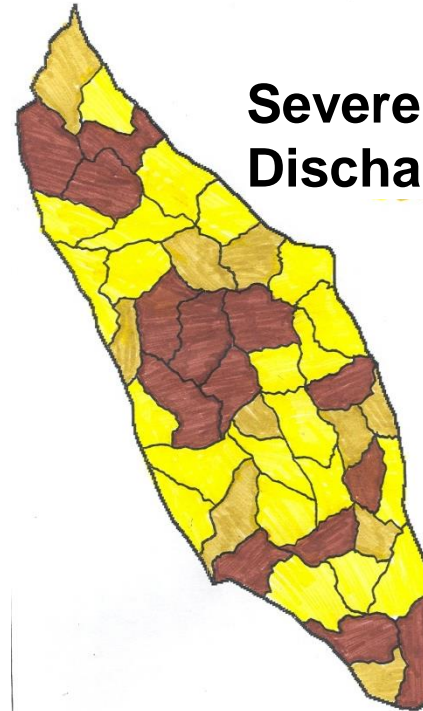
# 5. Results Shown by Subwatershed



**Minimal Illicit Discharge Problems**

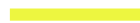




**Clustered Illicit Discharge Problems**



**Severe Illicit Discharge Problems**

**Key:**

-  Low IDP risk
-  Medium IDP risk
-  High IDP risk

EXAMPLE  
Stafford County, VA

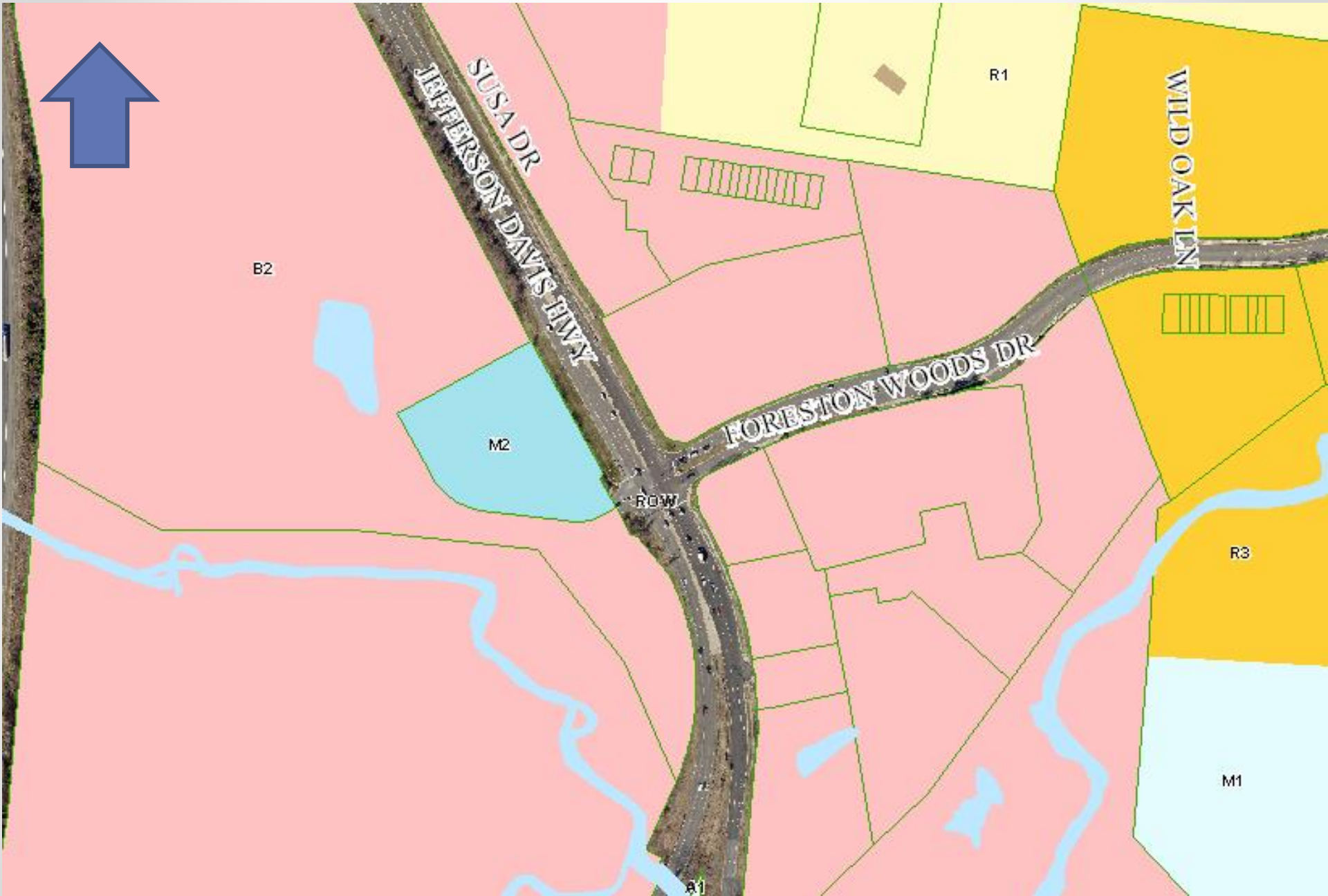
(slides courtesy of Paul Santay)



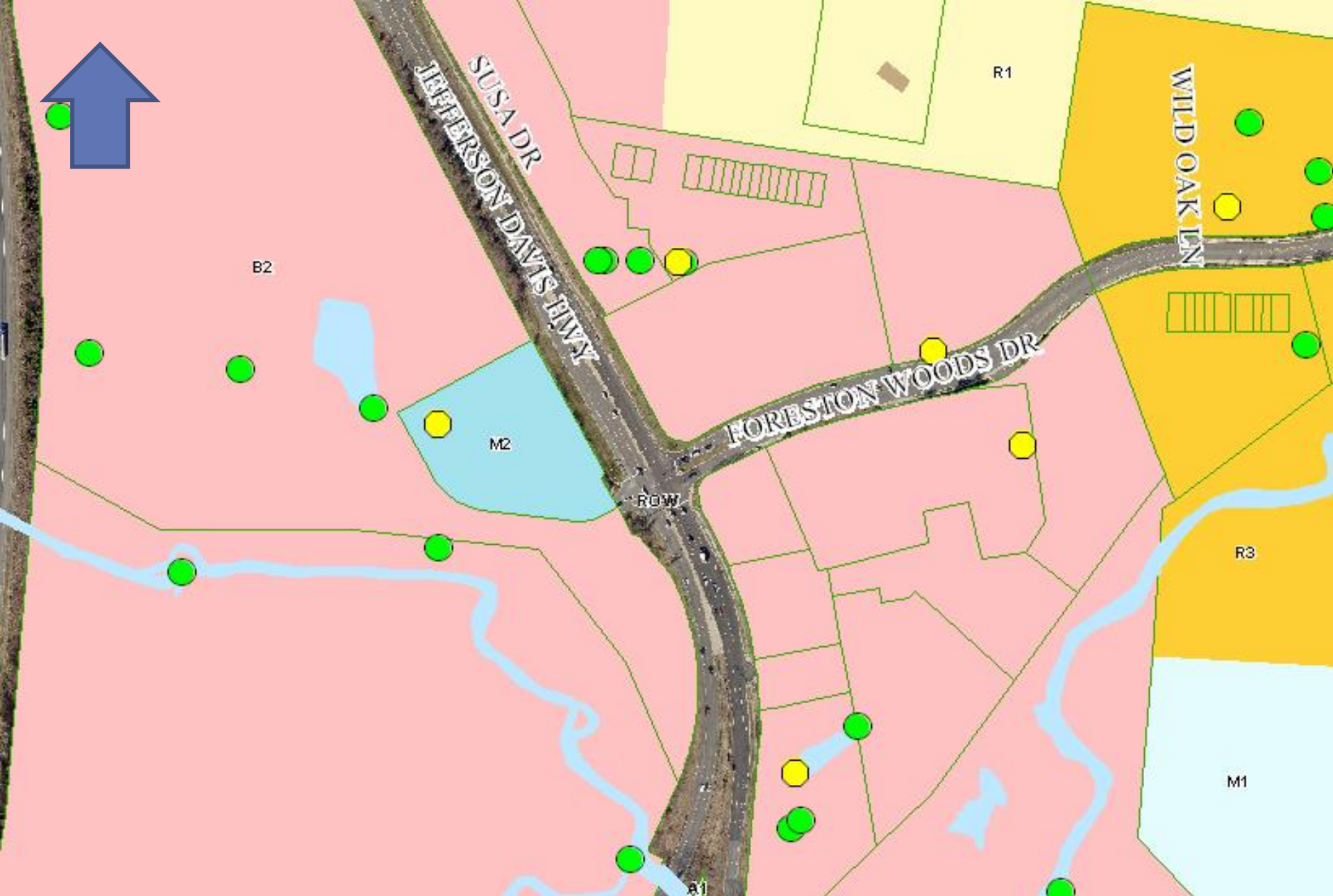


Aerial Photo: Intersection of Jefferson Davis Highway & Foreston Woods Drive.  
Austin Run (VA Impaired Water) from west-to-east





GIS layer (ZONING DISTRICT) added:  
R1 & R3 – Residential; B2 – Commercial; M1 & M2 – Industrial



GIS layer (OUTFALLS & BMP) added:  
Green Dot – Outfalls (ACoE); Yellow Dot (BMPs)





Aerial Photo: GIS layer (HOTSPOT) added





Aerial Photo: Only include OUTFALLS within 500 ft.



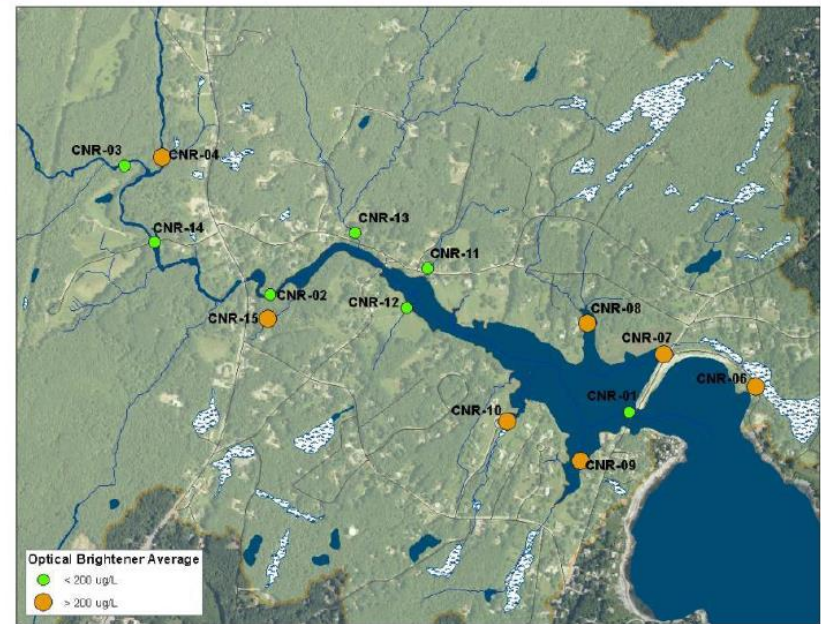
# Prioritization

Courtesy: Keri Lindberg, Maine Healthy Beaches

Intensified Bacteria Monitoring



Optical Brighteners



# Prioritization

Courtesy: Keri Lindberg, Maine Healthy Beaches

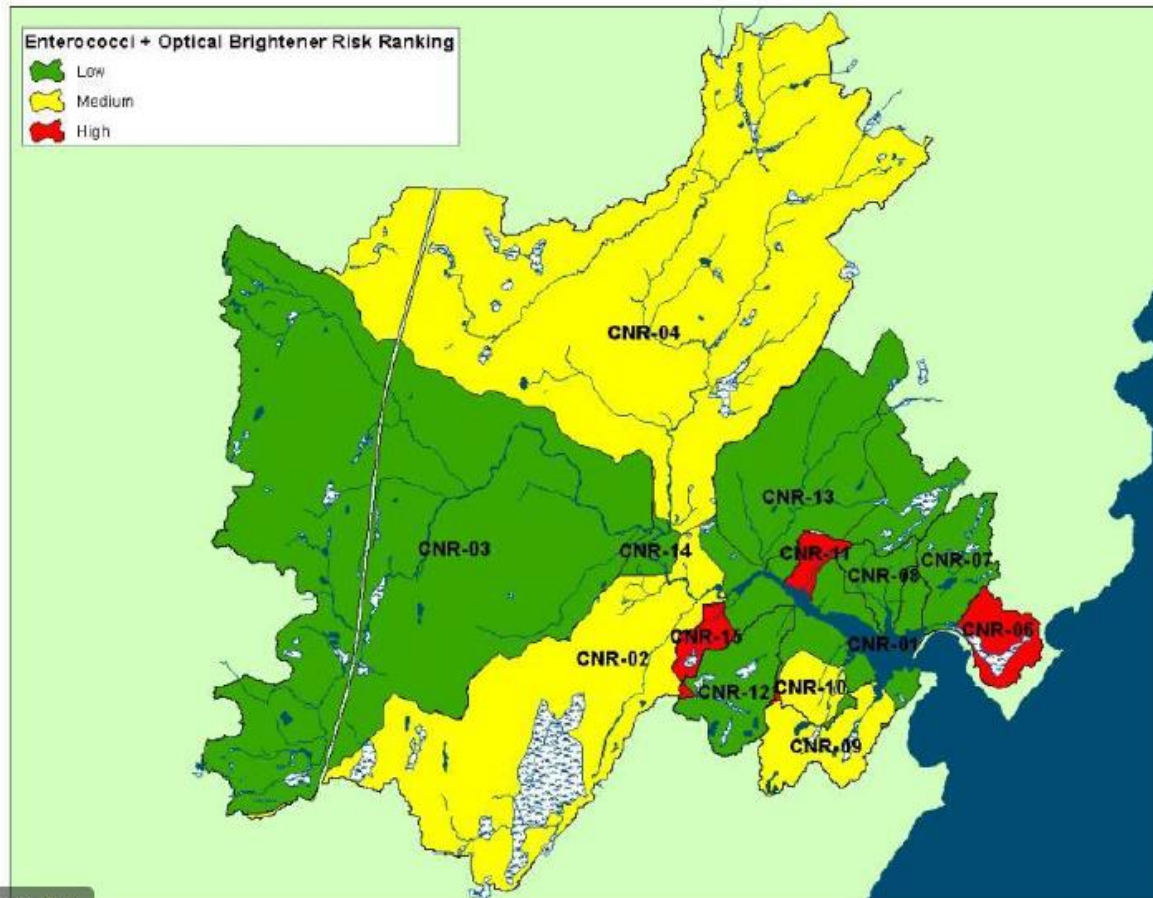
	High Bacteria	Low Bacteria
High Optical Brightener	Black water (e.g. human sources- malfunctioning septic system, sanitary sewer cross connection)	Grey or Gray water (e.g. laundry, wash water)
Low Optical Brightener	Human or non- human sources	Potentially low or no fecal contamination



# Prioritization

Courtesy: Keri Lindberg, Maine Healthy Beaches

## GIS: Risk Analysis



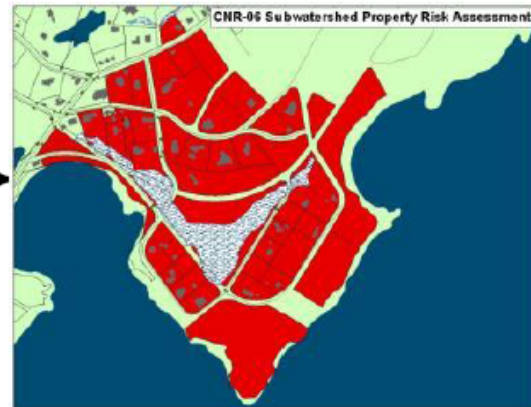
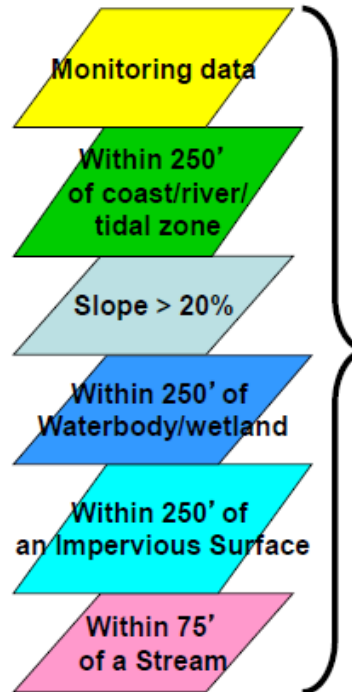
# Prioritization

Courtesy: Keri Lindberg, Maine Healthy Beaches

## GIS: Risk Analysis



- Transforming data to usable information
- Priority areas to survey for malfunctioning septic systems
- Multiple towns & agency partners share data & remediation strategies



# Desktop Assessment Benefits

- GIS or other database system to track outfalls
- Understand severity of IDDE problems
- Creating basic mapping for IDDE field work
- Prioritize field efforts to find and fix illicit discharges



# Q/A





# Indicator Monitoring & Field Techniques

October 24, 2017  
CapCOG Training



# “Dry Weather” Outfall Screening

- Looking at and testing flow from pipes, not in-stream
- At least 48 hours after precipitation (runoff-producing rain event)
- During period of low groundwater





# Time of Year Considerations



Frozen flows

Safety

Road salt



High groundwater  
table



Excess vegetation –  
hard to find outfalls

A/C condensate

Temperature  
effects on  
equipment

# Time of Year Considerations



- ▶ Vegetation died back
- ▶ Not too cold; good time for field work
- ▶ Road salt and groundwater influences at a minimum

# If you find dry weather flow:

- Take photos and notes (on DEP form)
- Collect a sample – if safe
- Mark the outfall or manhole
- Try to track down source of discharge





# Visual Indicators for Flowing Outfalls

- Is there flow?
- Odor
- Color
- Transparency
- Floatables



Photo credit: Snohomish County, WA

# Visual Indicators for Flowing Outfalls

- Outfall Damage
- Deposits/Stains
- Abnormal Vegetation
- Poor Pool Quality
- Pipe Benthic Growth



# Foam

## “Natural” foam

- Formed when organic matter decomposes
- Can be caused by turbulence (e.g. Waterfalls)
- Does not “last”
- Brownish / tannish edges



## “Un-natural” Foam

- Has “staying” power
- Whiter
- May have an odor



Jury is out — a water sample is needed for a definitive answer



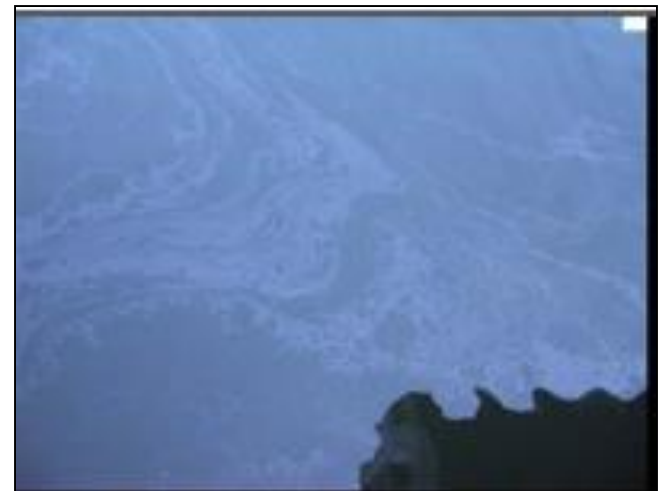
# Iron Floc

- Normally a naturally occurring phenomenon resulting from iron bacteria growth.
- These harmless bacteria "bloom" when oxygen, water and iron combine. The bacteria are typically rust-colored and appear oily.
- Generally associated with acidic soils.
- May be especially evident after heavy rains, when iron leaches from the soil.



# Sheens

- Sheens can occur from naturally occurring bacteria – these break into pieces when touched with a stick or other object
- Petroleum-based sheens break apart and then come back together when disturbed



Synthetic oil forms a swirling pattern.

# Visual Indicators

Source	Indicator
Wastewater	Gray, sewage odor, sewage fungus, floatables
Washwater	Suds, detergent or sweet smell
Sediment	Orange/brown color
Tap water	Chlorine smell (maybe)
Paint	Color, turbidity
Concrete washout	Turbidity
Industrial	Color, odors



# Indicator Monitoring

- Test chemical makeup of dry weather flows to:
  - Find problem discharges not apparent from visual indicators alone
  - Test suspect flow to *confirm* if illicit discharge
  - Determine *type* of illicit discharge



# Ammonia

- Concentration much higher in sewage than in groundwater or tap water
- Present in some industrial wastes
- *Challenges:*
  - Can volatilize
  - Pet/wildlife sources



# Detergents

- Most illicit discharges have detergents present
- Absent in natural waters and tap water
- *Surfactants* = active ingredient in most detergents





# Optical Brighteners

Optical brighteners are present in laundry washwater, intermittently present in wastewater

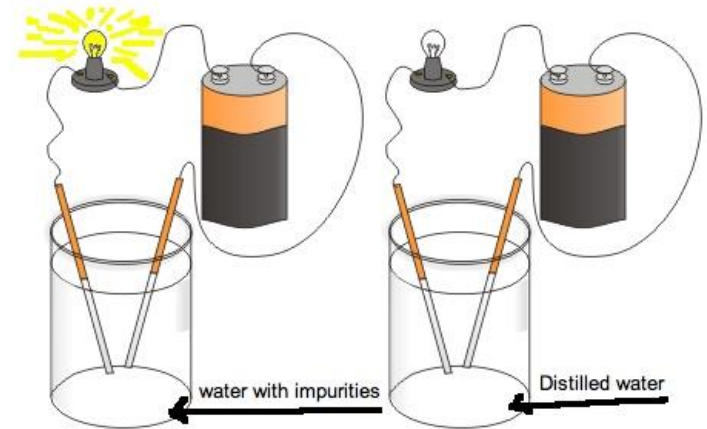
## Optical Brightener Traps:

- Detects detergents that are *intermittently* present
- Anchor absorbent pads in storm drains (2-7 days)
- Dry & view under black light



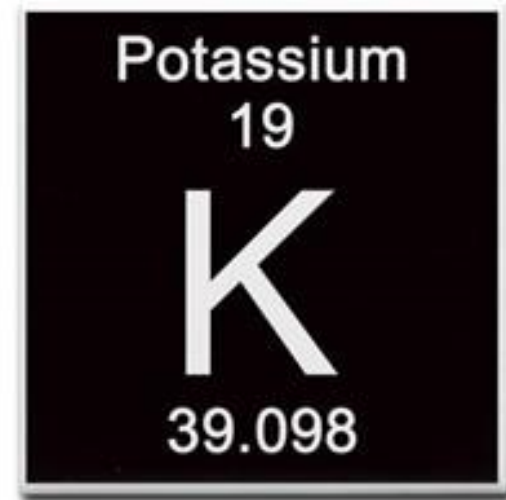
# Conductivity

- Correlated with amount of dissolved material in water
- Must first establish conductivity of groundwater
- Some industrial discharges have very high conductivity
- Easy to measure, but limited value



# Potassium

- Relatively high in sewage
- Very high in some industrial processes
- Combined with ammonia (*as a ratio*), can distinguish wash water from sewage





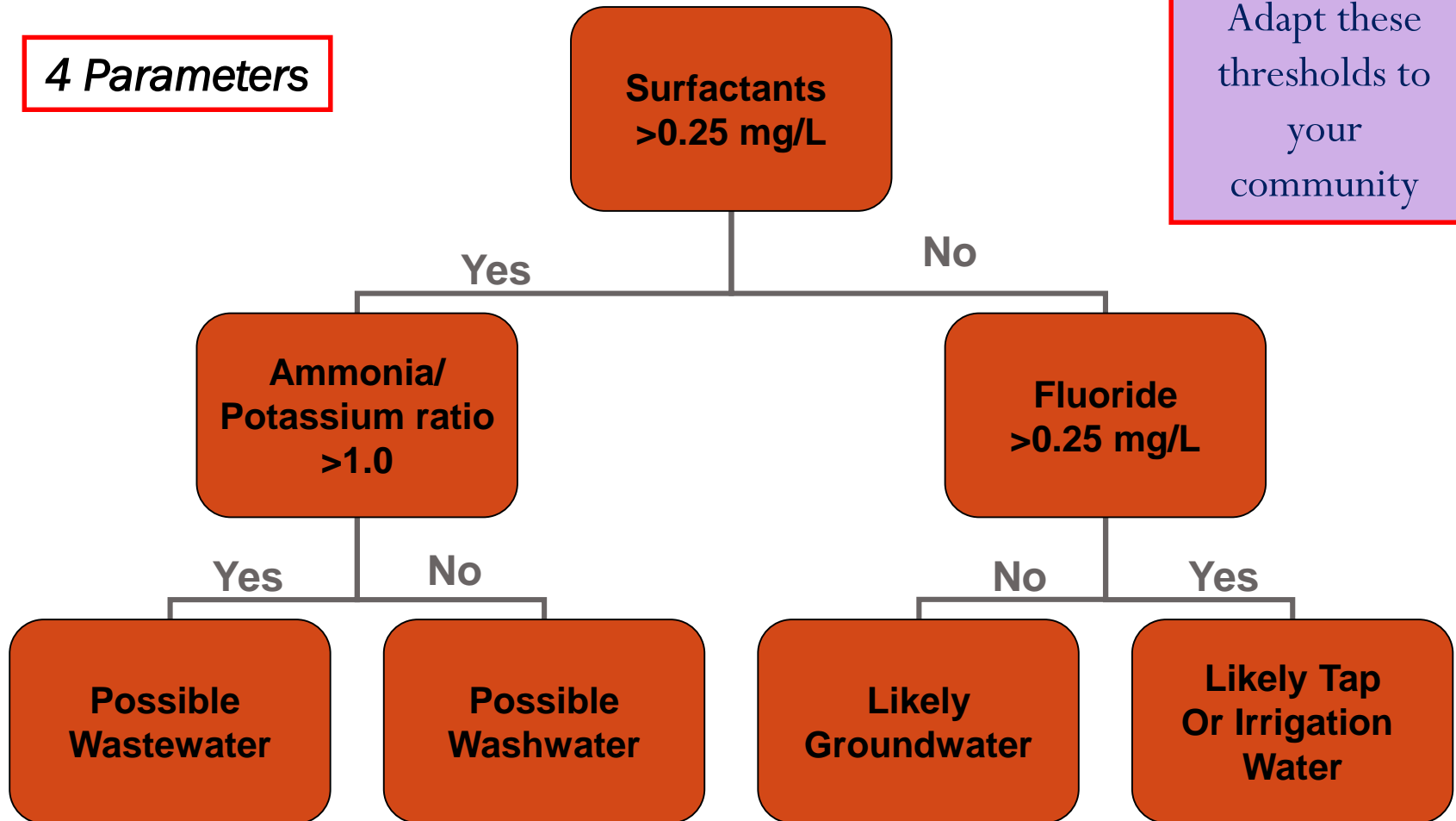
# Single Parameter Screening

- **Detergents** (methylene blue active substances, MBAS)
  - Best single parameter to detect illicit discharges
  - Analysis conducted in controlled lab setting
- **Ammonia**
  - Concentrations  $>0.2$  mg/L is potential indicator of sewage
  - Analysis in field using portable spectrophotometer

# Flow Chart Method

**4 Parameters**

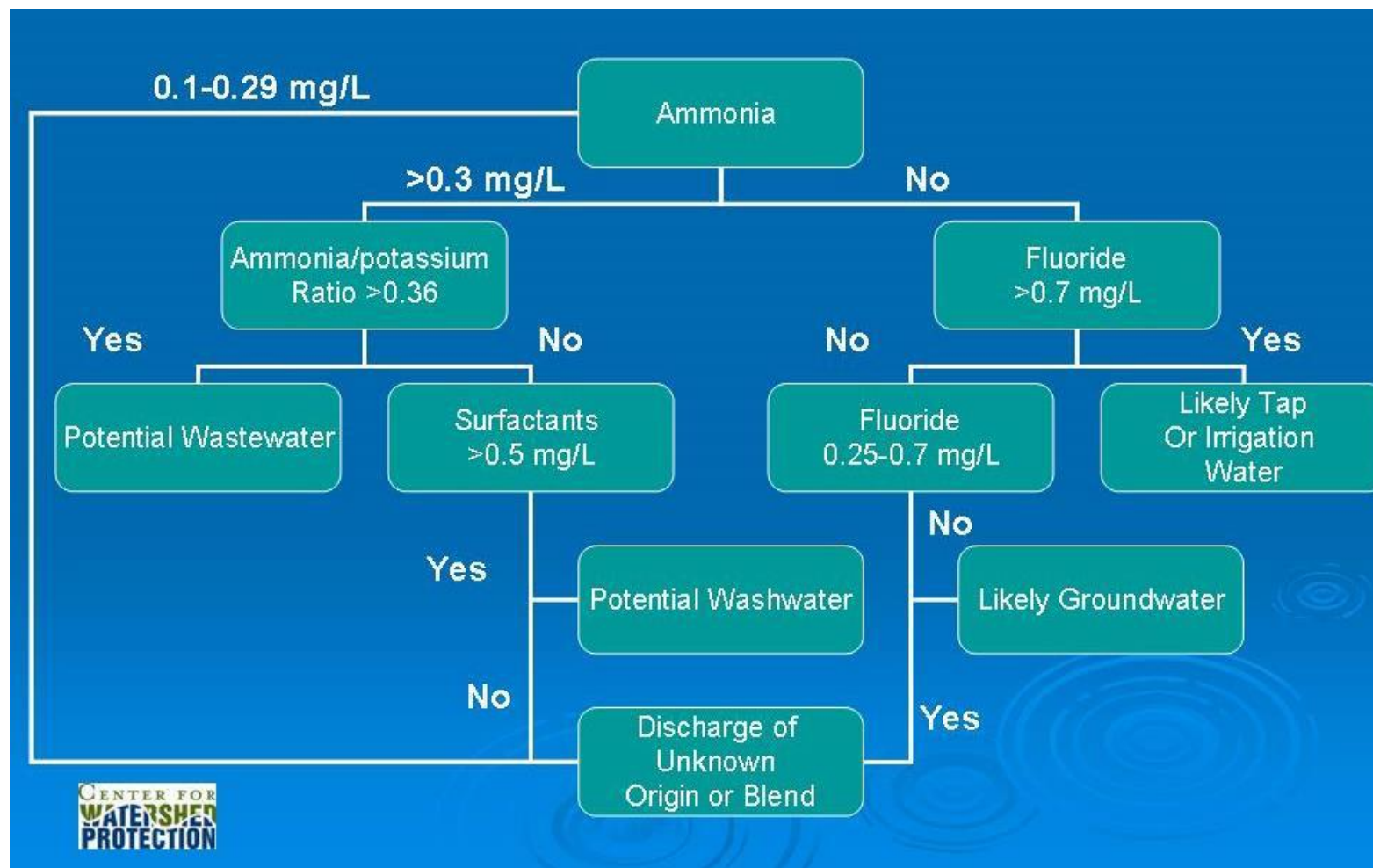
Adapt these  
thresholds to  
your  
community



From Brown et al (2004)

# IDDE Flow Chart – Baltimore

Modified from Brown et al, 2004





# Industrial Discharge Benchmarks

Benchmark	Concentration	Notes
Ammonia (mg/L)	$\geq 50$	Existing "Flow Chart" Parameter Concentrations higher than the benchmark can identify a few industrial discharges
Potassium (mg/L)	$\geq 20$	Existing "Flow Chart" Parameter Excellent indicator of a broad range of industrial discharges
Color (Units)	$\geq 500$	Supplemental parameter that identifies a few specific industrial discharges
Conductivity ( $\mu\text{S}/\text{cm}$ )	$\geq 2,000$	Identifies a few industrial discharges May be useful to distinguish between industrial sources
Hardness (mg/L as $\text{CaCO}_3$ )	$\leq 10$ $\geq 2,000$	Identifies a few industrial discharges May be useful to distinguish between industrial sources
pH (Units)	$\leq 5$	Only captures a few industrial discharges High pH values may also indicate an industrial discharge but residential wash waters can have a high pH as well
Turbidity (NTU)	$\geq 1,000$	Supplemental parameter that identifies a few specific industrial discharges

# Taking a Sample

- DO NOT take sample if discharge has strong smell or is hard to reach
- Only take sample if it seems safe
- Use sample bottle or bags that can seal well
- Wear gloves
- Avoid touching inside lip of container
- Record site id, date, location and sample collectors on bottle and on form
- Keep sample on ice if testing for bacteria



# Holding Samples

Parameter	Holding Time	Notes
Bacteria	6 hours	Cool, 4°C
Ammonia	Process immediately	Can preserve with sulfuric acid and hold for 28 days
Fluoride	28 days (HDPE plastic container only)	Cool, 4°C
Anionic Surfactants	2 days	Cool, 4°C
Potassium	6 months	Frozen
Total nitrogen / Total phosphorus	24 hours 30 days	Cool, 4°C Frozen below -20°C
pH	Process immediately	
Temperature	Process immediately	

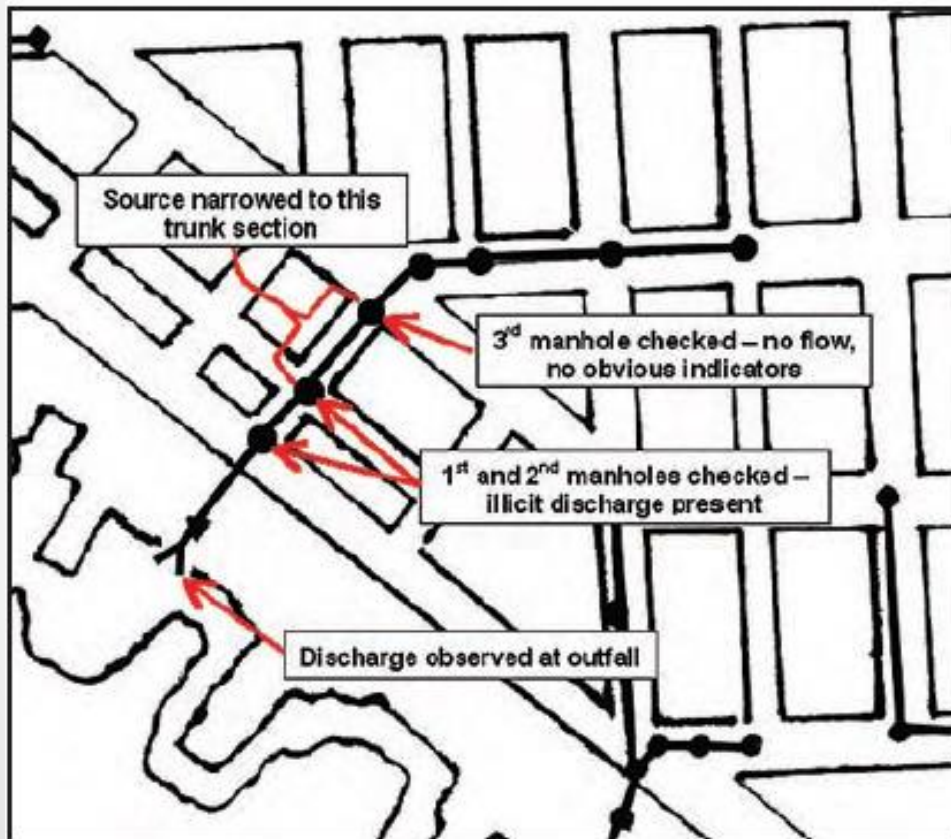


# Track Up Storm Drain Network

- During dry weather only
- Isolate flow at manholes
- Look for physical indicators
- Sample in manholes & test for chemical indicators



# Isolating Flow in Storm Drain



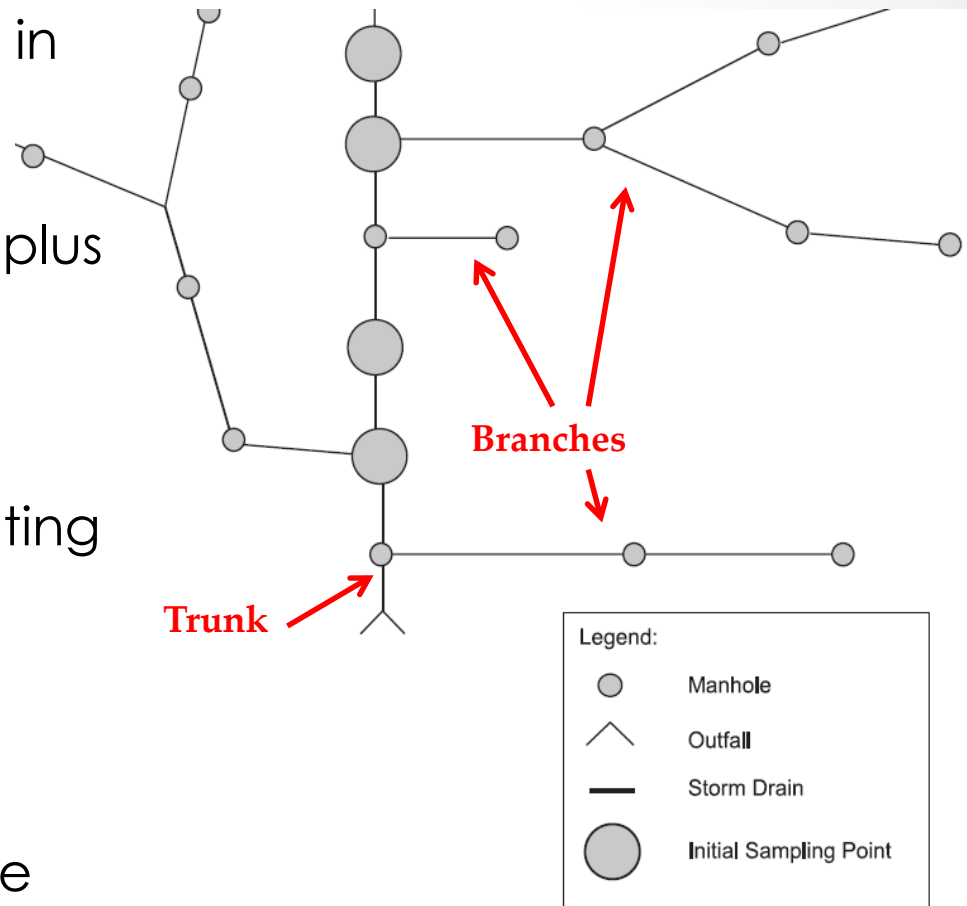
From Brown et al (2004)

- Start at outfall & move up pipe network
- **Goal:** Isolate flow to between 2 manholes



# Splitting the Trunk

1. Identify major branches to the trunk (largest diameter pipe in the network)
2. Identify manholes where branches connect to trunk, plus one immediately upstream.
3. Working up the network, investigate
4. manholes on each contributing branch and trunk
5. Narrow the discharge to a specific section of trunk or contributing branch
6. Move up until a specific pipe segment is isolated

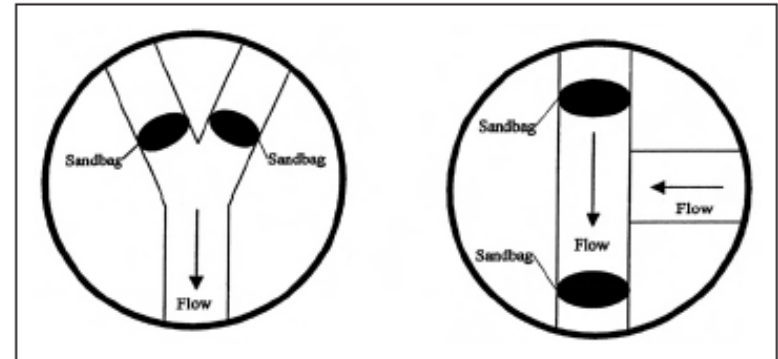




# For Intermittent Flows

## Catch the flow:

- Dam flow with sandbags (if not tidal)
- Install when no rain is predicted
- Leave in for 48 hours or less



(Source: Jewell, 2001)

# Video Surveys

- Closed caption television (CCTV) – robot camera
- Use for sanitary sewer or storm pipes
- Live image to see cracks, leaks, breaks, and blockages
- Best for continuous discharges



# Dye Testing



- Add to plumbing fixtures to see if/where dye comes into storm sewers (cross-connection)
- Use when discharge has been isolated to very small drainage area (<10 properties)
- Must gain access to private property; inform residents & agencies
- Requires extra staff to find dye





# Drainage Area Investigation

- Drive or walk around looking at potential discharge source sites
- Only works if flow is distinct (e.g., color, odor, or high indicator reading)
- Not very helpful for finding sewage leaks



# Field Guide & Procedures

- Common Pollution Problems
- Illicit Discharge Characteristics
  - Odor
  - Color
  - Turbidity
  - Floatables
- Written Procedures
- WILL be adapted to HR Area for coastal conditions



Shenandoah Valley MS4 Communities

Illicit Discharge Detection and Elimination Field Guide:  
How to Identify and Quickly Report Pollution Problems

Funding: Virginia Environmental Endowment  
Written by: Center for Watershed Protection

December 2014

# QUESTIONS?







## MS4 OUTFALL FIELD SCREENING REPORT

### BACKGROUND INFORMATION

Permittee Name:	NPDES Permit No.: PA
Date of Inspection:	Outfall ID No.:
Land Uses in Outfall Drainage Area (Select All):	Latitude: _____ ° _____ ' _____ "
<input type="checkbox"/> Industrial <input type="checkbox"/> Urban Residential	Longitude: _____ ° _____ ' _____ "
<input type="checkbox"/> Commercial <input type="checkbox"/> Suburban Residential	Dry Weather Inspection? <input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Open Space <input type="checkbox"/> Other:	Date of Previous Precipitation:
	Amount of Previous Precipitation: _____ in
Inspector Name(s):	Were Photographs Taken? <input type="checkbox"/> Yes <input type="checkbox"/> No
	Are Photographs Attached? <input type="checkbox"/> Yes <input type="checkbox"/> No

### OUTFALL DESCRIPTION

TYPE	MATERIAL	SHAPE	DIMENSIONS	SUBMERGED
<input type="checkbox"/> Closed Pipe	<input type="checkbox"/> RCP <input type="checkbox"/> CMP <input type="checkbox"/> PVC <input type="checkbox"/> HDPE <input type="checkbox"/> Steel <input type="checkbox"/> Other	<input type="checkbox"/> Circular <input type="checkbox"/> Single <input type="checkbox"/> Elliptical <input type="checkbox"/> Double <input type="checkbox"/> Box <input type="checkbox"/> Triple <input type="checkbox"/> Other <input type="checkbox"/> Other	Diameter: _____ in	<input type="checkbox"/> In Water <input type="checkbox"/> With Sediment
<input type="checkbox"/> Open Channel	<input type="checkbox"/> Concrete <input type="checkbox"/> Earthen <input type="checkbox"/> Rip-Rap <input type="checkbox"/> Other	<input type="checkbox"/> Trapezoid <input type="checkbox"/> Parabolic <input type="checkbox"/> Other	Depth: _____ in Top Width: _____ in Bottom Width: _____	

Dry Weather Flow Present at Outfall During Inspection? ☐ Yes ☐ No (If No, skip to Certification Section)

Description of Flow Rate: ☐ Trickle ☐ Moderate ☐ Significant ☐ N/A

### DRY WEATHER FLOW EVALUATION

Does the dry weather flow contain color? ☐ Yes ☐ No If Yes, provide a description below.

Does the dry weather flow contain an odor? ☐ Yes ☐ No If Yes, provide a description below.

Is there an observed change in the receiving waters as a result of the discharge? ☐ Yes ☐ No  
If Yes, provide a description below.

Does the dry weather flow contain floating solids, scum, sheen or substances that result in deposits? ☐ Yes ☐ No  
If Yes, provide a description below.

Were sample(s) collected of the dry weather flow? <input type="checkbox"/> Yes <input type="checkbox"/> No (If Yes, No. Samples: _____)					
<b>FIELD / LABORATORY ANALYSIS</b>					
<b>PARAMETER</b>	<b>RESULTS</b>	<b>UNITS</b>	<b>PARAMETER</b>	<b>RESULTS</b>	<b>UNITS</b>
Flow Rate		GPM	Fecal Coliform		No./100 mL
pH		S.U.	COD		mg/L
Total Residual Chlorine (TRC)		mg/L	BOD5		mg/L
Conductivity		µmhos/cm	TSS		mg/L
Ammonia-Nitrogen		mg/L	TDS		mg/L
Other: _____			Oil and Grease		mg/L
Other: _____			Other: _____		
Indicate the parameters above that were analyzed by a DEP-certified laboratory:					
<b>ILLICIT DISCHARGES</b>					
Is the dry weather flow an illicit discharge? <input type="checkbox"/> Yes <input type="checkbox"/> No					
If Yes, describe efforts made to determine the source(s) of the illicit discharge.					
Describe corrective actions taken by the permittee in response to the finding of an illicit discharge.					
Inspector Comments:					
<b>RESPONSIBLE OFFICIAL CERTIFICATION</b>					
I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowledge of violations. See 18 Pa. C.S. § 4904 (relating to unsworn falsification).					
Responsible Official Name			Signature		
Telephone No.			Date		