MS4 Program Elements for Watershed Protection

Watershed Inspector Training

CT Department of Public Health

Tuesday, October 15, 2019

Agenda

- Intro
- MS4 Permit Requirements
  - MCM 1 – Public Education & Outreach
  - MCM 3 – IDDE
  - MCM 5 – Post Construction SW Management
- Impaired Waters & USGS Water Quality Model

MS4 Basics

MS4

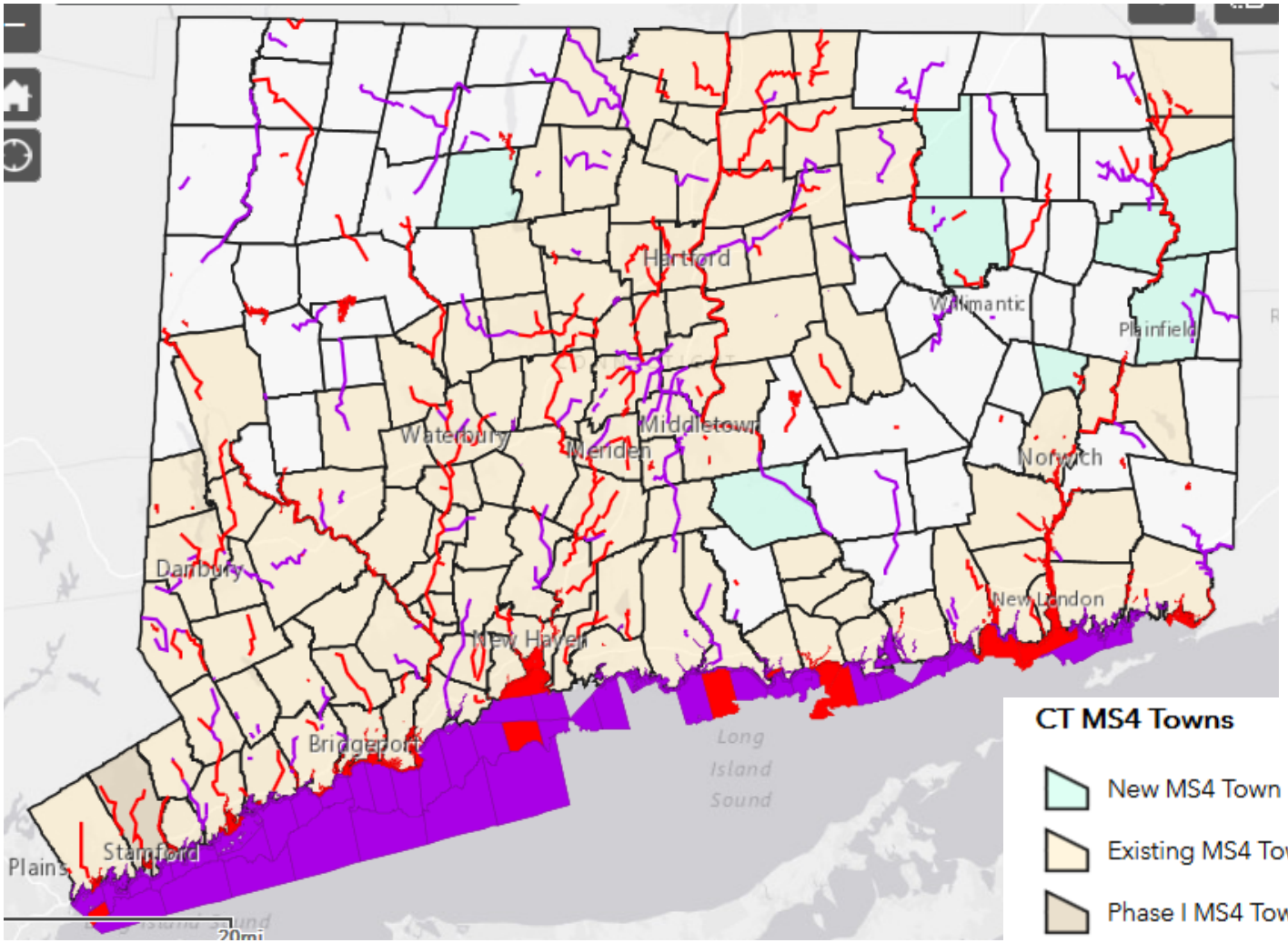
- Municipal Separate Storm Sewer System
  - A publicly owned stormwater runoff conveyance system
  - Discharges to the waters of the U.S.

NPDES

- National Pollutant Discharge Elimination System
  - Permits issued by EPA or authorized states

Image from the cover of the Wastewater Facilities Plan for the Town of Fairfield, CT. Draft April 2017. Connecticut Council of Environmental Quality. Retrieved from http://www.ct.gov/ceq/lib/ceq/Fairfield_FacilityPlan_Draft_2017-04-17.pdf

Who is Covered?



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DOT MS4 Permit Overview

- Six Minimum Control Measures (MCMs)
  1. **Public Outreach & Education**
  2. Public Involvement / Participation
  3. **Illicit Discharge Detection & Elimination**
  4. Construction Site Stormwater Runoff Control
  5. Post Construction Stormwater Management
  6. Pollution Prevention / Good Housekeeping
- **Plus, outfall monitoring requirements**

Grassed Channel (Biofilter Swale). Structural BMP Specifications for the Massachusetts Stormwater Handbook. Vol. 2 Chap. 2. Massachusetts Department of Environmental Protection. Retrieved from https://www.mass.gov/files/documents/2016/08/qi/v2c2.pdf

MCM #1 - Public Education & Outreach

UCONN | UNIVERSITY OF CONNECTICUT

CENTER FOR LAND USE EDUCATION AND RESEARCH & CT NEMO

Connecticut MS4 Guide

NEMO

Basics Tasks Tools About MS4 News NEMO CLEAR

Implementation

Public Education and Outreach

The new permit expands on the requirement for MS4s to implement a public education and outreach program. All MS4s will need to distribute educational material on how the specific topics below impact stormwater quality or conduct equivalent outreach activities. Some specific examples of public education can be found below.

Another great resource is the **EPA's Stormwater Outreach Toolbox**. You can just type in a topic and it will provide a list of examples of public education on that topic from around the country.

General Stormwater Education Library

All MS4's are required to provide public education and outreach on pet waste, fertilizer, pesticides, and herbicides, impervious cover, and the impacts of illicit discharges. Samples for each topic can be found below and modified for use.

- Pet Waste
- Fertilizer, Pesticides, & Herbicides
- Impervious Cover
- Impacts of Illicit Discharges
- Residential stormwater management

Specific Pollutant Library

If any MS4 outfalls empty directly into an impaired waterbody, the MS4 must also provide public education and outreach focused on the pollutants causing the pollution. Sample outreach material covering common sources and activities associated with each pollutant are provided below.

- Septic Systems (Nitrogen, Phosphorus, & Bacteria)
- Fertilizer Use (Nitrogen, Phosphorus, & Bacteria)
- Grass Clippings & Leaves (Nitrogen & Phosphorus)
- Detergent Use (Nitrogen & Phosphorus)

Clean Waters

Starting in Your Home and Yard

Clean Waters is a collaboration of the Connecticut Sea Grant Extension Program and the University of Connecticut Cooperative Extension System's NEMO Project, educating individuals about the impacts of everyday activities on water quality and simple techniques that help protect water resources from the home well to Long Island Sound.

3 Fact Sheet December 1999

Caring for Your Septic System

When you flush your toilet, or pour something down your drain, do you know where it goes? If your home is not on a municipal or community system, your wastewater probably goes into an on-site sewage disposal system, commonly called a septic system. A septic system is designed to collect, treat and dispose of wastewater on site so that it can percolate into the ground without clogging the soil or contaminating ground or surface waters.

In Connecticut, nearly 40% of homes use some form of on-site sewage disposal system to treat and dispose of household wastewater. When properly sited, designed, installed and maintained, a septic system can be a cost-effective method of wastewater treatment. However, since wastewater disposal is something most of us don't spend much time thinking about, many systems are out of date, not functioning properly, or clearly failing.

Domestic wastewater contains several kinds of pollutants. The major pollutant is the pathogens (disease-causing microorganisms) like the bacteria and viruses that cause dysentery, hepatitis, and typhoid fever. Fortunately, soil and soil bacteria can effectively remove most pathogens from wastewater treated by a properly functioning septic system.

When nutrients such as nitrogen and phosphorus are discharged from septic systems into the groundwater, they can contaminate drinking water supplies, and also represent a potentially important nonpoint source of pollution to ponds, streams, and estuaries such as Long Island Sound. In freshwater systems, phosphorus causes excessive aquatic weed growth that can limit the uses of ponds and lakes. In the Sound, excess nitrogen fuels massive algal blooms, which in turn die, using up oxygen as they decompose.

The improper use of septic systems has been shown to contribute to contamination of groundwater by toxic chemicals. Contaminants that may enter groundwater through septic systems include heavy metals and toxic chemicals from small commercial establishments, toxic household products, and organic chemicals typically found in septic tank cleaning products.

How Does A Septic System Operate?

Most systems have two main components: the septic tank and the leach field. A distribution box is often found between these two components to distribute wastewater to all parts of the leach field.

The septic tank receives the wastewater and provides a site for the solids to separate and settle and for some decomposition of solids and contaminants to occur. Heavy solids settle to the bottom of the tank forming a layer of sludge. Lighter solids, like grease, float to the top forming a layer of scum. The wastewater in the middle is pushed out into the leach field as more wastewater moves into the tank. Solids need time to settle to prevent them from being pushed out into the leach field and they also need to be periodically pumped from the tank. A properly sized tank will hold 2-3 days worth of wastewater to allow for proper settling. A two-chambered tank allows for more complete settling of solids because there is less turbulence in the second chamber, resulting in cleaner water leaving the tank.

The leach field consists of trenches or a bed, often lined with gravel or coarse sand, and is buried one to three feet below the surface of the ground.

Perforated pipes or drain tiles run through the trenches. Wastewater trickles from the perforat-

MCM 3 – Illicit Discharges

"Illicit Discharge" means any unpermitted discharge to waters of the state that does not consist entirely of stormwater or uncontaminated ground water except those discharges identified in Section 3(*a*)(2) of the DOT MS4 general permit.

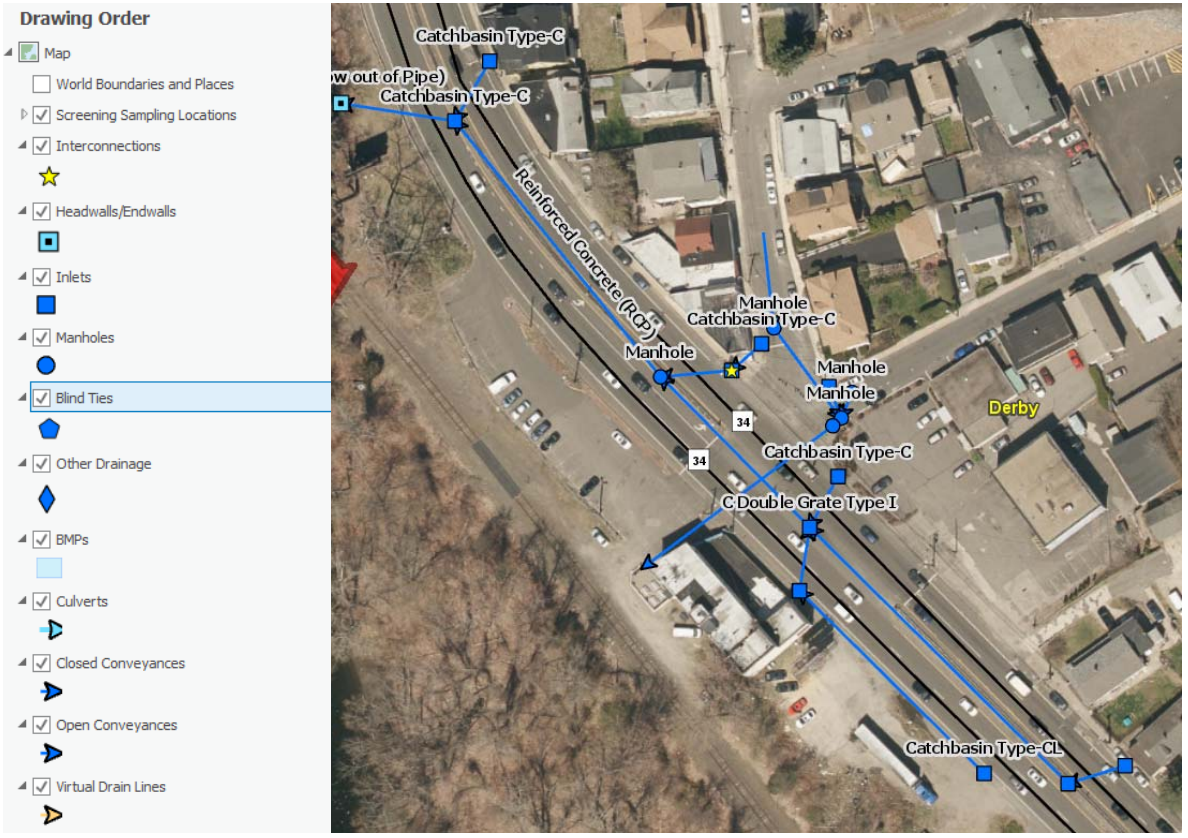
The DOT MS4 Permit's primary focus is on bacteria when sampling suspected illicit discharges

Pictures taken from "Common Water Quality Complaints Color Guide", Published by the City of Austin, Texas

MCM 3 - IDDE

Mapping DOT's Stormwater System

- Started Mapping in June of this year
  - Approximately 25,000 assets in database currently
- DOT Schema is Statewide Standard
  - Ad Hoc GIS Standards Committee Blessed
  - DOT schema will be the basis of the State Standard

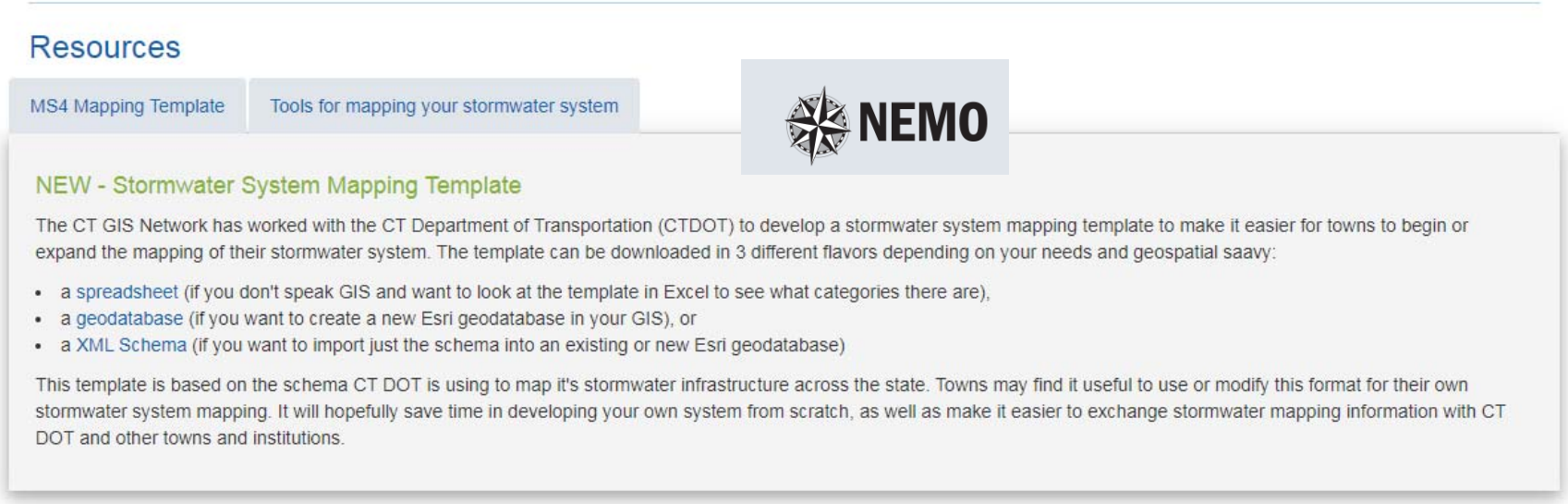


Screenshot of CTDOT Drainage Network Map

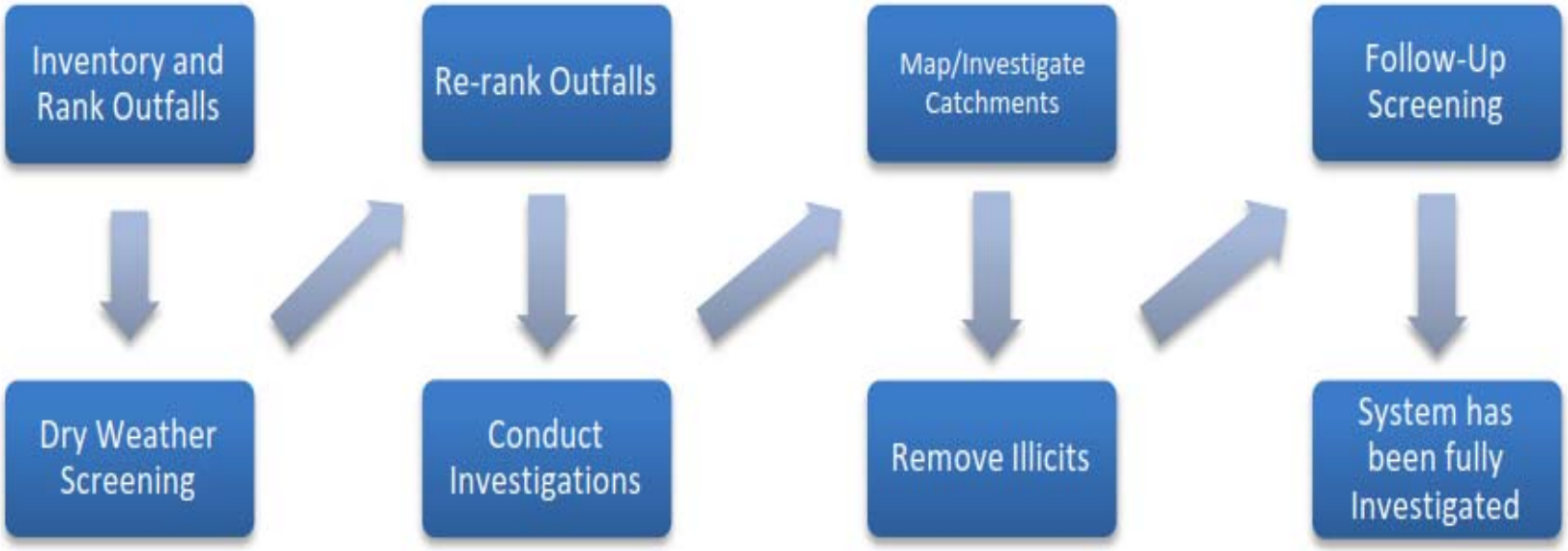
MCM 3 - IDDE

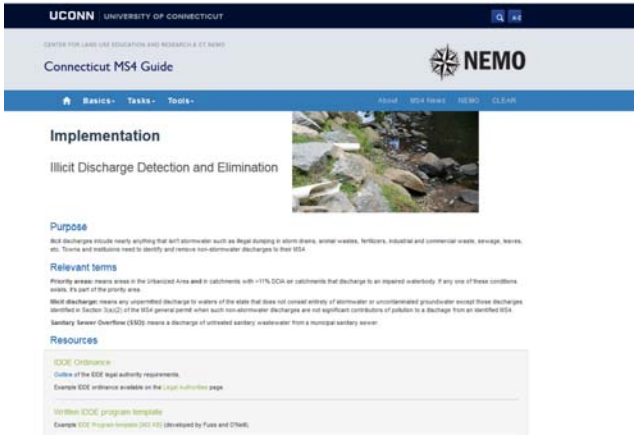
Mapping DOT's Stormwater System

- Geodatabase is available on UConn NEMO's website:
  - https://nemo.uconn.edu/ms4/tasks/mapping.htm
- Long-term goal of sharing MS4 interconnection data with municipalities

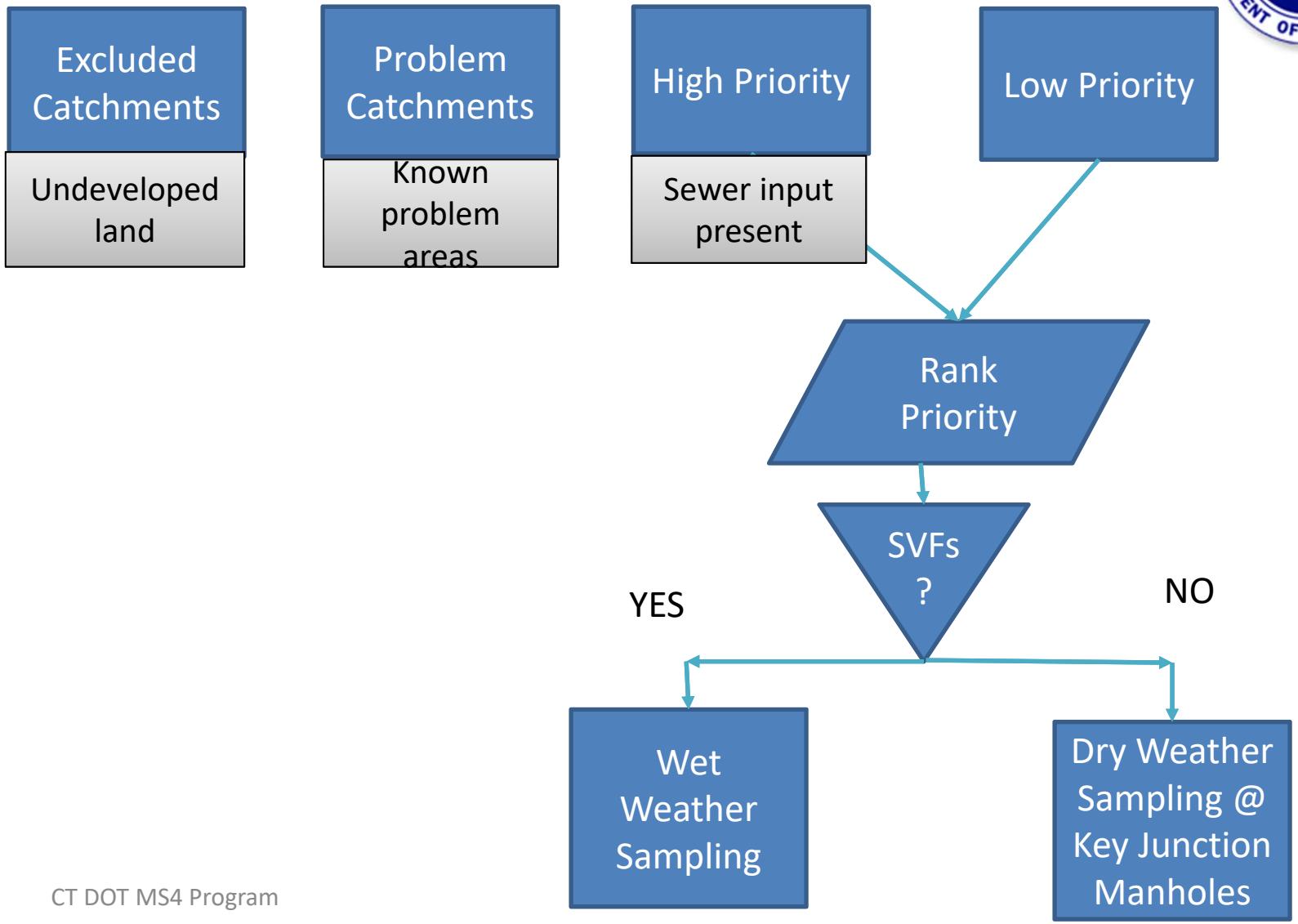


Detection & Elimination





Catchment Investigation



Catchment Priority Ranking

Discharge Screening Factor	Illicit Discharge Potential Score
Past Discharge Complaints and Reports	Past discharge complaints/reports: <5 = 1; 5-10 = 2; >10 = 3
Poor Dry Weather Water Quality	% of Dry weather water quality sampling results failing benchmarks: <25% = 1; 25-50% = 2; >50% = 3
Density of Generating Sites or Industrial NPDES Storm Water Permits	Storm water outfall density: <10 = 1; 10-20 = 2; >20 = 3
Age of catchment development	Average age of development: <25 years = 1; 25- 50 years = 2; >50 years = 3
Sewer Conversion	Catchment sewer conversion: <20 years =1 20-30 years = 2 >30 years =3
Historic Combined Sewer Systems	Catchments once served by combined sewer = 3
Density of Aging Septic Systems	
Culverted Streams	

Catchment Priority Ranking

System Vulnerability Factors

- History of SSOs
- Common or Twin Invert Manholes
- Common Trench Construction
- Storm/Sanitary Crossings (Sanitary Above)
- Sanitary Lines with Underdrains
- Inadequate Sanitary Level of Service
- Areas Formerly Served by Combined Sewers
- Sanitary Infrastructure Defects
- SSO Potential In Event of System Failures
- Sanitary and Storm Drain Infrastructure >40 years Old
- Septic with Poor Soils or Water Table Separation
- History of Health Department Actions addressing Septic Failures

MCM 5 – Post-Construction Stormwater

DCIA Reduction Goal

- Determine and track changes to DCIA
- Permit requires CTDOT to disconnect 2% of mapped Directly Connected Impervious Area by 2024
- Typically done with Stormwater BMP's

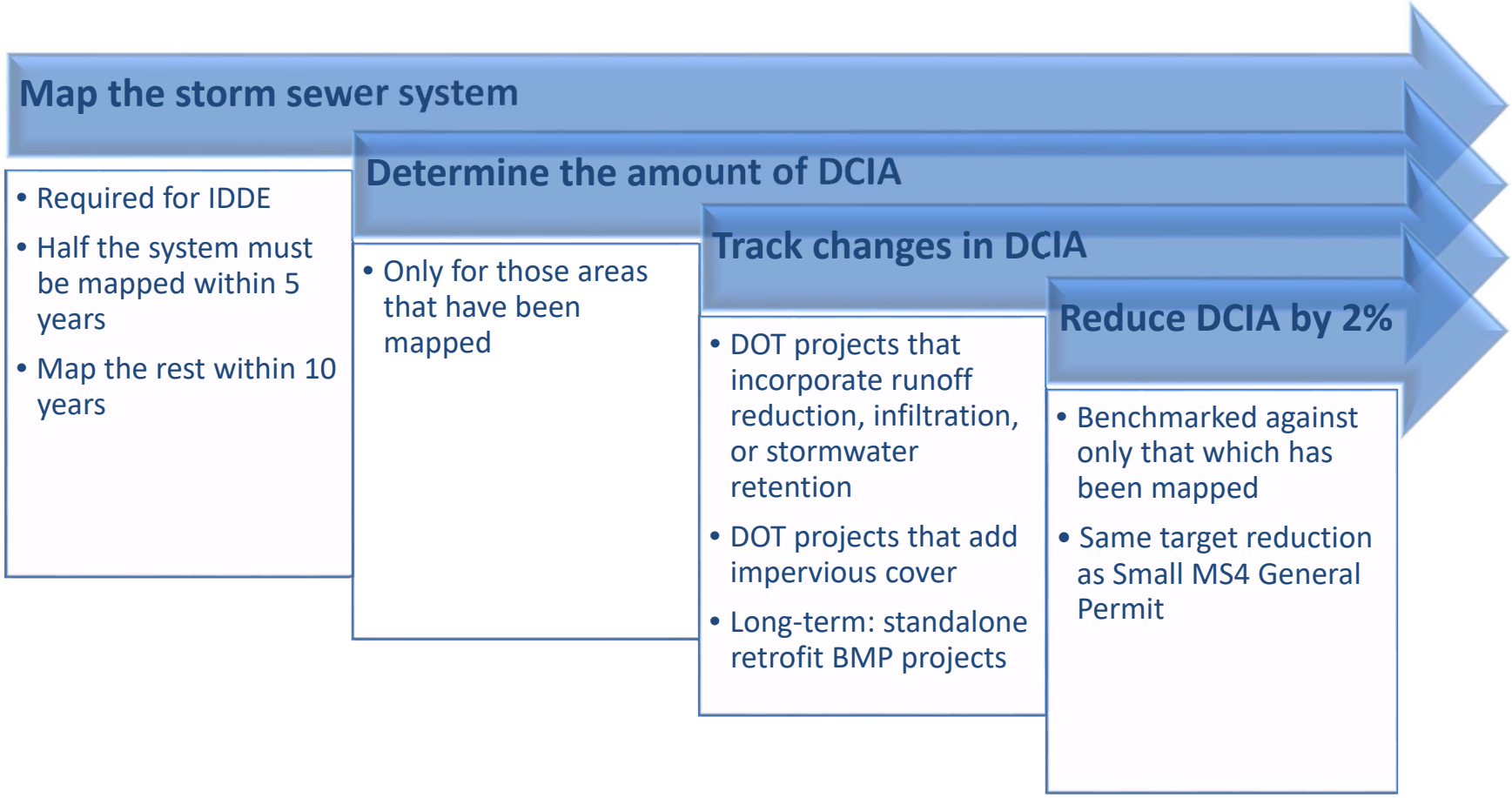
Directly Connected Impervious Area

Retrieved from UCONN NEMO "What Type of Impervious Cover do you Have?"
https://nemo.uconn.edu/ic-guide/step2-type.htm

Disconnected Impervious Area

Retrieved from UCONN NEMO "What Type of Impervious Cover do you Have?"
https://nemo.uconn.edu/ic-guide/step2-type.htm

DCIA – Mapping, Tracking & Reductions



MCM 5 – Post Construction Stormwater

Examples of Stormwater BMPs

Vegetated Swale

Photo of a Vegetated Swale. Win-brook Office Park, Brook Street Rocky Hill, CT. National Low Impact Developed (LID) Atlas Retrieved from: http://lidmap.uconn.edu/

Rain Gardens and Pervious Pavers

Photo of rain gardens and pervious pavers along Main Street, Bridgeport, CT. National Low Impact Developed (LID) Atlas
Retrieved from: http://lidmap.uconn.edu/

MCM 5 – Post Construction Stormwater

Examples of Stormwater BMPs

Bioretention System

Bioretention System at lower Horne Street. Image taken from pg. 10 of Berry Brook Watershed Implementation Plan by the City of Dover, NH and UNH Stormwater Center. Retrieved from: https://www.dover.nh.gov/Assets/government/city-operations/2document/community-services/current-projects/Berry%20Brook%20Watershed%20Plan.pdf

Bioswales

Photo of bioswales at Richmond Parkway along Contra Costa 80, CA. Best Management Practices(BMPs) Examples. California Department of Transportation. Retrieved from http://www.dot.ca.gov/design/hsd/bmp/examples.html#biofiltration

MCM 5 – Post Construction Stormwater

Examples of Stormwater BMPs

Enhanced Dry Swale

Georgia Stormwater Management Manual [GSMM], Volume 2. Retrieved from https://cdn.atlantaregional.org/wp-content/uploads/2017/03/gsmm-2016-final.pdf

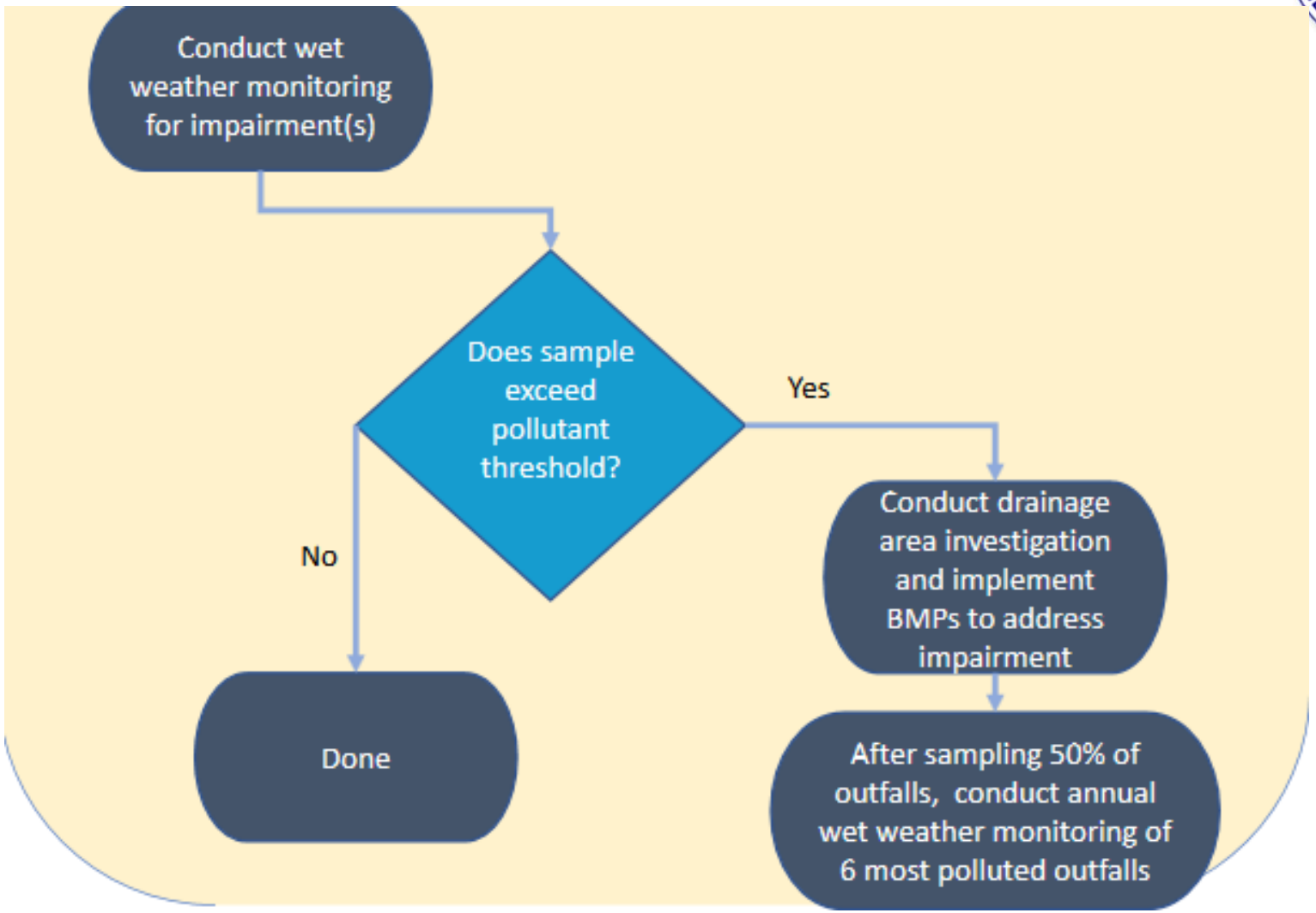
Post-Construction Wet Pond

Image taken from cover of Stormwater Wet Pond and Wetland Management Guidebook, Feb. 2009. U.S.EPA. Retrieved from https://www.epa.gov/sites/production/files/2015-11/documents/pondmgmtguide.pdf

Agenda

- CTDOT MS4 Team
- DOT MS4 Permit
  - MCM 3 – IDDE
  - MCM 5 – Post Construction SW Management
- Impaired Waters & USGS Water Quality Model

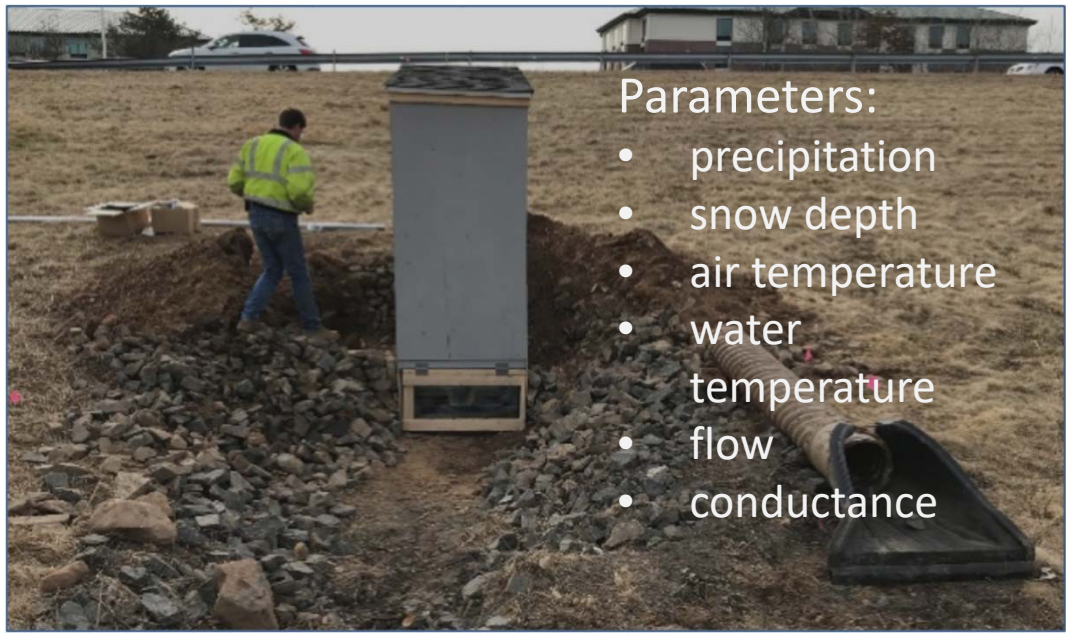
Municipal: Impaired Waters



DOT: Impaired Waters Monitoring

USGS will monitor 9 representative outfalls

- Locations were selected based on land use, impervious area, and traffic
- 2 years of continuous monitoring for each out-fall



CTDOT Photo of USGS building an outfall monitoring station in Glastonbury

DOT's Stormwater Management Plan

SWMP

- DOT's plan on implementing its MS4 Program
- Lists the best practices to be implemented to meet permit requirements
- Plan can be found here: *www.ct.gov/dot/ctdot-ms4*

STATE OF
CONNECTICUT
DEPARTMENT OF
TRANSPORTATION

STORMWATER
MANAGEMENT PLAN

March 2019

This plan is based on a template originally created by Western Connecticut Council of Governments staff and modified for Statewide use by staff from UConn Center for Land use Education and Research (CLEAR).

1

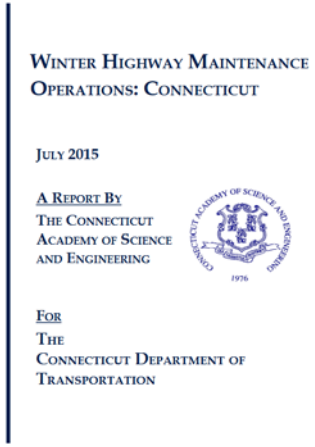
Questions ?

DOT.MS4@ct.gov

Department of Transportation – Snow & Ice Control Guidelines

COMMON MYTH #1

- Why doesn't DOT just go back to using sand?
  - 2006: Operational Change
    - 7 Sand:2 Sodium Chloride Mix to Sodium Chloride
      - Sand is just not as effective
      - Loses its abrasive properties fast
      - Sand has other effects:
        - drainage system maintenance
        - Wetland/surface water impacts
      - Use same amount of sodium chloride


WINTER HIGHWAY MAINTENANCE OPERATIONS: CONNECTICUT

JULY 2015

A REPORT BY
THE CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING

FOR
THE CONNECTICUT DEPARTMENT OF TRANSPORTATION

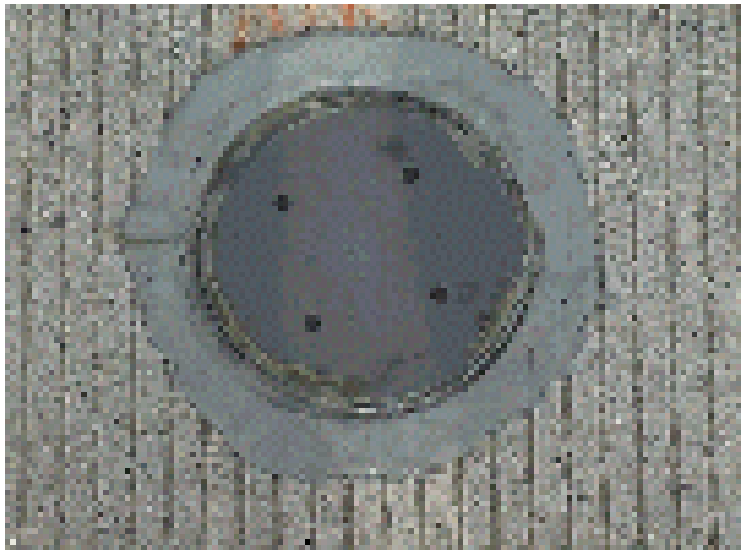
  - 2015: Connecticut Academy of Science & Engineering Review
  - State of the Art Operations – DOT wants to be the leader on Snow & Ice programs

Application Rates

- Based upon Field Conditions
  - Type of precipitation
  - Roadway/Pavement temperature
- Road Weather Information Systems (RWIS)
- Solid Material – Sodium Chloride
- Liquid Material
  - > 25°F pre-wet with sodium chloride (brine)
  - < 25°F pre-wet with magnesium chloride

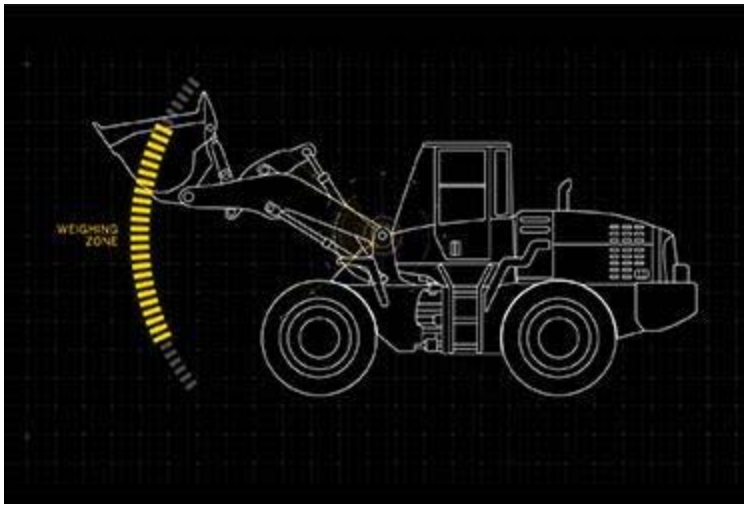
RWIS - Road Weather Information Systems

Pavement Sensors



Inventory Control

- Amount loaded onto trucks
  - Documented by Bucket
  - Loadrite® System
- Application Tracking by each storm route
  - Material Allotted – by storm conditions
  - Material Used
  - Material Returned
  - Supervisor Review

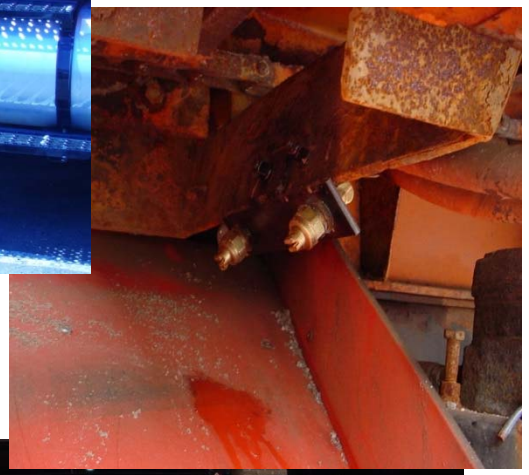


COMMON MYTH #2

- Why does DOT not use products with beet juice and molasses?
  - Still need a chloride source to melt snow
  - Wetland/surface water impacts

Pre-Storm/Planning

- Calibration
  - Spreaders
  - Pre-wetting Systems
- Training
  - Annual Operator Training
  - Tailgate Talks



COMMON MYTH #3

- Are those white lines the DOT puts down just over-applying salt

Pre-Treating/Anti-Icing

- Proactive strategy
  - maintains a sufficient quantity of ice control chemicals on the pavement surface
  - before or very soon after precipitation or ice formation begins.
- Salt Brine (23%)
  - Bridge Decks
  - frost prone areas
    - Valleys
    - Shaded Areas
    - History

COMMON MYTH #4

- CTDOT should have reduced application zones just like neighboring states

State	Conditions	Application Rate (lbs/lane-mile)	Frequency
CONNECTICUT	Above 29°F	200	3 hours
	20-29°F		
	Below 20°F		
MAINE	Above 20°F	100-300	Unknown
	Below 20°F	300-800	
MASSACHUSETTS	All	240	Unknown
NEW HAMPSHIRE	Sleet/Freezing Rain	300	1.5 - 2 hrs - Interstate
	Snow: 20° F	250	2.5 - 3 hrs- State roads
	Snow: < 20° F	250	
NEW YORK	Above 32°F	160	Unknown
	23-32°F	225 - 275	
	15-23°F	275-360	
	Below 15°F	Abrasives	
VERMONT	Above 32°F	0 - 100	Unknown
	25-32°F	100 - 200	
	20-25°F	200 - 300	
	15-20°F	300 - 400	
RHODE ISLAND	All	320	Unknown

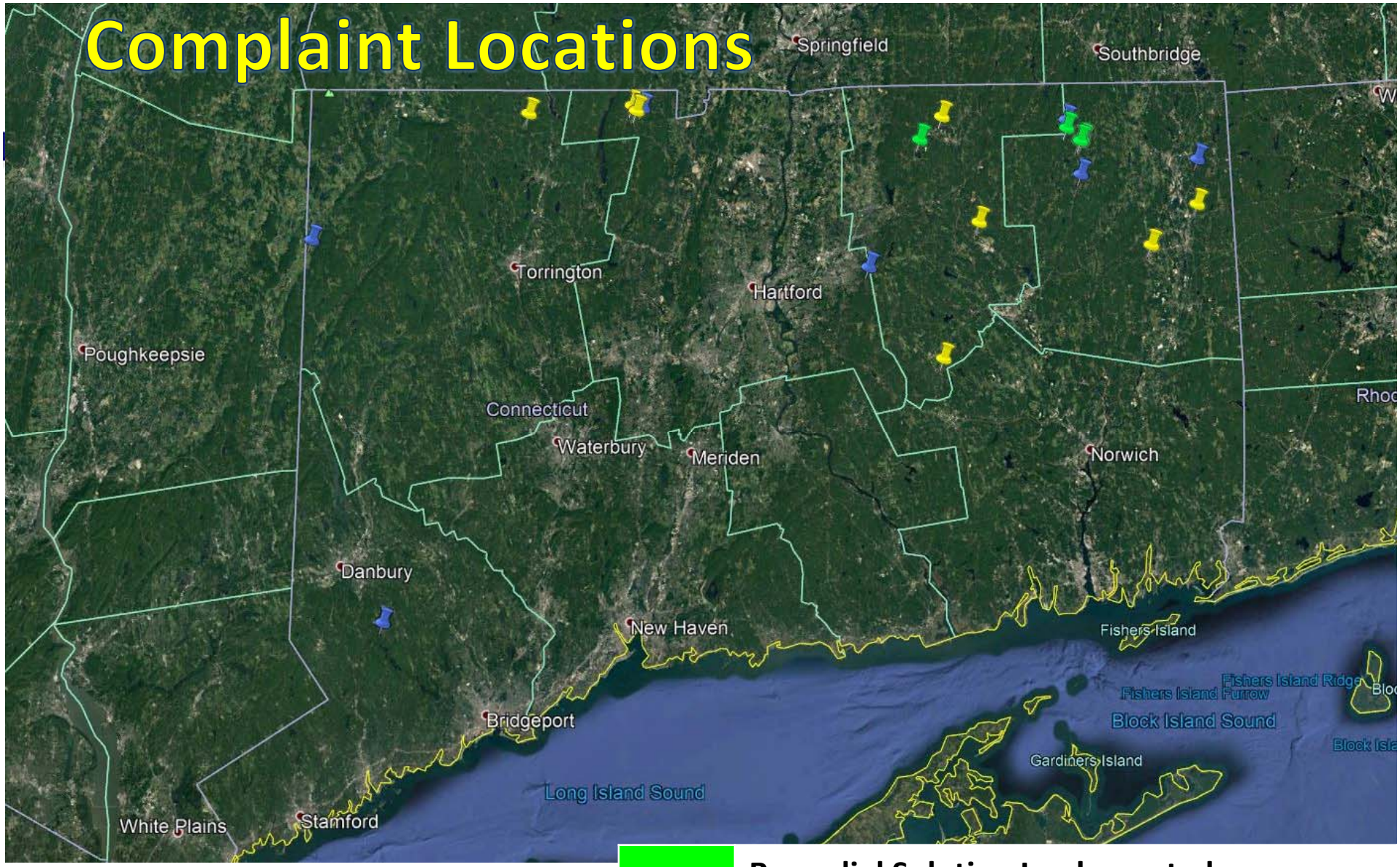
- ConnDOT does not have a bare and wet pavement policy

- Our state highway system should remain ***reasonably safe*** and in a ***passable*** condition by ***continuous plowing*** and ***judicious use*** of snow and ice materials

Regional State Application Rates

State	Total Lane Miles	Winter 2016 - 2017					
		Liquid			Dry Materials		
		Liquid Materials applied (gallons)	Average Liquid Materials applied (gallons) per Lane Mile	Relative Rank	Dry Materials applied (tons)	Average Dry Materials applied (tons) per Lane Mile	Relative Rank
CONNECTICUT	10,870	1,606,170	148	3	188,610	17	4
MAINE	8,300	1,197,494	144	4	142,192	17	4
MASSACHUSETTS	16,000	3,340,000	209	2	516,327	32	1
NEW HAMPSHIRE	9,366	226,280	24	6	87,030	9	6
NEW YORK	43,716	1,537,170	35	5	1,090,000	25	2
VERMONT	6,511	2,833,669	435	1	127,382	20	3
RHODE ISLAND	3,300						

Complaint Locations



Remedial Solution Implemented

Remedial Solution In Progress

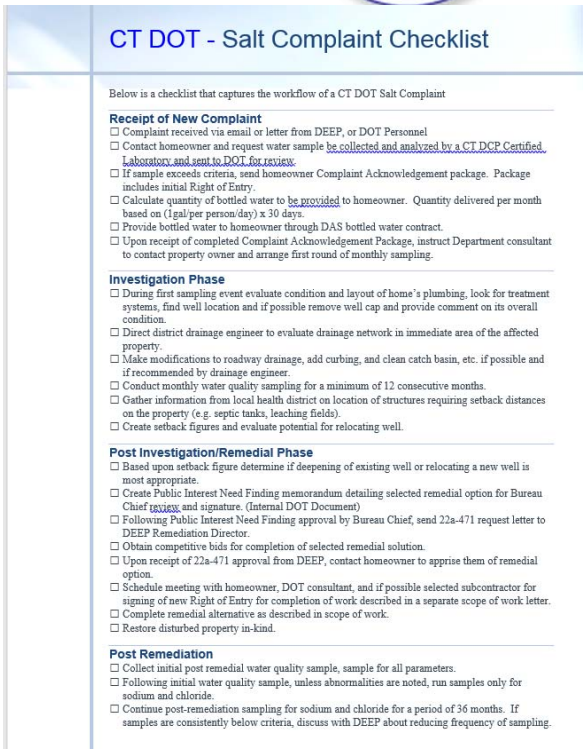
Initial Sampling in Progress

Complaint Procedures

- Complaints are typically received via:
  - Sister state agency (DEEP, DPH)
  - Directly from well owner
  - Local Health Department
  - Internal CTDOT units (e.g., CTDOT Maintenance).
- Property owner's initial water sample is reviewed by CTDOT.
- Bottled water is provided to homeowner as an interim drinking supply.
- CTDOT then conducts investigation to determine the appropriate remedial solutions.

Process Developed

- Complaint Acceptance
- Investigation
- Drainage Improvements
- Remedial Options
- Scopes of Work for Drillers
- Public Interest Need Finding
- DEEP approval under 22a-471
- Homeowner Outreach
- Coordination with Office of Attorney General for Claims Commission documentation



CT DOT - Salt Complaint Checklist

Below is a checklist that captures the workflow of a CT DOT Salt Complaint

Receipt of New Complaint

- ☐ Complaint received via email or letter from DEEP, or DOT Personnel
- ☐ Contact homeowner and request water sample be collected and analyzed by a CT DCP Certified Laboratory and sent to DOT for review.
- ☐ If sample exceeds criteria, send homeowner Complaint Acknowledgement package. Package includes initial Right of Entry.
- ☐ Calculate quantity of bottled water to be provided to homeowner. Quantity delivered per month based on (1gal/per person/day) x 30 days.
- ☐ Provide bottled water to homeowner through DAS bottled water contract.
- ☐ Upon receipt of completed Complaint Acknowledgement Package, instruct Department consultant to contact property owner and arrange first round of monthly sampling.

Investigation Phase

- ☐ During first sampling event evaluate condition and layout of home's plumbing, look for treatment systems, find well location and if possible remove well cap and provide comment on its overall condition.
- ☐ Direct district drainage engineer to evaluate drainage network in immediate area of the affected property.
- ☐ Make modifications to roadway drainage, add curbing, and clean catch basin, etc. if possible and if recommended by drainage engineer.
- ☐ Conduct monthly water quality sampling for a minimum of 12 consecutive months.
- ☐ Gather information from local health district on location of structures requiring setback distances on the property (e.g. septic tanks, leaching fields).
- ☐ Create setback figures and evaluate potential for relocating well.

Post Investigation/Remedial Phase

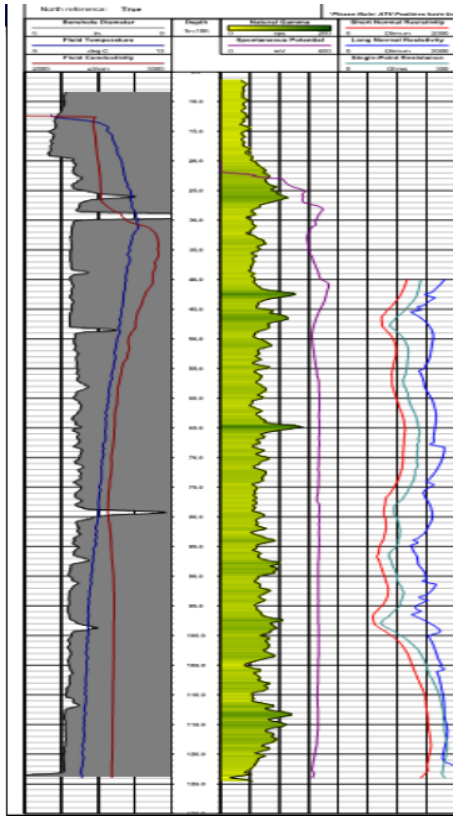
- ☐ Based upon setback figure determine if deepening of existing well or relocating a new well is most appropriate.
- ☐ Create Public Interest Need Finding memorandum detailing selected remedial option for Bureau Chief review and signature. (Internal DOT Document)
- ☐ Following Public Interest Need Finding approval by Bureau Chief, send 22a-471 request letter to DEEP Remediation Director.
- ☐ Obtain competitive bids for completion of selected remedial solution.
- ☐ Upon receipt of 22a-471 approval from DEEP, contact homeowner to apprise them of remedial option.
- ☐ Schedule meeting with homeowner, DOT consultant, and if possible selected subcontractor for signing of new Right of Entry for completion of work described in a separate scope of work letter.
- ☐ Complete remedial alternative as described in scope of work.
- ☐ Restore disturbed property in-kind.

Post Remediation

- ☐ Collect initial post remedial water quality sample, sample for all parameters.
- ☐ Following initial water quality sample, unless abnormalities are noted, run samples only for sodium and chloride.
- ☐ Continue post-remediation sampling for sodium and chloride for a period of 36 months. If samples are consistently below criteria, discuss with DEEP about reducing frequency of sampling.

Trends & Solutions

- Common issues with wells
  - Shallow overburden
  - Dug wells
  - Well zone of influence includes roadway network
- Well Siting
  - Near snow shelf
  - Near drainage
- Solutions are unique to each location



Successes

Remedial Strategy	Installed & Connected	Field Work Scheduled/ In Progress	Bids Being Secured	Under Evaluation	Total
Connection to Watermain		1		1	2
New Well	2	2	5	2	11
Deepening of Wells	1	2			3
Reverse Osmosis System	1				1
Complaints in Investigation				8	8
Total					25

Moving Forward

- Siting of new wells:
  - Recognize that roadways are a potential source of pollution and there should be a 75 foot minimum separation distance
  - Already within Public Health Code – Enforced by Health Departments
  - Emphasis was provided to CEHA
- Recognizing that private contractors are a large contributing factor
  - Green Snow Pro – New Hampshire Model
  - Liability Relief
- Training

UCONN T2 Training

- Training targeting municipalities – implemented by UCONN Technology Transfer Center.
  - Similar to New Hampshire Green SnowPro Certification.
- Promote reductions of total salt usage by Municipalities through calibration of equipment and other ConnDOT best practices.
- UCONN T2 Center is implementing training

QUESTIONS

Adam Fox, P.E.
Transportation Principal Engineer
Environmental Compliance
CTDOT
adam.fox@ct.gov
860-594-3404