MS4 Compliance: What it Means and How to be Successful”

MRWA Presentation
February 5, 2020
Presentation Goals

1. Review impact of Ms4 compliance on Water Districts
Ms4 Compliance

The General Permit -

- Defined Municipal Separate Storm Sewer Systems (Ms4).
- Regulated stormwater discharges.
- Permit is issued every five years.
- Requires permittee to prevent and minimize the discharge of pollutants from the permittee’s stormwater conveyance system (MS4) through implementation of a Stormwater Program Management Plan.
MDEP General Permit Requirements

• Discharges under the General Permit may not

  ➢ Contain any pollutant which may cause/contribute to any adverse impact on receiving water
  ➢ Be a receiving water that is not meeting its classification which may be effected by the discharge
  ➢ Impart color, taste, turbidity... or other properties that cause receiving water to be unsuitable for designated uses ascribed to its classification.
40 regulated entities were identified:

30 municipalities.

8 State and Federal facilities.

2 transportation entities (MTA & MDOT).
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<thead>
<tr>
<th></th>
<th>Town</th>
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<tr>
<td>15</td>
<td>Lisbon</td>
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<td>York</td>
</tr>
</tbody>
</table>
MDEP General Permit Requirements

STATE OR FEDERALLY OWNED SEPARATE STORM SEWER SYSTEMS

1. Portsmouth Naval Shipyard
2. Southern Maine Community College
3. University Of Maine Augusta – Bangor Campus
4. Eastern Maine Community College
5. University of Southern Maine
6. University of Maine, Orono
7. Maine Air National Guard, Bangor
8. Dorothea Dix Psychiatric Center
Ms4 Compliance

Transportation Entities

1. Maine Department of Transportation
2. Maine Turnpike Authority
Ms4 Compliance

Under the MDEP General Permit for the Discharge of Stormwater from small MS4 systems, non-stormwater discharges are authorized such as hydrant flushing for water main flushing, discharges from potable water sources, and firefighting activity runoff, so long as the discharges do not contribute to the non-attainment of water quality standards.
MS4 entities must ensure that drinking water utilities have procedures in place to ensure that these water quality criteria will not be exceeded due to water system discharges to the MS4 during both planned and unplanned maintenance events.
Ms4 Compliance

- Currently, water systems within non-MS4 communities are not required to submit evidence that they do not discharge chlorinated water into water resources.
- MDEP staff has not indicated immediate plans to require documented compliance from water systems other than those within MS4 communities.
- However, MDEP staff has reminded all water system operators that discharge of chlorinated water into water resources could be considered a violation of the Federal “Clean Water Act”. 
Maine DEP and EPA understand that Chlorine is common for drinking water disinfection.

However, aquatic organisms are much more susceptible to chlorine toxicity than humans.
EPA and Maine have long standing aquatic life chlorine toxicity criteria for fresh and marine waters.

Addressing potential aquatic life chlorine toxicity is a common issue for wastewater discharges.

An emerging issue for drinking water discharges.
In 1986 the USEPA established ambient water quality criteria for total residual chlorine (TRC) concentration for receiving waters based on acute (short-term) and chronic (longer-term) toxic effects for aquatic life. Maine has adopted these water quality criteria.
## Ms4 Compliance

<table>
<thead>
<tr>
<th></th>
<th>Acute</th>
<th>Chronic</th>
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<tbody>
<tr>
<td>Fresh Water</td>
<td>19 ug/l</td>
<td>11 ug/l</td>
</tr>
<tr>
<td>Marine Water</td>
<td>13 ug/l</td>
<td>7.5 ug/l</td>
</tr>
</tbody>
</table>

ug/l (micrograms/liter)

Discharges from water systems are considered acute, other than blowoffs, that could be considered Chronic if they operate over long periods of time.
Maine DEP agrees to 0.05 mg/l as the concentration that must be attained in the water resource.

Based on the current accuracies of the field equipment available for measuring chlorine concentration.
January 2017 - A Task Force Committee was organized by MRWA and MWUA, funded by the DWP to develop a BMP Manual that water systems could use as a guideline for compliance.
The intent is that use of the manual is to provide more options for water systems to consider when discharging chlorinated water to the environment.

Provides Chemical and non-chemical means of dechlorination

It is recommended that systems look to non-chemical means of dechlorination initially, and use chemical dechlorination when non-chemical options will not meet water quality standards.
Ms4 Compliance

The BMP Manual is intended to be used for the following water system operations:

• Bi-annual (or annual) hydrant flushing for water quality within water system
• Emergency repairs and post repair flushing
• Trench dewatering from draining water main
• Flushing when disinfecting new water main installations per AWWA chlorination standards.
• Draining of storage tanks, reservoirs or clear wells.
• Other chlorinated water discharges to the environment.
Chapter 1 – Dechlorination Flowchart
A flow chart was established for the manual that provides a quick resource for water system operators to utilize when selecting an appropriate BMP for a particular discharge.
Water System Dechlorination BMP Manual

Water system operator should ensure that they have the test equipment that will read chlorine concentrations down to 0.05 mg/L, as required by the State for discharges to water resources.

Water system operator is required by the State to verify that the BMP meets the chlorine discharge standards. Once verified at least 2 discharge events from the same location, the system is not required to continue residual monitoring so long as the proven BMP is used for the selected discharge.
Water System Dechlorination
BMP Manual

Chapter 2 – Introduction
The BMP Manual looks at two different options for selection of BMP’s for chlorinated discharge. These include:

- Non-chemical dechlorination for Total Residual Chlorine Concentrations that are less than 4 mg/L.

- Chemical dechlorination for Total Residual Chlorine Concentrations that are greater than or equal to 4 mg/L.

Most water systems daily operations consist of TRC concentrations of less than 4 mg/L in their distribution system.

Operational conditions where TRC concentrations may be greater than 4 mg/L would include disinfection flushing for new water mains and water main repairs.
Non-Chemical dechlorination BMP options within the manual include the following:

- Dilution of the chlorinated discharge in a water resource
- Directing the chlorinated discharge into the sanitary sewer system
- Land application of the chlorinated discharge
- Use of operational/maintenance techniques to limit the impact of the chlorinated discharge on water resources
- Directing the chlorinated discharge to pavement and storm drainage systems.
Chemical dechlorination BMP options within the manual include the following chemical alternatives:

- Sodium Sulfate/Sulfite
- Sodium Bi-Sulfite
- Sodium Metabisulfite
- Sodium or Calcium Thiosulfate
- Sulfur Dioxide
- Ascorbic Acid (Vitamin C)
- Sodium Ascorbate (Vitamin C)
Water systems should develop a Standard Operating Procedure (SOP) for planned and emergency discharges. MDEP recommends that public water systems discharging to an MS4 system have these procedures in place, on file, with appropriate training to those employees that will contend with system discharges to MS4 and other water resources.
Sample SOP for Emergency Chlorinated Discharges (such as a water main break) might include use of the following equipment:

- Trench dewatering pump
- Silt sock, staked hay bales, crushed stone for stone berm, catch basin rim filter bag, or other such erosion control material.
- Dechlorination mat, sock or other mechanism to dechlorinate the discharged water.
  - Possibly install stone berm in ditch, with dechlorination mat upstream of the berm in ponded area.
  - Filter bag over CB inlet with dechlorination mat installed within filter bag.
  - Silt bag with dechlorination tablets installed in the bag.
Several important factors for Public Water Systems in emergency situations include:

- MDEP recognizes that timely and safe operations are the highest priority for PWS
- Resolve the emergency as quickly as possible to minimize the volume of chlorinated discharge
- Have equipment and materials on hand for dechlorination efforts. This should be set up in the SOP as the quickest option available for the majority of possible emergencies that may occur in the PWS.
Chapter 3 – System Evaluation for Discharge Locations
Chapter 3 – System Evaluation for Discharge Location

▪ Review system map to determine locations of current chlorinated water discharge points
▪ Larger water systems can locate these discharge using GPS instrumentation and include on GIS Mapping
▪ Review flushing and discharge locations to determine proximity to water resources.
▪ Evaluate options for moving the discharge locations of these discharge points to areas that have less impact on the water resources.
▪ Evaluate options for moving discharge locations to areas where non-chemical BMP’s may be used rather than chemical BMPs.
Chapter 4 – Chlorine Monitoring & Record Keeping
Chapter 4 – Chlorine Monitoring and Record Keeping

- Consider using the Chlorinated Discharge Field Form included in the BMP Manual that provides data to backup BMP selection.

- Ensure that BMP’s selected are appropriately meeting the regulations.

- Once the water system has shown that a BMP selection meets the regulatory standards (BMP manual suggests at least 2 discharge events), future monitoring of each discharge event at this location can be reduced to periodic verification checks as determined by the water system operators.
### Chlorinated Discharge Field Form

<table>
<thead>
<tr>
<th>Location</th>
<th>Date</th>
<th>Start Time</th>
<th>Stop Time</th>
<th>Discharge Flow (gpm)</th>
<th>Time Interval (min.)</th>
<th>Chlor Cl Residual (mg/L)</th>
<th>Chlor Residual (mg/L)</th>
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</table>

ND: Non-detect
▪ Water system operator should maintain the records of which BMP selections were made for all discharge locations, and have Discharge Field Forms kept on file.
Chapter 5 – Non-chemical Methods
Water System Dechlorination
BMP Manual

Chapter 5A – Dilution of Discharge
Two means of estimating flow of water resource

1. Estimate the flow of the water resource chlorinated discharge will be directed into.
   - For rough estimate measure the velocity timing a floating object over a specified distance.
   - Measure the rough cross sectional area where the velocity was measured.
   - Use $Q = VA$ equation ($Q$ – flowate (cfs), $V$ – velocity (ft/sec), $A$ – area (s.f.) to estimate stream flow rate.
Two means of estimating flow of water resource (Cont)

2. If data is lacking on flow in the water resource, estimate flow based upon use of BMP chart and comparison using Google Earth, USGS maps, or other mapping systems.

- Determine the required flow rate for the chlorinated discharge
Calculate the required water resource flow to ensure that the TRC concentration in the resource will not exceed the regulatory standards.

Disperse the chlorinated discharge as much as possible to promote mixing with the non-chlorinated flow in the resource.

Monitor the TRC concentration at the discharge point and in the resource to ensure regulatory standards are met.
Water System Dechlorination BMP Manual

- **Important consideration:** Flush when there is the greatest dilution in the MS4 and the receiving water.
Chapter 5B – Discharge into Sanitary Sewer
Early planning discussions with Sanitary Sewer System owner or operator to determine potential for use.

Are there limitations on the flow into the sewer system at the discharge location, such as a downstream pump station, etc.

Can the piping downstream of the discharge point handle the required chlorinated discharge flow?

Will the chlorinated discharge into the sanitary sewer negatively impact the sewer treatment process?

Determine the backflow prevention requirements and discuss with the Drinking Water Program
Water System Dechlorination
BMP Manual

Chapter 5C – Discharge using Land Application
Plan the use of equipment that will appropriately disperse the water to maximize the contact of the chlorinated water discharge with the ground materials.

- Use energy reducing device such as a diffuser tank connected to a truck or diffuser connected to hose to disperse water.

- Inspect area where discharge will be released to be sure there are no ditches, channels or other such site conditions that will minimize the sheet flow condition.
▪ Determine the length from the discharge point to the water resource.
▪ Implement erosion control devices if necessary.
▪ Determine any negative impact to land or vegetation destruction from TRC concentrations.
▪ Monitor TRC concentrations at discharge point and prior to entering water resource throughout the duration of the discharge event.
MDEP suggests discharge overland if possible. (with consideration for erosion, property rights, surface waters.)
Water System Dechlorination
BMP Manual

Chapter 5D – Operation & Maintenance Techniques
Techniques to Minimize impact on Water Resource

▪ Evaluate the water system discharge locations to see if new locations can be selected to minimize impact on water resources.

▪ Determine if timing of discharge event can occur during high water flows in the water resource, such as early spring or late fall.

▪ Determine if implementing either full or partial system Uni-directional Flushing is a viable option.
Chapter 5E – Discharge to Pavement and/or Storm Water Systems
Determine the flow path length for the chlorinated discharge either over pavement and/or through the storm water drainage system present.

Field inspect the site to verify that there are no grease, oil or other substances downstream of the discharge location.

Review TRC decay charts in the BMP manual to determine if the measured length provides enough time for the TRC concentration to decay.
As evidenced from previous studies by AWWA, the decay rate for chlorinated discharge over pavement or concrete is very low.

Chlorinated discharge over grass/topsoil provides much faster decay rates due to the organic materials present.
Water systems should consider the current water quality of the water resource into which the discharge is to flow.

For instance, operators may wish to avoid using sulfates or sulfites in areas where water resource has a low dissolved oxygen content, as these chemicals will reduce the dissolved oxygen in the discharge flow and potentially further reduce the DO in the receiving water.

Some dechlorination chemicals have an effect on pH, so the operator should be sure that pH changes will not adversely impact the water resource.
Water system operators should be sure that they do not overfeed the dechlorination chemical, since many of these chemicals are used in tablet form, this may be difficult.

The suggestion would be for the operator to use only enough of the chemical tablets to ensure the discharge meets the regulatory requirements.

Some suppliers suggest using the tablet systems in parallel if having trouble meeting the TRC concentration standards with one assembly.
Dechlorination Diffusers are available for both tablet and liquid injection into the chlorinated discharge.
Treatment Chemicals commercially available include:

- Sulfate salts, Sulfur Dioxide
- Ascorbic Acid, Sodium Ascorbate
Use commercial dechlorination units as needed.

Proper selection of chemical and dosage is important!
Tablet, Chlorination / Dechlorination
Water System Dechlorination BMP Manual

Liquid, Chlorination / Dechlorination
Dechlorination Mats are available for chemical tablet dispersement into the chlorinated discharge.
Water System Dechlorination BMP Manual

Tablet Dechlorination Mat
Tablet Dechlorination Mat
Dechlorination Socks are available for chemical tablet dispersion into the chlorinated discharge.
Water System Dechlorination BMP Manual

Tablet Dechlorination Sock
Dechlorination Mixing Tanks are available for chemical tablet, powder and liquid dispersement into the chlorinated discharge.
Water System Dechlorination BMP Manual

Dechlorination Mixing Tanks
Water System Dechlorination BMP Manual

Free Chlorine Field Test Kit capable of measuring 0.05 mg/l
Optional Equipment may include pH test kit.
Optional Equipment may include Dissolved Oxygen test kit
Chapter 7 – Erosion Control for PWS Discharges
**STONE CHECK DAMS**

Stone check dams are constructed across a swale or drainage ditch to reduce the flow velocity and erosive forces and to promote the deposit of sediments. Stone check dams are most important in channels with a slope greater than 6%. They are not effective for silts and clays. Other proprietary products are available and should be used and installed per the manufacturer’s guidelines.

**IMPORTANT NOTE:**

Check dams are intended for the settlement of sediments and flow velocity reduction. A ditch lining will be necessary for erosion control.

**CONSTRUCTION SPECIFICATIONS**

- Check dams should be installed before runoff is directed to the swale.
- The area around each check dam should be free of debris.
- A stone check dam should be comprised of well-graded crushed rock with a maximum size of 6 inches and a minimum stone size of 1 inch. Larger stones may be used on steep slopes.
- The maximum height of a stone check dam should be 2 feet with a 6-inch depression at its center for overflow. The edges of the dam should be keyed onto the embankments to prevent side erosion.
- Mechanical placement followed by hand placement will be necessary to achieve a tight mass within the channel and to ensure that the center of the dam is lower than the edges.
- The check dams may be removed when the swale is stabilized with vegetation (95% coverage).

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*Any erosion downgradient or around the edges of stone check dams should be corrected immediately.*
Stormdrain Inlet Protection

**STORMDRAIN INLET PROTECTION**

An inlet protection (storm drain drop inlet or curb inlet) captures sediment before runoff enters a catchbasin. It is not effective for silts and clays.

Various types of off-the-shelf devices are acceptable if installed, used, and maintained as specified by the manufacturer.

**SILT FENCE WITH GRAVEL** may be placed around the perimeter of a catchbasin and surrounded with gravel.

**SAND-FILLED BAGS** butted together around the perimeter of a storm drain may be used if the bags are staggered to make a stable barrier. The berm should have a minimum height of 12 inches.
Sediment Traps

SEDIMENT TRAPS
A sediment trap can be above ground with a perimeter berm, within a natural depression, or in an excavated depression. The drainage area to a trap should be small, and the discharge should be directed to a stable, moderately flat (<5%) area with at least 25 feet of healthy vegetation. Sediment traps are not designed to work within a drainage way with high flow volumes or velocities.

ABOVE GROUND SEDIMENT TRAPS may be an enclosed perimeter of hay bales or concrete barriers lined with non-woven geotextile, or a silt-fence enclosure buttressed by sandbags. The area should be cleared of woody vegetation that may damage the fabric and cause leakage.

NATURAL DEPRESSIONS or excavated basins may be adapted to detain runoff. A low point in a natural depression could be blocked off by a temporary embankment (berm or sand bags) to increase its capacity. The embankment should be high enough to detain the expected volume of water, wide enough to resist collapse, and be appropriately stabilized.
GEOTEXTILE FILTER BAG

A geotextile filter bag is a prefabricated sack that is used to filter sediments from dewatering activities. A filter bag should be used in accordance with the manufacturer’s recommended guidelines. Consult the DEP if the structure will be within 75 feet of a sensitive resource or if secondary containment is required.

CONSTRUCTION SPECIFICATIONS

- Set up the filter bag prior to initiating any activities which will require dewatering.
- The type of fabric should be based on the size of soil particles to be trapped (i.e., a woven material for coarse particles and a nonwoven material for finer particles).
- A filter bag should be located in an area mostly level (with less than 5% slope). A pad of crushed gravel may be provided.
- Avoid discharging to an area that is bare of vegetation or newly vegetated. Any sign of erosion or channelization from the discharged water requires immediate correction.

Filter bags have a finite capacity for sediment collection and may be prone to plugging. Avoid over-pressurizing the bag or it may burst.
Water System Dechlorination
BMP Manual

Sample Local Water District Equipment
Water System Dechlorination BMP Manual

KK & W Water District “Snuffy”
Snuffy in action
Maine Water Company Unit
Liquid Chemical Dechlorination system
Water System Dechlorination BMP Manual

Questions (?)