STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JANET T. MILLS
GOVERNOR

MELANIE LOYZIM
COMMISSIONER

June 7, 2022

Mr. David Gardner
Environmental Office Director
Maine Department of Transportation
16 State House Station
Augusta, Maine 04333-0016
e-mail: *david.gardner@maine.gov*

RE: Municipal Separate Storm Sewer System (MS4) General Permit #MER043000
Final - MER043002

Dear Mr. Gardner:

Enclosed please find a copy of your **final** MEPDES permit and Maine WDL which was approved by the Department of Environmental Protection. Please read this permit/license and its attached conditions carefully. Compliance with this permit/license will protect water quality.

Any interested person aggrieved by a Department determination made pursuant to applicable regulations, may appeal the decision following the procedures described in the attached DEP FACT SHEET entitled "*Appealing a Commissioner's Licensing Decision*."

If you have any questions regarding the matter, please feel free to call me at 287-7693. Your Department compliance inspector copied below is also a resource that can assist you with compliance. Please do not hesitate to contact them with any questions.

Thank you for your efforts to protect and improve the waters of the great state of Maine!

Sincerely,

Gregg Wood
Division of Water Quality Management
Bureau of Water Quality

Enc.

cc: Holliday Keen, DEP/CMRO
Damien Houlihan, USEPA
Newton Tedder, USEPA
Alison Moody DEP/SMRO
Nathan Chien, USEPA
Lori Mitchell, DEP/CMRO
Richard Carvalho, USEPA

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION
AUGUSTA, ME 04333

DEPARTMENT ORDER

IN THE MATTER OF

MAINE DEPARTMENT OF TRANSPORTATION	)	MUNICIPAL SEPARATE STORM
AUGUSTA, KENNEBEC COUNTY, MAINE	)	SEWER SYSTEM
MER043002	)	MER041000
	)	**GENERAL PERMIT COVERAGE**
APPROVAL	)	**RENEWAL**

The Department of Environmental Protection (Department/DEP) has considered the Notice of Intent submitted by the MAINE DEPARTMENT OF TRANSPORTATION (MDOT/permittee), with supportive data, agency review comments and other related materials on file for coverage under the Municipal Separate Storm Sewer System (MS4) General Permit (GP), #MER043000, issued by the Department on August 18, 2021, and FINDS THE FOLLOWING FACTS.

The permittee submitted a Notice of Intent (NOI) with an initial Stormwater Management Plan (SWMP) to the Department on September 30, 2021 that were made available for a 30-day public comment period on the Department's website at https://www.maine.gov/dep/comment/comment.html?id=4463193. No public comments were received on the NOI or the initial SWMP. The Department has reviewed the initial SWMP document and made the determination that the document is consistent with and fully articulates what is required to meet the MS4 GP standard. Pursuant to Part IV(B) of MS4 GP issued by the Department on August 18, 2021, the permittee must update the initial SWMP within 60 days of the effective date of this DEP permittee specific order or within 60 days of the final resolution to an appeal of this DEP permittee specific order. The final plan must be submitted to the Department and will be posted on the Department's website.

The permittee must fully implement the Best Management Practices in accordance with their associated schedules of compliance, as established in the Modified Stormwater Management Plan that is in effect at the time any schedule for compliance is due.

The permittee has agreed to comply with all terms and conditions of the MS4 General Permit, #MER043000, dated August 18, 2021. Operated in accordance with the Municipal Separate Storm Sewer System (MS4) General Permit, #MER043000, the discharges identified by the permittee will not have a significant adverse effect on water quality or cause or contribute to the violation of the water quality standards of the receiving water.

Impaired Waters

The MDOT has point source discharges to Arctic Brook, Concord Gully Brook, Frost Gully Brook, Goosefare Brook, Nasons Brook, Penjajawoc Brook, Red Brook and Sucker Brook which are classified as an Urban Impaired Streams in Maine DEP Rule Chapter 502. To address the impairments, the permittee must fully implement all actions, schedules and milestones established in Appendix G, *Urban Impaired Stream BMP Compliance Strategy*, in the April 5, 2022 revised initial SWMP and any revisions reflected in the Modified Stormwater Management Plan required by Part IV(B). Appendix G is attached to this Order.

THEREFORE, the Department GRANTS the MAINE DEPARTMENT OF TRANSPORTATION, coverage under the Municipal Separate Storm Sewer System (MS4) General Permit, #MER043000, issued by the Department on August 18, 2021, subject to the terms and conditions therein.

This DEP permittee specific order becomes effective on July 1, 2022 and expires at midnight five (5) years after that date. If the GP is to be renewed, this DEP permittee specific order will remain in effect and enforceable until the Department takes final action on the renewal.

DONE AND DATED AT AUGUSTA, MAINE, THIS 7 DAY OF June, 2022.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: _____
for Melanie Loyzim, Commissioner

PLEASE NOTE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES

The Notice of Intent was received by the Department on September 30, 2021.

The Notice of Intent was accepted by the Department on October 14, 2021.

FILED

JUNE 7, 2022

State of Maine
Board of Environmental Protection

Date filed with Board of Environmental Protection: ___

This Order prepared by GREGG WOOD, BUREAU OF WATER QUALITY

MER043002 6/6/2022

RESPONSE TO COMMENTS

During the period of May 3, 2022 through the effective date of this final agency action, the Department solicited comments on the draft MEPDES permit. The Department did not receive any comments that resulted in any substantive changes to the draft permit. Therefore, the final permit is being issued as drafted.

APPENDIX G. Urban Impaired Stream BMP Compliance Strategy

This document explains MaineDOT's strategy to comply with the additional best management practice (BMP) requirement of the new transportation municipal separate storm sewer system (TS4) permit for the urban impaired stream (UIS) watersheds.

1. TS4 Permit Requirement

Part IV.E.3 of the TS4 permit requires MaineDOT to propose and fully implement at least three structural or non-structural BMPs or equivalent measures in the UIS watersheds where the Department operates a point source:

"If the waterbody to which a point source covered by this GP discharges is an Urban Impaired Stream (UIS) (Appendix B of this permit) the permittee must propose and fully implement at least three structural or non-structural BMPs or other equivalent measures to be considered for inclusion in the permittee specific DEP Order, unless the Department has determined the MS4 discharge is not causing or contributing to the impairment. The BMPs must address a specific impairment from the MS4 discharge within the UA and be clear, specific and measurable. Structural or nonstructural BMPs may selected from a) MCMs 1-6, b) an existing Department approved Watershed Management Plan, or c) BMPs in Appendix D, BMPs for Discharges to Urban Impaired Streams, of this GP or more specifically developed by the permittee. For receiving waters impaired in whole or in part by nutrient loading, including UISs covered by the Impervious Cover TMDL, permittees may propose measures designed to reduce loads into the MS4 system. The permittee specific DEP Order will set forth those measures the permittee must take, and may include, in whole or in part, the measures proposed by the permittee."

2. The Urban Impaired Streams and Priority Stressors

MaineDOT operates (maintains) TS4 outfalls in eight UIS watersheds (**Table 1**). MaineDOT must propose and fully implement BMPs in these watersheds to comply with the new TS4 permit. Land use/land cover, MaineDOT impervious cover and outfall metrics for each UIS watershed is given in **Attachment 1**.

DEP Division of Environmental Assessment (DEA) has provided MaineDOT the pririty stressors based on the best available data (**Table 1**).

Chloride is the most common stressor prioritized by DEP DEA across the UIS watersheds.

Table 1. Summary of the UIS Watershed Priority Stressors

UIS Watershed	Town	Environmental Stressors Prioritized by DEP*	WBMP Available?
Arctic Brook	Bangor	DO, Chloride, Habitat/Flow	Yes
Concord Gully	Freeport	Chloride, Habitat/Flow	Yes
Frost Gully Brook	Freeport	Flow/Habitat Instability	-
Goosefare Brook	Saco	Chloride, Nutrients, Habitat	Yes
Nasons Brook	Westbrook, Portland	Habitat, Chloride**	-
Penjajawoc Stream	Bangor	DO, Chloride	Yes
Red Brook	Scarborough, South Portland	Habitat/Flow, Habitat/Crossings, Chloride	Yes
Sucker Brook	Bangor, Hampden	Chloride, DO/Nutrient Enrichment	-

*: As provided by DEP Division of Environmental Assessment (2021).
**: MaineDOT has no plow crew in Nasons Brook watershed and does not contribute to the chloride input to the watershed.
DO: Dissolved Oxygen
IC: Impervious Cover
TMDL: Total Maximum Daily Load
WBMP: Watershed-based Management Plan

3. Stormwater BMPs for the Urban Impaired Stream Watersheds

Operational priorities of and resources available to MaineDOT may change over the course of the permit cycle. Therefore, MaineDOT proposes a flexible approach rather than a highly prescriptive one to address the BMP requirement given in Part IV.E.3 of the TS4 permit. The proposed flexible approach considers the uncertainty associated with the number, scope, and schedule of the MaineDOT construction projects which will be completed in each urban impaired stream (UIS) watershed during the permit cycle. The proposed approach also aims to ensure that MaineDOT contributes to the full implementation of clear, specific, and measurable best management practices (BMPs) by the end of the permit cycle.

MaineDOT has created a list of BMP alternatives targeting the priority stressors in the UIS watersheds (**Table 2**). MaineDOT proposes to fulfill its BMP requirement in each UIS watershed through implementation of three of these BMP alternatives before the end of the permit cycle (i.e. 7/1/2027).

MaineDOT will evaluate its BMP implementation progress for each UIS watershed by the end of PY3. If the evaluation results indicate that MaineDOT will not be able to meet the permit requirement (i.e. minimum three BMPs) in certain UIS watershed(s) by the end of the permit cycle, MaineDOT will propose to (a) implement new BMPs which are not listed in **Table 2,** and/or (b) fund eligible BMPs to be implemented by other entities by the end of the permit cycle. The proposal will be submitted to DEP as a permit modification request.

Table 2. Stormwater Best Management Practices for the Urban Impaired Stream Watersheds.

A. Structural Best Management Practices			
#	BMP	Project Type	Target UIS Stressor(s)
A.1.a	New Treatment Measure	O	All Except Chloride
A.1.b	New Small Footprint Measure	O	Nutrients, Dissolved Oxygen
A.2	Smart Chloride Mitigation System	N	Chloride
A.3	Stream Crossing Upgrade	O	Habitat
B. Non-structural Best Management Practices			
B.1	Street Sweeping	N	Nutrients, Dissolved Oxygen
B.2	Winter Salt Application	N	Chloride
B.3	Stream Channel Restoration	N	Habitat

Abbreviations:
Project Type: Opportunistic (O) stands for the BMPs linked to the projects in the current or future MaineDOT work plans. New (N) stands for the BMPs developed to address the TS4 permit requirements.

Table 3 summarizes the BMPs that MaineDOT intends to implement for each UIS watershed. It must be noted that the potential BMPs given for a UIS watershed are designed to address the specific priority stressors. Emboldened potential BMPs are those most likely to be implemented in the watershed.

Table 3. Summary of the UIS Watershed BMP Implementation.

UIS Watershed	Environmental Stressors Prioritized by DEP*	Potential BMPs for the Watershed (from Table 2)
Arctic Brook	DO, Chloride, Habitat/Flow	A.1**, **A.2**, A.3, B.1, **B.2**, B.3
Concord Gully Brook	Chloride, Habitat/Flow	**A.1**, **A.2**, **B.2**, B.3
Frost Gully Brook	Flow/Habitat Instability	A.1, A.3, B.3
Goosefare Brook	Chloride, Nutrients, Habitat	**A.1**, **A.2**, A.3, B.1, **B.2**, B.3
Nasons Brook	Habitat, Chloride***	A.1, **A.2**, A.3, B.3
Penjajawoc Stream	DO, Chloride	**A.1**, **A.2**, B.1, **B.2**
Red Brook	Habitat/Flow, Habitat/Crossings, Chloride	A.1, **A.2**, **A.3**, **B.2,** B.3
Sucker Brook	Chloride, DO/Nutrient Enrichment	A.1**, **A.2**, B.1, **B.2**

*: As provided by DEP Division of Environmental Assessment (2021).
**: Small footprint treatment measure can be implemented.
***: MaineDOT has no plow crew serving Nasons Brook watershed and does not contribute to the winter salt/chloride input to the watershed. So, B.2 is not included in the "Potential BMPs for the Watershed (from Table 2)" column for Nasons Brook watershed.
DO: Dissolved Oxygen

Explanations for the BMPs given in **bold**:
A.1: MaineDOT projects in the current work plan which will include a new post-construction treatment measure (see **Table 4**).

A.2: Smart chloride mitigation system (SCMS) will be implemented in one of the seven chloride-impaired UIS watersheds. However, DEP indicated that MaineDOT could receive one BMP credit for each of the watersheds with a chloride impairment considering the *"know-how"* generated by the first SCMS can be used for the development of new BMPs in the chloride impaired UIS watersheds (MaineDOT-DEP meeting dated 9/13/2021).

B.2: "Winter Salt Application Report", which will be submitted with the annual TS4 report, will include the winter salt application rates for the pavement maintained by MaineDOT in the chloride impaired UIS watersheds.

A. Structural Best Management Practices

A.1 New Treatment Measure

MaineDOT proposes the following to count towards the fulfillment of the UIS BMP requirement:

a. New treatment measures constructed to comply with minimum control measure 5 (MCM5) or with the UIS BMP requirement:

"New treatment measure" refers to a new structural measure constructed in an UIS watershed within the permit cycle to mitigate the impact of the stormwater discharges from a developed area that is under the control of MaineDOT. These measures typically provide water quality and channel protection volume to mitigate the downstream impact of the stormwater. MaineDOT plans on constructing new treatment measures for the projects which are in its current work plan (2021-2022-2023) and given in **Table 4**. MaineDOT may also choose to partner with another entity to construct a new treatment measure.

Table 4. MaineDOT Projects Including New Treatment Measures (Work Plan: 2021 thru 2023).

UIS Watershed	WIN#	Project Description	Construction	
			Begin Date (Forecast)	End Date (Forecast)
Goosefare Brook	023274.00	Park & Ride Expansion	04/10/2023	08/18/2023
Penjajawoc Stream	018595.10	Diverging Diamond Interchange (Hogan Rd-I95)	06/09/2024	10/21/2026
Concord Gully Brook	023627.00	I-295 Exit 20 Bridge	11/17/2021	11/07/2024

b. New small footprint measures opportunistically constructed with the maintenance projects:

"New small footprint measure" refers to a new structural measure including high rate filter media with demonstrated "Total Suspended Solids (TSS)" and "Total Phosphorus (TP)" removal performance. A recent study on the "International Stormwater BMP Database" has shown that the high rate filter media supporting plants (high rate biofiltration) significantly reduce the TSS and TP concentrations using three statistical methods (see **Attachment 3**). MaineDOT can consider the high rate biofiltration measures for the UIS watersheds with sediment related priority stressors (i.e. dissolved oxygen, nutrients) (see **Table 3**). The high rate biofiltration measures can be implemented in Arctic Brook and Sucker Brook watersheds for these watersheds do not have any projects with new treatment measure in the current MaineDOT work plan. MaineDOT will consult with and obtain the approval of DEP prior to the construction of the small footprint measures.

A.2 Smart Chloride Mitigation System

MaineDOT has developed a novel smart chloride mitigation system (SCMS) concept which will be implemented in one of the seven UIS watersheds where chloride has been identified as a priority stressor (**Table 3**). The SCMS will utilize continuous monitoring adaptive control (CMAC) consisting of sensors, actuated valves or gates to detain chloride-rich stormwater from impervious surfaces treated with winter salt and gradually release it to minimize its adverse impact on the freshwater stream habitat. In other words, the SCMS will be designed to flush the winter salt from the stream watershed with minimum salinity impact on the habitat. Details of the SCMS are provided in **Attachment 2**.

MaineDOT proposes to fully implement one pilot SCMS in an area which is under the full control of the Department by the end of the permit cycle. The park & ride lots have emerged as likely candidates for the pilot SCMS in the cursory review of the winter salt treated impervious areas in MaineDOT right-of-way. The ultimate location will be determined based on the results of a multi-criteria site evaluation and selection process. If no feasible site can be identified in the seven UIS watersheds where MaineDOT maintains outfalls, MaineDOT may select a site in another UIS watershed in consultation with DEP.

MaineDOT proposes the following implementation schedule for SCMS BMP:

- Permit Year (PY) 2: Site evaluation and selection, SCMS design
- PY3: SCMS construction
- PY 4 and 5: SCMS operation and maintenance, development of new SCMS configurations, and public education and outreach.

MaineDOT had a meeting with DEP on the SCMS on 9/13/21: DEP indicated that MaineDOT could receive one BMP credit for each of the UIS watersheds (see **Table 3**) with chloride impairment considering the *"know-how"* generated by the first SCMS can be used for the development of new BMPs in the chloride impaired UIS watersheds. Therefore, MaineDOT proposes to receive one BMP credit for each chloride impaired UIS watershed for the full implementation of the SCMS.

A.3 Stream Crossing Upgrade

MaineDOT has developed and successfully implemented a range of design approaches to remove fish and aquatic organism passage barriers when upgrading its stream crossings. These include hydraulic and geomorphic-based designs, and may follow MaineDOT's Habitat Connectivity Design (HCD) guidance in areas covered by the Maine Atlantic Salmon Programmatic Consultation (MAP). MaineDOT proposes that its stream crossing upgrade projects which removes fish and aquatic organism barriers count toward the fulfillment of the BMP requirement for the habitat impaired UISs (**Table 3**). MaineDOT currently has two stream crossing upgrade projects in its current work plan (**Table 5**). Both are retrofits of existing large culverts intended to provide fish passage for brook trout and therefore will likely require a hydraulic design approach. This may include weir/baffles to the inside of the culvert and building either a concrete pool-weir fishway or geomorphic-based roughened channel at the outlet. Similar projects in the future work plans (e.g. 2022-2023-2024) will be considered towards the fulfillment of the BMP requirement. Potential upstream and downstream geomorphological effects of the stream crossing upgrade projects will be assessed to ensure that the projects will not negatively impact the stream habitat.

Table 5. MaineDOT Stream Crossing Upgrade Projects in the UIS Watersheds (Work Plan 2021-2022-2023).

UIS Watershed	WIN#	Project Description	Construction	
			Begin Date (Forecast)	End Date (Forecast)
Red Brook	023601.00	Culvert Rehabilitation to I-295 Northbound/Red Brook Bridge	10/18/2022	01/24/2023
	020535.00	Aquatic Organism Passage Restoration	10/18/2022	10/21/2026

B. Non-structural Best Management Practices

B.1 Street Sweeping

MaineDOT "Maintenance & Operations" sweeps state and state-aid highways typically once a year in accordance with its level-of-service guidance document. Sweeping is a source control BMP that removes coarser sediment and sediment-bound nutrients from impervious surfaces before they are washed off by surface runoff. Road intersections with high traffic counts and long queues have higher concentrations of fine sediment and exhaust particulate and are considered pollutant "hot spots." To effectively remove the fine particulate requires the use of regenerative vacuum sweepers.

In addition to scheduled sweeping, the Department proposes to provide regenerative vacuum sweeping of road intersections and sections hot spots, to be pre-approved by DEP, when antecedent dry periods exceed two weeks.

B.2 Winter Salt Application

MaineDOT proposes to track and report its winter salt application for the UIS watersheds for which chloride has been identified as a priority stressor (**Tables 2 & 3**). The winter salt application rates coupled with the Accumulated Winter Season Severity Index (AWSSI) (https://mrcc.purdue.edu/research/awssi/indexAwssi.jsp) will be reported for the UIS watersheds with the annual report. To increase the temporal resolution of the salt application rates, MaineDOT will track the amount of the salt applied by its own crews and its contractors for each storm in the UIS watersheds (**Attachment 4**). The application rates will be both reported on a seasonal "per lane mile" and "per impervious area" basis. High-resolution GIS data will be used to calculate the impervious area served by each crew and contractor. MaineDOT will include its average statewide salt application rates and the average statewide salt application rates of neighboring state DOTs to put the MaineDOT's UIS watershed salt application rates into context. Salt application data of the other state DOTs will be obtained from the Clear Roads "Annual Survey of State Winter Maintenance Data" (https://clearroads.org/winter-maintenance-survey/). The annual UIS watershed salt application data to be reported by MaineDOT can be used to determine the baseline salt/chloride input to a UIS watershed and potential salt/chloride hot spots if coupled with the data from the other winter salt applicators (e.g. towns, contractors).

MaineDOT is currently in the process of reviewing the latest generation of spreader controls that are on the market. Currently, MaineDOT's fleet of 400 plow trucks is about two-thirds outfitted with a generation of spreader controls known as *Cirus SpreadSmart,* and about one-third are outfitted with a much older generation of spreader controls from the 90's known as *Compu-Spread CS-230AC* units. Being an older generation of spreader control, the *CS-230AC* units are much more complicated to calibrate and have a spread-rate variability of approximately 10%. Newer spreader controls, like the *Cirus* units, provide a much more automated calibration process and reduce the variability of the spread rate to approximately 2%. Over the course of the permit cycle, MaineDOT intends to swap over the last remaining *CS-230AC* units to a current-generation spreader control that will improve the accuracy of the salt application data. MaineDOT will provide the number of spreader control upgrades for the plow crews serving the UIS watersheds in the annual reports.

In this permit cycle, MaineDOT will implement *Automatic Vehicle Location (AVL)* technology to increase the spatial resolution of the salt application data in one of the UIS watersheds where it has a relatively high winter maintenance footprint (**Attachment 4**): Red Brook or Sucker Brook. MaineDOT will equip the plow trucks of its Scarborough or Bangor crew (#71404 or #71103) by the end of PY2. MaineDOT will submit its salt application data with finer spatial resolution for Red Brook or Sucker Brook watershed starting with PY3 annual report.

MaineDOT will evaluate the baseline winter salt application data by the end of PY5 to assess the need for additional winter maintenance BMPs to be implemented in the UIS watersheds in the following permit cycle.

B.4 Stream Channel Restoration

MaineDOT proposes to restore the UIS reaches within its right-of-way. The stream restoration projects will be considered for the UIS under the stress of habitat degradation (**Tables 2 & 3**). MaineDOT can opportunistically develop a restoration project to be coupled with another project in its work plan. The restoration project development will follow the "General Stream Restoration Techniques" given under Attachment D of the 2022 Transportation MS4 permit. Upon identification of an UIS reach for restoration, MaineDOT will promptly contact DEP to obtain its approval and develop the restoration project in consultation with DEP.

Attachment 1. Land Use/Land Cover, MaineDOT TS4 Metrics of the Urban Impaired Stream Watersheds

Urban Impaired Stream	Watershed Area (sq. mi)	NLCD 2016 Developed Area	NCLD 2016 Impervious Area	Percent of the Watershed's Total Impervious Area (NLCD 2016)				MaineDOT Impervious Area (ac)	MaineDOT TS4 Outfalls
				Primary Roads	Secondary Roads	Tertiary Roads	Non-Road		
Arctic Brook	1.16	71%	29%	5%	7%	37%	52%	9.8	11
Concord Gully	0.88	56%	25%	4%	13%	19%	64%	9.1	2
Frost Gully Brook	2.54	29%	6%	10%	24%	26%	40%	11.7	7
Goosefare Brook	5.62	52%	18%	4%	12%	25%	60%	28.6	15
Nasons Brook	1.13	60%	32%	2%	11%	9%	78%	12.5	5
Penjajawoc Stream	8.61	29%	13%	5%	6%	24%	65%	37.6	14
Red Brook	2.96	32%	12%	15%	21%	8%	56%	50.4	17
Sucker Brook	2.75	72%	32%	10%	7%	13%	71%	52.1	26

NLCD 2016: National Land Cover Database Year 2016 Data. The land cover and imperviousness data were minimally processed by MaineDOT to obtain the percentages given in the table. https://www.mrlc.gov/data

Primary Roads: Interstates and other major roads.
Secondary Roads: Non-interstate highways.
Tertiary Roads: Any two-lane road.
Non-Road: Impervious area other than roads.

Attachment 2. A "Smart" Stormwater System to Mitigate the Chloride Impact on the Urban Impaired Streams

EXECUTIVE SUMMARY

Chloride has been identified as a stressor impairing stream water quality in Maine. Salt application due to winter maintenance of the impervious surfaces (roads, parking lots, sidewalks) is the leading chloride source in the stream watersheds. Chloride is a challenging stormwater contaminant since

- Chloride cannot be removed by any of the existing stormwater treatment measures due to its high solubility,
- As opposed to most stormwater contaminants, stormwater infiltration into soil is not a removal mechanism for chloride. On the contrary, groundwater contaminated by chloride persistently elevates chloride concentrations in streams through baseflow,
- Chloride source control is a challenging endeavor due to the public safety, level of service concerns against reduced winter salt application.

Research on the export of winter salt (chloride) has shown that the highest chloride mass export from the source areas (e.g. roadways) occurs during winter and spring snowmelt/rain events: small surface runoff volume and very high chloride concentrations. Seasonal diversion and detention of high-chloride stormwater to mitigate the chloride impact on the stream habitat has been proposed and evaluated by the researchers and practitioners.

Main goal of the project is to mitigate the chloride impact on the stream habitats by implementing:

- A "smart" stormwater system that detain and release chloride-rich stormwater

"Smart" stormwater systems consist of sensors, actuated valves, and specialized software giving them "Continuous Monitoring Adaptive Control" capabilities. As opposed to conventional stormwater control measures, smart systems can continuously measure parameters of interest, analyze the monitoring data, and make autonomous decisions which ultimately deliver better performance or even achieve goals that their conventional counterparts cannot.

The proposed smart system mainly consists of a non-infiltrating detention basin equipped with flow gauges and specific conductance (easy-to-measure, proxy parameter for chloride) sensors. A "logic" customized for chloride mitigation will be developed for the system. Potential DOT application sites are park & rides, highway medians, and interchange infields.

Detailed discussion of the proposed smart system's schematics and the pilot application alternatives can be found in Section 2 and 3, respectively.

1. BACKGROUND AND OBJECTIVE

Chloride has been identified as a stressor impairing stream water quality in Maine. The Department of Environmental Protection (DEP) Chloride is a stressor in seven of the eight urban impaired streams (UIS) where MaineDOT operates "Municipal Separate Storm Sewer Systems (MS4)". Additional best management practices are required to address the chloride and other stressors in the UIS watersheds by the new transportation general MS4 permit which will go into effect on July 1, 2022.

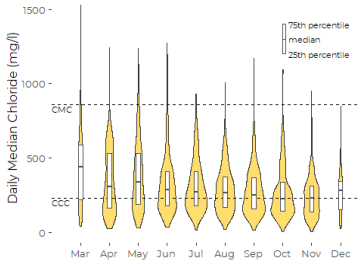
Salt application due to winter maintenance of the impervious surfaces (roads, parking lots, sidewalks) is the leading chloride source in the stream watersheds. Chloride is a challenging stormwater contaminant since

Chloride Trends in an Urban Impaired Stream in Maine: Long Creek

Long Creek is a unique urban impaired stream which has its own general permit issued by EPA under its residual designation authority. Long Creek Watershed Management District (LCWMD) is the entity specifically established to operate the general permit. Since 2010, LCWMD has been monitoring Long Creek main stem and its tributaries for various water quality parameters including specific conductance and chloride. Continuous specific conductance monitoring has generated a large data set reflecting temporal trend of specific conductance/chloride concentration in Long Creek main stem and its tributaries.

Following graph shows the daily median chloride concentrations estimated using automatic/continuous specific conductance measurements performed at various stations in the watershed. The blob width shows the number of observations for a given daily median chloride concentration: less observations/measurements are available for March and December as compared other months. Based on the figure, we can say:

- Daily median chloride concentration is generally high late winter/early spring and gradually decreases until fall indicating that road salt is partially flushed out of the watershed between the consecutive winter maintenance seasons,
- More than 50% of the daily median chloride concentrations exceed the chronic water quality criterion set for chloride (i.e. 230 mg L^{-1}) (see "CCC" line in the figure) indicating a persistent yearlong chloride stress on the stream biota,
- It is not uncommon that the daily mean chloride concentrations exceed the acute water quality criterion every month (i.e. 860 mg L^{-1}) (see "CMC" line in the figure),
- Even under the worst conditions (see "March" in the figure), approximately 25% of the daily median chloride concentrations are under the chronic water quality criterion (CCC) which indicates that a window of opportunity exists every month for releasing chloride-rich stormwater from a smart system (see the details for the proposed smart system below).



Aggregated Daily Mean Chloride Concentrations in Long Creek streams (Courtesy of Dr. Curtis Bohlen)

A Comprehensive Chloride Monitoring Case Study: Lake McCarrons Watershed (Minnesota)

A recent monitoring study on the roadway runoff provides very useful information on the chloride dynamics (Herb et al. 2017). Figures below are for the two monitoring sites in Lake McCarrons Watershed (MN) monitored for three field seasons (2015-2017):

- *County Road B:* 28-ac drainage area consisting of 0.5-mile county road and residential streets (curb-and-gutter roadway),
- *Highway 36 Ditch:* 12-ac drainage area consisting of ditches/swales adjacent to Highway 36 and its eastbound off-ramp.

Major findings are:

- There is a stark contrast between chloride retention behavior of the two study watersheds. Retention reported below is the "*percentage of applied road salt/chloride that is not observed in the surface runoff*":

Study Site	2015-2016 Field Season	2016-2017 Field Season
Curb-and-gutter Roadway (County Road B)	Road Salt Applied: 3,595 lbs (128 lbs/ac) Chloride Observed in Surface Runoff: 1,212 lbs (43 lbs/ac) Chloride Retention: **66%**	Road Salt Applied: 4,726 lbs (169 lbs/ac) Chloride Observed in Surface Runoff: 2,968 lbs (106 lbs/ac) Chloride Retention: **37%**
Highway Ditch (Highway 36)	Road Salt Applied: 6,233 lbs (519 lbs/ac) Chloride Observed in Surface Runoff: 375 lbs (31 lbs/ac) Chloride Retention: **94%**	Road Salt Applied: 9,012 lbs (751 lbs/ac) Chloride Observed in Surface Runoff: 556 lbs (46 lbs/ac) Chloride Retention: **94%**
Values reported in parentheses are chloride mass normalized by the area of the study watershed (Not impervious area or impervious roadway area)		

The highway ditch site consistently has a higher chloride retention than the curb-and-gutter roadway indicating that a significant amount (i.e. 94%) of road salt infiltrates into the ditch soil and does not appear in the concentrated ditch flow,

- Chloride retained in the ditch soil (shallow groundwater) can be exported in fall season (see "November Mean Chloride Load" in the bottom-right figure). Note that the November chloride peak was not due to new winter salt application. On the other hand, major chloride export occurs in winter season in the curb-and-gutter roadway (see "Mean Chloride Load" in the bottom-left figure),

Noteworthy Conclusions of the Researchers Pertinent to the Smart Chloride Mitigation Concept:

Section 6.3 of the report (Herb et al. 2017) includes statements supporting the smart chloride mitigation concept, although the authors did not specifically mention the application of a smart stormwater system, discussed herein. For instance, the authors state:

- *"The chloride management strategies examined in this study focused primarily on snowmelt capture, with the idea that capturing small amounts of snowmelt runoff with high chloride concentrations may be a relatively efficient method to mitigate chloride spreading from de-icers in the environment…."*
- *"….Chloride removal by diversion of saline runoff will be most effective (in terms of mass of chloride removed per volume of water) if implemented at the scale of a roadway, before runoff enters the drainage network (e.g., at County Road B)…..For example, a diversion of 0.1 inches of the most saline runoff at the County Road B site would remove 80% of surface runoff chloride from the site….."*

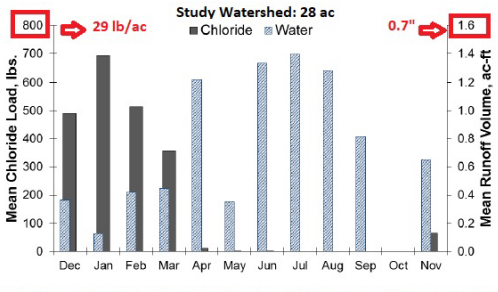


Figure 3-9. Mean monthly loading of chloride (lbs.; left axis) and water (ac-ft; right axis) observed at ***County Road B*** over two years of continuous monitoring Aug 1, 2015 – Jul 31, 2017. The lack of October runoff data is due to temporary removal of the weir for site maintenance.

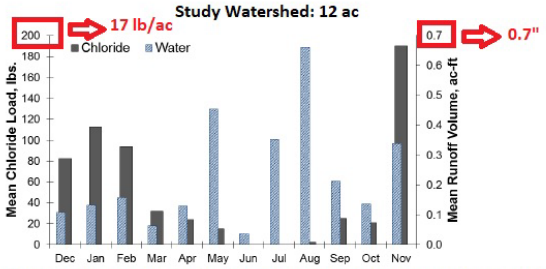


Figure 3-11. Mean monthly loading of chloride (lbs.; left axis) and water (ac-ft; right axis) observed at ***Highway 36 Ditch*** over two years of continuous monitoring Aug 1, 2015 – Jul 31, 2017.

- Chloride cannot be removed by any of the existing stormwater treatment measures due to its high solubility,

- As opposed to most stormwater contaminants, stormwater infiltration into soil is not a removal mechanism for chloride: chloride is neither retained by soil particles nor decomposes in the soil column. On the contrary, stormwater chloride contaminates groundwater after its infiltration. Elevated year-round chloride concentrations observed in the streams are due to the high-chloride groundwater baseflow in addition to the surface runoff (See text box below for the chloride trends in an urban impaired stream in Maine). Any stormwater measure aiming chloride mitigation must consider "chloride transport into groundwater via infiltration" as the surface runoff moves towards a stream or another surface water. This transport mechanism increases the chloride residence time in a watershed and results in chronic water quality problems for the chloride applied in a winter maintenance season is not "flushed out" of the watershed before the onset of the following winter maintenance season,

- Chloride source control is a challenging endeavor due to the public safety, level of service concerns against reduced winter salt application.

Therefore, there is a clear need for innovative end-of-pipe stormwater measures to mitigate the stress exerted on the stream water quality and habitats by elevated chloride levels.

Main goal of the project is to mitigate the chloride impact on the stream habitats by implementing:

- A "smart" stormwater system that detain and release chloride-rich stormwater

"Smart" stormwater systems consist of sensors, actuated valves, and specialized software giving them "Continuous Monitoring Adaptive Control (CMAC)" capabilities. As opposed to conventional stormwater control measures, smart systems can continuously measure parameters of interest, analyze the monitoring data, and make autonomous decisions which ultimately deliver better performance or even achieve goals that their conventional counterparts cannot (**Fig. 1**).

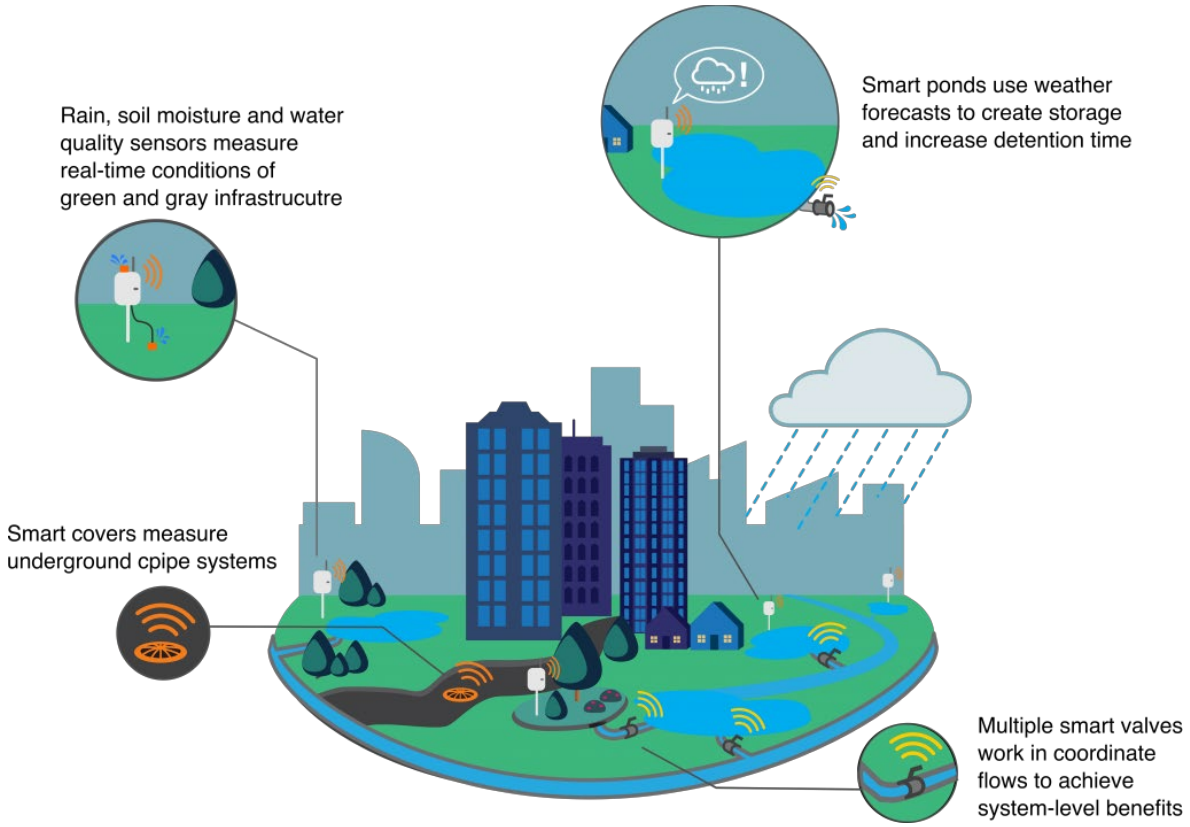


Figure 1. Potential applications of smart stormwater management (Reference: http://open-storm.org/workshop-cps2020/).

CMAC is an innovative stormwater management approach and an active area of research. As relative cost of CMAC components decrease, full-scale CMAC projects will be more common across the nation. Select (incomplete) list of the CMAC projects and their objectives are given below.

Project	Objective(s)
City of Ann Harbor (MI) Stormwater System*	• Flood mitigation • Water quality improvement • Cost reduction
Maryland Department of Transportation (MDOT) & Walmart "Public Private Partnership" (PPP)**	• Flood mitigation • Water quality improvement • Cost reduction • Water quality credit
Real-time Control Schemes for Bioretention Cells***	• Performance Enhancement
Conner Creek Watershed (Knox County, TN)***	• Investigation of site- and system-level barriers against smart stormwater management

City of Albany (NY), Bronx (NY), Hoboken (NJ), Kansas City (MO), Philadelphia (PA)**	• Combined Sewer Overflow (CSO) Mitigation
*: (http://open-storm.org/case-studies/) **: Opti Case Studies (https://optirtc.com/case-studies) ***: Jon Hathaway's Personal Research Webpage (Assoc. Prof @ UTK: http://hathaway.utk.edu/Research.html)	

Although smart stormwater systems have been used for flood and CSO mitigation, improving water quality treatment, they have yet to be used for mitigating the chloride resulting from winter deicing activities. Specifically, the "logic" required for the smart chloride system is currently unavailable and needs to be developed.

2. MAINEDOT STORMWATER BMP FRAMEWORK FOR CHLORIDE MITIGATION

New or retrofit post-construction stormwater best management practices (BMPs) that use CMAC to detain chloride-rich stormwater and mitigate its adverse impact on the downstream freshwaters. Potential application scenarios/configurations are shown below.

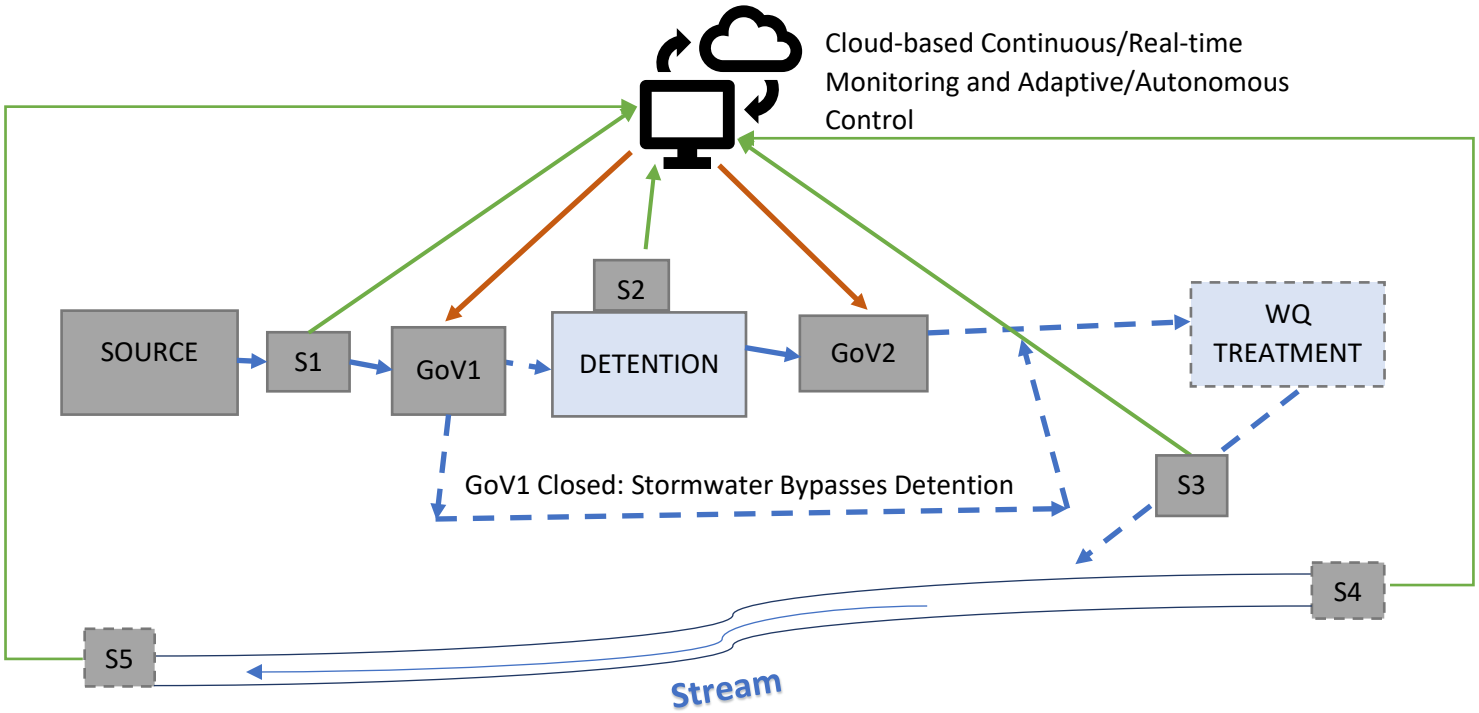


Figure 1. Smart Chloride Mitigation System Schematics.

Table 1. Smart Chloride Mitigation System Component Details.

DIAGRAM ITEM	DESCRIPTION	CRITERIA, LIMITATIONS ETC.
SOURCE	Deicer Treated Impervious Surfaces (i.e. Roads, Parking Areas, Sidewalks)	• Distance between the source and detention BMP or measure must be relatively small, • Source area must be sufficiently large to justify the cost of the smart system, • Sufficient detention volume must be available for storing chloride-rich stormwater: the smart system can be unfeasible for high "source area: detention area" • Source areas with closed stormwater drainage are preferred.
S1	Electrical Conductivity Sensor and Flow Gauge	• Stormwater sampling and analysis for chloride can be necessary to correlate "electrical conductivity" to "chloride concentration". • Based on the electrical conductivity input signal from S1, the logic will either open or close GoV1.
S2	Electrical Conductivity and Level Sensor (e.g. Pressure Transducer)	• If the level sensor indicates that the maximum water level is reached in the DETENTION measure, the logic will close GoV1. • Chloride mass in the DETENTION measure will be continuously monitored: chloride stratification (i.e. chloride concentration increasing with depth) in the DETENTION measure can be a limitation. • The logic will decide how much of the influent from the SOURCE will be blended with the stormwater based on S1 and S2 input signals. Hence, the smart system will deliver stormwater with "acceptable" electrical conductivity/chloride concentration downstream.
S3	Electrical Conductivity and Flow Gauge	• S3 will continuously monitor the flow and electrical conductivity/chloride concentration of the smart system effluent. • S1 and S3 data will demonstrate the chloride mitigation effectiveness of the smart system.
		• The logic can use S4 input signal to control GoV2 and release the detained stormwater if

S4	Electrical Conductivity and Flow Gauge on Stream Upstream the Smart System (OPTIONAL)	the stream conditions are amenable (i.e. high stream flow and/or low electrical conductivity). • This option can be unfeasible if the smart system and the receiving stream are relatively far from each other. • Stream channel accessibility (e.g. right-of-way) and environmental permitting requirements may limit S4 application.
S5	Electrical Conductivity and Flow Gauge on Stream Downstream the Smart System (OPTIONAL)	• S5 will be used to monitor the impact of the smart system outfall on the stream. S5 signals will not be necessarily used as an input for the logic. • Surface runoff, outfalls other than the smart system's outfall, and baseflow may also impact the flow rate and the electrical conductivity (i.e. challenge to isolate the impact of the smart system outfall).
GoV1	Actuated Gate or Valve	• The smart system will allow remote control of GoV1 (i.e. manual on/off) • GoV1 will be fully open or fully closed at a given time. GoV1 doesn't need to have the capability of being partially open.
GoV2	Actuated Gate or Valve	• The smart system will allow remote control of GoV2 (i.e. manual on/off). • GoV2 will have the capability of being open and adjusting the DETENTION outflow rate.
DETENTION	Detention Measure	• A stormwater measure (e.g. existing depression, extended dry detention basin, wetpond) with sufficient storage volume for high electrical conductivity/chloride inflows from the source. • Depending on the site soil characteristics, the detention measure may require a liner to minimize infiltration into the soil.
WQ TREATMENT	Structural Water Quality Treatment BMP (or Measure)	• Conventional stormwater treatment measure to retain and treat the "water quality volume" • The measure can be designed to infiltrate where applicable and appropriate.

3. PILOT APPLICATION ALTERNATIVES FOR SMART CHLORIDE MITIGATION

Following factors have been considered for the development of the pilot application alternatives for smart chloride mitigation:

- The pilot application must be in an urban impaired stream (UIS) watershed where MaineDOT will be required to implement additional stormwater BMPs in accordance with the new transportation general MS4 permit (henceforth, TS4 permit),
- MaineDOT has full access to and control over the project area,
- The pilot application must not conflict with other MaineDOT projects in the work plan,
- Source (deicer applied impervious) area of the pilot application must be sufficiently large to justify the cost of the smart system,
- The pilot application must not be very complex to minimize maintenance and operation problems,
- The pilot application must be flexible to expand the monitored and/or controlled water quality parameters beyond electrical conductivity/chloride,
- Hardware (e.g. sensors, valves) of the pilot application must operate under extreme weather conditions (particularly freezing temperatures) with minimal maintenance,
- Minimum grade must be available for positive drainage of the detained stormwater,
- The pilot application must provide the data to develop low-cost/simpler systems which can be applied more widely.

3.1 PILOT APPLICATION FOR THE NON-LINEAR SOURCE AREAS

Potential application areas are MaineDOT maintenance and park & ride lots within the UIS watersheds (**Table 2**). Maine Department of Environmental Protection has identified chloride as a major stressor for all the UIS watersheds given in **Table 2**. There is only one MaineDOT maintenance lot in the UIS watersheds:

- Bangor Maintenance Facility in the watershed of Penjajawoc Stream.

Table 2. MaineDOT Owned Park and Ride (P&R) Lots in the Urban Impaired Stream Watersheds.

UIS Watershed	Town	P&R Name	Maintenance Responsibility	Winter Maintenance
Concord Gully	Freeport	North	Town of Freeport	Town of Freeport
Sucker Brook	Bangor	Odlin Rd	MaineDOT	MaineDOT
Nasons Brook	Westbrook	Larrabee Rd	City of Westbrook	City of Westbrook
Red Brook	South Portland	Exit 45	MaineDOT	MaineDOT
Goosefare Brook	Saco	Industrial Park Rd	MaineDOT	Contracted
No P&R lots in Frost Gully Brook, Arctic Brook, and Penjajawoc Stream UIS watersheds.				

A potential application of smart chloride mitigation system (SCMS) for a nonlinear source area is shown in **Fig. 2**. Scope of the SCMS work will be limited to the construction of stormwater conveyances, detention basin, and auxiliary structures (e.g. solar panel, control panel box) to the maximum extent practicable. Regrading of the road inslopes and backslopes will be avoided to the maximum extent practicable. Existing

impervious area (e.g. driveways, parking areas) will not be disturbed to allow the continuity of the services. New stormwater conveyances will consist of swales strategically located to capture the chloride-rich snowmelt both from the snow piles and from the impervious surfaces. The swales will be impermeable to eliminate the infiltration of chloride-rich stormwater into the shallow groundwater and maximize the amount of chloride captured by SCMS. In other words, the impermeable swales will be designed to capture most of the chloride applied on the impervious surface during winter season and direct it to SCMS. The chloride-rich stormwater detained by SCMS will be gradually released during higher flow storm events which will presumably generate low-chloride stormwater. Furthermore, it is expected that the open stormwater conveyance (e.g. swales, ditches) soil will be saturated during the higher flow events and the stormwater travel time to the stream through the open conveyance will be relatively short. Under these conditions, minimal amount of the chloride released from SCMS will infiltrate into shallow groundwater as it is conveyed downstream and most of the released chloride will be discharged into the stream. Therefore, chloride from SCMS source area will not contaminate the groundwater and contribute to the base flow chloride load which results in elevated yearlong chloride concentrations in the streams.

Depending on the distance between SCMS outlet and UIS, a simple or complex control logic will be used:

- **Simple Control Logic:** This logic is more appropriate for the applications that do not have a direct outfall to the streams. A fixed electrical conductivity (EC) value (i.e. maximum allowable EC (MAX)) will be set for the autonomous control. The fixed value will be chosen in consultation and with the approval of the Maine Department of Environmental Protection (DEP). An on-site monitoring study may need to be performed prior to the SCMS installation to correlate the EC to chloride concentration.

If Electrical Conductivity (EC) @ S1 > MAX then "Open GoV1 & Fill Detention: GoV2 Closed" (See **Fig. 1**)

If EC @ S1 ≤ MAX then "Close GoV1 & Open GoV2" (See **Fig. 1**)

&

Adjust GoV2 with EC Feedback from S3 to keep EC @ S3 ≤ MAX

- **Complex Control Logic:** This logic is more appropriate for the applications that has a direct outfall to the streams. Instead of the fixed control value proposed for the "Simple Control Logic", the

If Electrical Conductivity (EC) @ S1 > EC @ S4 then "Open GoV1 & Fill Detention: GoV2 Closed" (See **Fig. 1**)

If $EC_{S1} < EC_{S4}$ then "Close GoV1 & Open GoV2" (See **Fig. 1**)

&

Adjust GoV2 with EC Feedback from S4 and S5 to maintain $(EC_{S5} - EC_{S4})/EC_{S4} \times 100 \leq MAX$ *

MAX: Maximum relative EC percent increase allowed for the stream reach by DEP

*: Assuming that SCMS outfall is the major contributor to "EC/Chloride" and "Flow" of the stream reach monitored by S4 and S5 (i.e. distance between S4 and S5 must be relatively short).

"Complex Control Logic" will use the dynamic in-stream data from S4 and S5 (see **Fig. 1**). A tentative simplified version of the complex control logic is presented below. Development of the complex control logic is highly likely to be an iterative process requiring the analysis of monitoring data. DEP will be consulted during the process and its approval of the finalized logic will be sought.

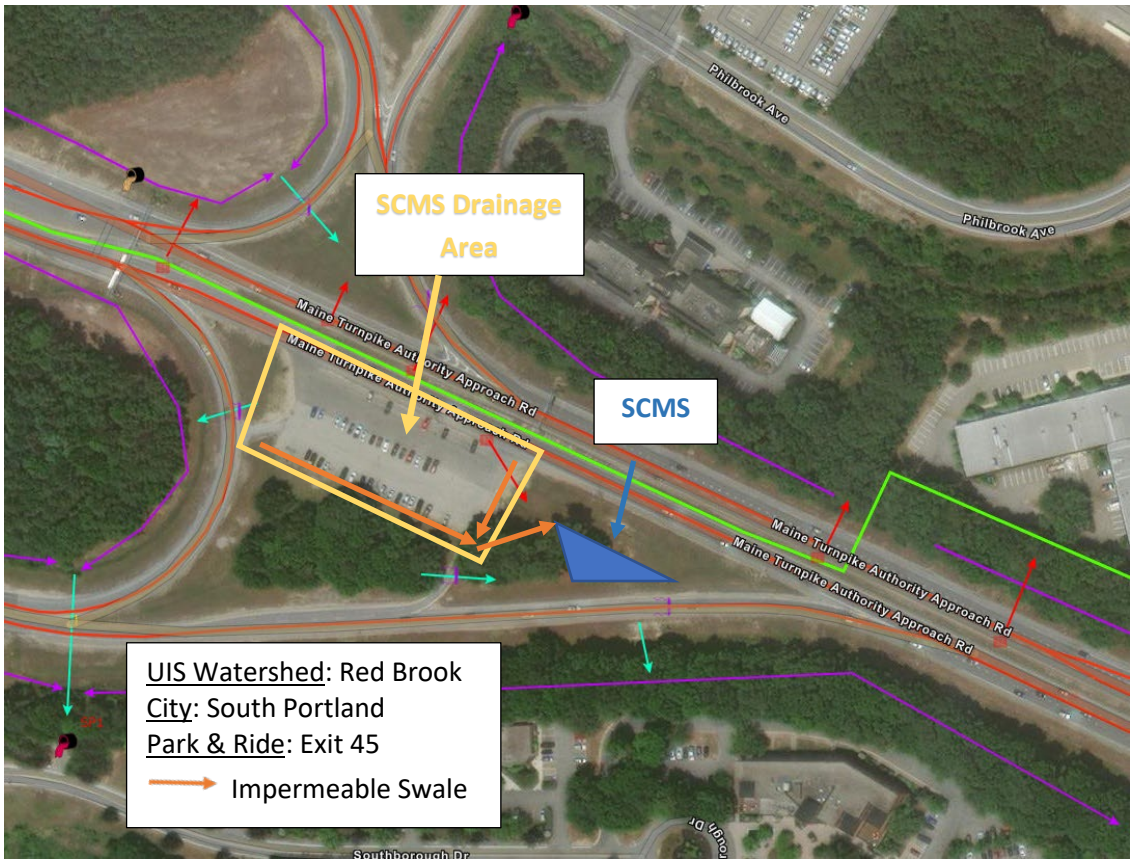


Figure 2. Plan view of a potential smart chloride mitigation system (SCMS) in an urban impaired stream (UIS) watershed. Arrows and lines other than the orange ones belong to the MaineDOT MS4 outfall map and indicate flow directions.

3.2 PILOT APPLICATION FOR THE LINEAR SOURCE AREAS

Linear source areas for SCMS mainly consist of highways treated with deicer during winter maintenance season. Existing depressions can be potentially used to treat the surface runoff from source areas using SCMS. Smart Chloride Mitigation System can also be installed at the outlet of a closed drainage system collecting the surface runoff from a sufficiently large source area. However, it is a challenge to find a closed drainage system meeting the criteria for SCMS, especially having appropriate space and grade at its outlet. It appears that a pilot SCMS application is practicable for the highway medians and interchange infields. The SCMS design must satisfy the clear zone and other applicable safety standards and guidelines.

A potential SCMS application in an interchange infield is shown in **Fig. 3**. In this example, it is assumed that one lane and shoulder of northbound I-295 is sloped towards the infield whereas the on- and off-ramps are sloped away from the infield. Therefore, the section sloped towards the infield is delineated

as the source area of SCMS. As previously stated for the nonlinear source area application, scope of SCMS work will be limited to the construction of stormwater conveyances, detention basin, and auxiliary structures within the infield. Existing catch basin will be modified to operate as a “smart” outlet control structure (OCS) equipped with an actuated gate or valve (see GoV2 in Fig. 1). The OCS will have an overflow/emergency spillway to prevent excessive ponding in the detention area. Outlet pipe of the existing catch basin will be minimally impacted by the SCMS unless it is in very poor condition and must be repaired or replaced. Major earthwork will be for the construction of an impermeable detention basin around the low point of the depression. Construction of impermeable swales that will collect the snowmelt/surface runoff from the source can be necessary (e.g. impermeable downspouts from the shoulder to SCMS). This is particularly important to minimize the infiltration of chloride-rich snowmelt into shallow groundwater as the it runs over the inslope. More chloride-rich stormwater infiltrates, less effective becomes SCMS.

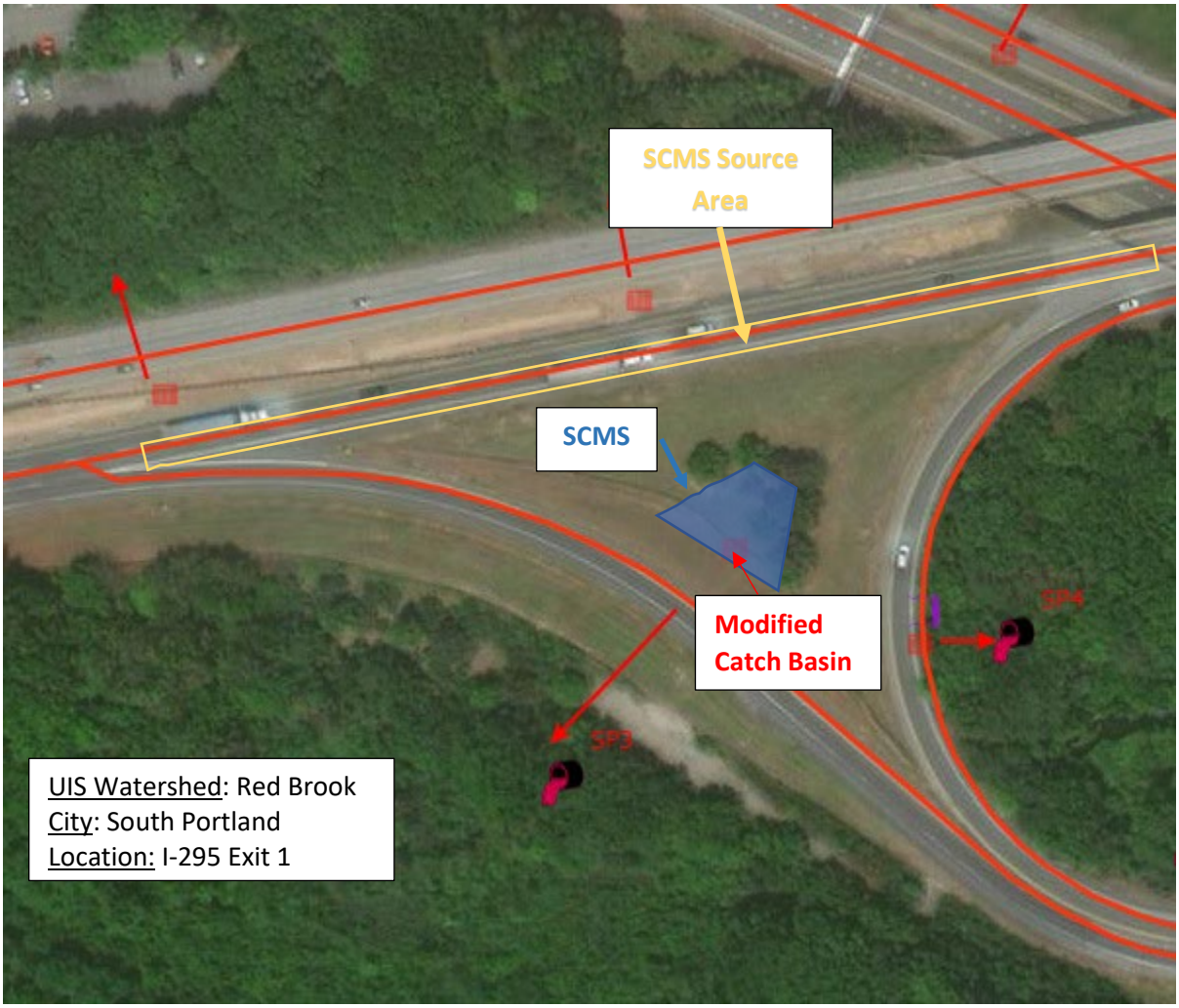


Figure 3. Plan view of a potential smart chloride mitigation system (SCMS) in an urban impaired system (UIS) watershed. Arrows and lines other than the orange lines belong to the MaineDOT MS4 outfall map and indicate flow directions.

4. REFERENCES

1. Herb, William; Janke, Ben; Stefan, Heinz. (2017). Study of De-icing Salt Accumulation and Transport Through a Watershed. Minnesota Department of Transportation. Retrieved from the University of Minnesota Digital Conservancy, https://hdl.handle.net/11299/195170.
2. Curtis Bohlen, Casco Bay Estuary Partnership. Personal Communication on the Long Creek Watershed Chloride Monitoring Data.

Attachment 3. Total Suspended Solids (TSS), Total Phosphorus (TP), and Total Nitrogen (TN) Concentrations of the Stormwater Best Management Practices (BMPs).

	Median TSS (mg/L) (95% Confidence Interval)		
BMP Category	**In**	**Out**	**TSS Median Concentration Reduction (%)**
HRBF	30.8	3.8	87.7%
Media Filter	44	7.2	83.6%
Bioretention	44	10	77.3%
Retention Pond	49	12	75.5%
Porous Pavement	77	22	71.4%
Detention Basin	65.1	22	66.2%
Wetland Basin	35.5	14	60.6%
HRMF	44	18	59.1%
OGS	36	15.5	56.9%
Grass Strip	48	23	52.1%
Grass Swale	26	13.7	47.3%
HDS	63.9	39	39.0%
All BMP categories above have been shown to reduce the TSS concentration significantly using three statistical methods.			
	Median TP (mg/L) (95% Confidence Interval)		
BMP Category	**In**	**Out**	**TP Median Concentration Reduction (%)**
Retention Pond	0.246	0.12	51.2%
HRBF	0.099	0.05	49.5%
Media Filter	0.165	0.09	45.5%
Porous Pavement	0.17	0.1	41.2%
HRMF	0.12	0.08	33.3%
Wetland Basin	0.17	0.122	28.2%
Detention Basin	0.25	0.186	25.6%
All BMP categories above have been shown to reduce the TP concentration significantly using three statistical methods.			
	Median TN (mg/L) (95% Confidence Interval)		
BMP Category	**In**	**Out**	**TN Median Concentration Reduction (%)**
HRMF *	1.88	1	46.8%
Retention Pond	1.63	1.2	26.4%
Bioretention	1.26	0.96	23.8%
Wetland Channel	1.76	1.45	17.6%
Media Filter *	1.06	0.89	16.0%
All BMP categories above have been shown to reduce the TN concentration significantly using three statistical methods.			
*: Two of the three methods indicated significant TN concentration reduction.			
HRBF: High-rate Biofiltration. Manufactured devices with high rate filtration media that support plants.			
HRMF: High-rate Media Filtration. Manufactured devices with high rate filtration media consisting of a variety of inert and sorptive media types and configurations (e.g. cartridge filters, upflow filters, membrane filters, vertical bed filters).			

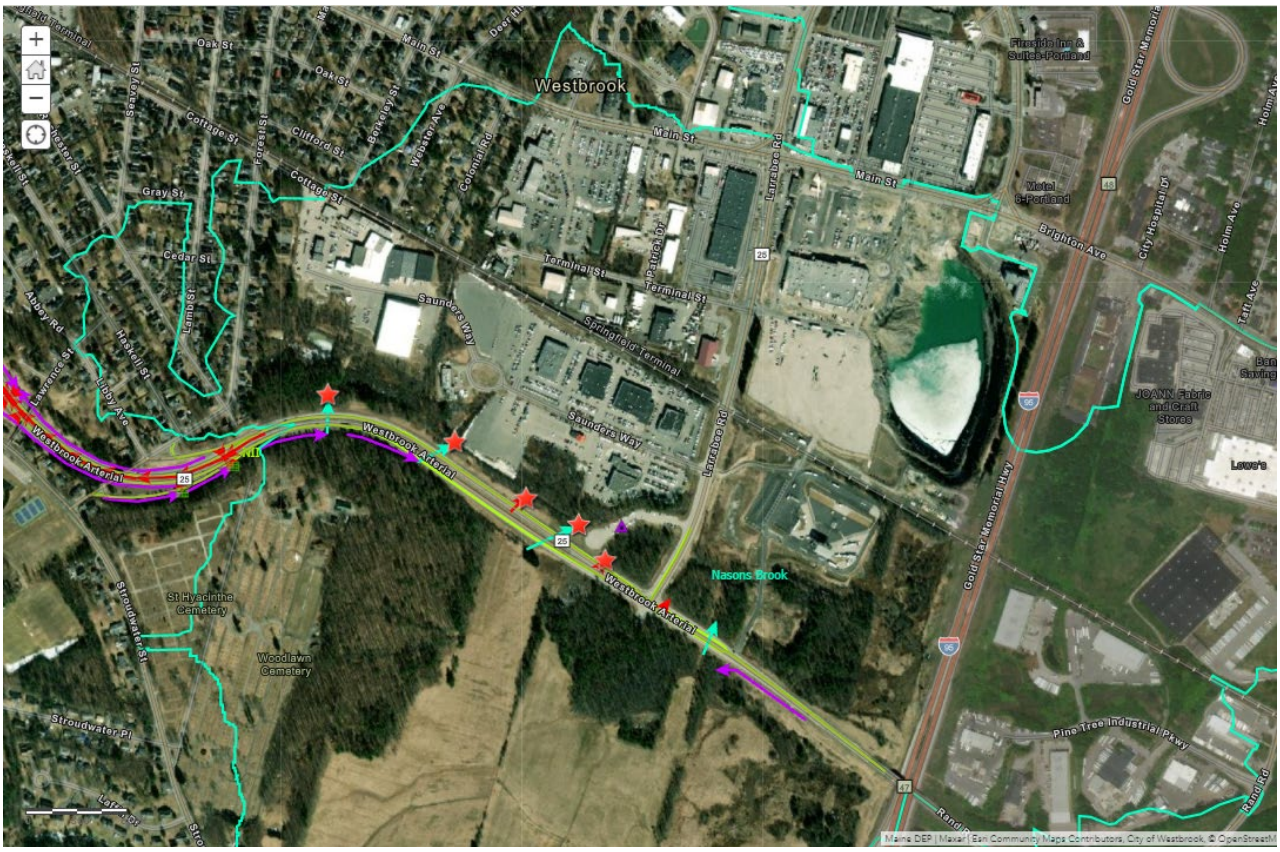
Reference: Water Research Foundation. 2020. International Stormwater BMP Database: 2020 Summary Statistics. Accessible from https://www.waterrf.org/system/files/resource/2020-11/DRPT-4968_0.pdf

Attachment 4. The Roads Plowed by MaineDOT and its Contractors in the Urban Impaired Stream (UIS) Watersheds.

UIS Watershed	Plow Crew #	Road Totals		
		Centerline Miles*	Lane Miles*	Impervious Area (ac)*
Arctic Brook	71404	1.7	3.5	8.4
Concord Gully	71114	1.2	2.4	5.9
Goosefare Brook	CNTRCT	6.2	12.3	28.4
Penjajawoc Stream	71404	5.8	11.6	28.2
	CNTRCT	0.2	0.3	0.7
Red Brook	71103	8.5	17.0	41.3
Sucker Brook	71404	12.5	24.9	60.5

*: Estimated figures which may be revised for accuracy.
Five-digit plow crew numbers stand for MaineDOT Region 1 and 4 plow crews.
CNTRCT: Contractor

Attachment 5. The Roads Plowed by MaineDOT and its Contractors in the Urban Impaired Stream (UIS) Watersheds.



Red stars signify MaineDOT TS4 outfalls along Westbrook Arterial discharging into the northerly stream reach.

The ArcGIS Online web map can be accessed from “Stormwater” link available at https://www.maine.gov/mdot/env/

DEP INFORMATION SHEET

Appealing a Department Licensing Decision

Dated: August 2021 **Contact: (207) 314-1458**

SUMMARY

This document provides information regarding a person's rights and obligations in filing an administrative or judicial appeal of a licensing decision made by the Department of Environmental Protection's (DEP) Commissioner.

Except as provided below, there are two methods available to an aggrieved person seeking to appeal a licensing decision made by the DEP Commissioner: (1) an administrative process before the Board of Environmental Protection (Board); or (2) a judicial process before Maine's Superior Court. An aggrieved person seeking review of a licensing decision over which the Board had original jurisdiction may seek judicial review in Maine's Superior Court.

A judicial appeal of final action by the Commissioner or the Board regarding an application for an expedited wind energy development (35-A M.R.S. § 3451(4)) or a general permit for an offshore wind energy demonstration project (38 M.R.S. § 480-HH(1)) or a general permit for a tidal energy demonstration project (38 M.R.S. § 636-A) must be taken to the Supreme Judicial Court sitting as the Law Court.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

A person filing an appeal with the Board should review Organization and Powers, 38 M.R.S. §§ 341-D(4) and 346; the Maine Administrative Procedure Act, 5 M.R.S. § 11001; and the DEP's *Rule Concerning the Processing of Applications and Other Administrative Matters* (Chapter 2), 06-096 C.M.R. ch. 2.

DEADLINE TO SUBMIT AN APPEAL TO THE BOARD

Not more than 30 days following the filing of a license decision by the Commissioner with the Board, an aggrieved person may appeal to the Board for review of the Commissioner's decision. The filing of an appeal with the Board, in care of the Board Clerk, is complete when the Board receives the submission by the close of business on the due date (5:00 p.m. on the 30th calendar day from which the Commissioner's decision was filed with the Board, as determined by the received time stamp on the document or electronic mail). Appeals filed after 5:00 p.m. on the 30th calendar day from which the Commissioner's decision was filed with the Board will be dismissed as untimely, absent a showing of good cause.

HOW TO SUBMIT AN APPEAL TO THE BOARD

An appeal to the Board may be submitted via postal mail or electronic mail and must contain all signatures and required appeal contents. An electronic filing must contain the scanned original signature of the appellant(s). The appeal documents must be sent to the following address.

Chair, Board of Environmental Protection
c/o Board Clerk
17 State House Station
Augusta, ME 04333-0017
ruth.a.burke@maine.gov

The DEP may also request the submittal of the original signed paper appeal documents when the appeal is filed electronically. The risk of material not being received in a timely manner is on the sender, regardless of the method used.

At the time an appeal is filed with the Board, the appellant must send a copy of the appeal to: (1) the Commissioner of the DEP (Maine Department of Environmental Protection, 17 State House Station, Augusta, Maine 04333-0017); (2) the licensee; and if a hearing was held on the application, (3) any intervenors in that hearing proceeding. **Please contact the DEP at 207-287-7688 with questions or for contact information regarding a specific licensing decision.**

REQUIRED APPEAL CONTENTS

A complete appeal must contain the following information at the time the appeal is submitted.

1. *Aggrieved status*. The appeal must explain how the appellant has standing to bring the appeal. This requires an explanation of how the appellant may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions, or conditions objected to or believed to be in error.* The appeal must identify the specific findings of fact, conclusions of law, license conditions, or other aspects of the written license decision or of the license review process that the appellant objects to or believes to be in error.
3. *The basis of the objections or challenge.* For the objections identified in Item #2, the appeal must state why the appellant believes that the license decision is incorrect and should be modified or reversed. If possible, the appeal should cite specific evidence in the record or specific licensing criteria that the appellant believes were not properly considered or fully addressed.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license to changes in specific license conditions.
5. *All the matters to be contested*. The Board will limit its consideration to those matters specifically raised in the written notice of appeal.
6. *Request for hearing.* If the appellant wishes the Board to hold a public hearing on the appeal, a request for hearing must be filed as part of the notice of appeal, and it must include an offer of proof regarding the testimony and other evidence that would be presented at the hearing. The offer of proof must consist of a statement of the substance of the evidence, its relevance to the issues on appeal, and whether any witnesses would testify. The Board will hear the arguments in favor of and in opposition to a hearing on the appeal and the presentations on the merits of an appeal at a regularly scheduled meeting. If the Board decides to hold a public hearing on an appeal, that hearing will then be scheduled for a later date.
7. *New or additional evidence to be offered.* If an appellant wants to provide evidence not previously provided to DEP staff during the DEP's review of the application, the request and the proposed supplemental evidence must be submitted with the appeal. The Board may allow new or additional evidence to be considered in an appeal only under limited circumstances. The proposed supplemental evidence must be relevant and material, and (a) the person seeking to add information to the record must show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process; or (b) the evidence itself must be newly discovered and therefore unable to have been presented earlier in the process. Requirements for supplemental evidence are set forth in Chapter 2 § 24.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, and is made accessible by the DEP. Upon request, the DEP will make application materials available to review and photocopy during normal working hours. There may be a charge for copies or copying services.

2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing the appeal.* DEP staff will provide this information upon request and answer general questions regarding the appeal process.

3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed, the license normally remains in effect pending the processing of the appeal. Unless a stay of the decision is requested and granted, a licensee may proceed with a project pending the outcome of an appeal, but the licensee runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will acknowledge receipt of an appeal, and it will provide the name of the DEP project manager assigned to the specific appeal. The notice of appeal, any materials admitted by the Board as supplementary evidence, any materials admitted in response to the appeal, relevant excerpts from the DEP's administrative record for the application, and the DEP staff's recommendation, in the form of a proposed Board Order, will be provided to Board members. The appellant, the licensee, and parties of record are notified in advance of the date set for the Board's consideration of an appeal or request for a hearing. The appellant and the licensee will have an opportunity to address the Board at the Board meeting. The Board will decide whether to hold a hearing on appeal when one is requested before deciding the merits of the appeal. The Board's decision on appeal may be to affirm all or part, affirm with conditions, order a hearing to be held as expeditiously as possible, reverse all or part of the decision of the Commissioner, or remand the matter to the Commissioner for further proceedings. The Board will notify the appellant, the licensee, and parties of record of its decision on appeal.

II. JUDICIAL APPEALS

Maine law generally allows aggrieved persons to appeal final Commissioner or Board licensing decisions to Maine's Superior Court (see 38 M.R.S. § 346(1); 06-096 C.M.R. ch. 2; 5 M.R.S. § 11001; and M.R. Civ. P. 80C). A party's appeal must be filed with the Superior Court within 30 days of receipt of notice of the Board's or the Commissioner's decision. For any other person, an appeal must be filed within 40 days of the date the decision was rendered. An appeal to court of a license decision regarding an expedited wind energy development, a general permit for an offshore wind energy demonstration project, or a general permit for a tidal energy demonstration project may only be taken directly to the Maine Supreme Judicial Court. See 38 M.R.S. § 346(4).

Maine's Administrative Procedure Act, DEP statutes governing a particular matter, and the Maine Rules of Civil Procedure must be consulted for the substantive and procedural details applicable to judicial appeals.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, for administrative appeals contact the Board Clerk at 207-287-2811 or the Board Executive Analyst at 207-314-1458 bill.hinkel@maine.gov, or for judicial appeals contact the court clerk's office in which the appeal will be filed.

Note: This information sheet, in conjunction with a review of the statutory and regulatory provisions referred to herein, is provided to help a person to understand their rights and obligations in filing an administrative or judicial appeal. The DEP provides this information sheet for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.