

Municipality/Organization: Town of Lincoln

EPA NPDES Permit Number: MAR041043

MaDEP Transmittal Number: W-035460

Annual Report Number

& Reporting Period: No. 10: May 2012 – May 2013

NPDES PII Small MS4 General Permit Annual Report

Part I. General Information

Contact Person: Timothy Higgins

Title: Town Administrator

Telephone #: 781-259-2600

Email: higginst@lincolntown.org

Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: 

Printed Name: Timothy S. Higgins

Title: Town Administrator

Date: April 30, 2013

Part II. Self-Assessment

The Town of Lincoln has completed the required self-assessment and offers the following feedback on the permit compliance of our municipality:

The initial 5-year NPDES MS4 General Permit is expired and the Town understands that a draft Permit (for Massachusetts North Coastal Small MS4 communities) is going to be issued shortly and made available for comment. We look forward to being able to review and comment on this draft when it is issued. We realize that we need to make a strong attempt to establish bylaws and regulations for construction site stormwater management and for illicit discharge detection and elimination. The issuance of a new Permit will help facilitate this course of action. Our educational outreach program needs to be reinvigorated and again this will be spurred on the issuance of a new Permit.

Much of Lincoln is located outside the MS4 regulated area, and the northern area of our MS4 is part of Hanscom Air Force Base which is governed by their own NPDES Permitting. However, we do our best to have clean stormwater discharges to the receiving waters throughout our community. Our biggest contribution to water quality is in land preservation and nearly half of our community is permanently preserved open space. The average impervious cover in our 7 abutting towns is 16.67% while Lincoln has the lowest at 9.09%.

Being a small community we have limited staff and when a new NPDES Permit is issued we will likely retain the professional services of a consulting firm with local stormwater management expertise to help us as we develop our Notice of Intent and associated plan for moving forward.

At our spring 2013 Town Meeting we passed a new Groundwater Protection Bylaw for our Zone II Aquifer Protection Zone. A considerable portion of this zone overlaps with our regulated MS4 zone. In March 2012 we passed a new Surface Water Supply Protection Bylaw. Both bylaws meet the required MA DEP regulatory standards.

Several major projects are coming up soon and these will incorporate significant improvements to stormwater management. These include a full reconstruction of the Lincoln Public School complex, the Hanscom AFB Schools, and the Crosby's Corner-Route 2 road work projects. Our next roadway project will have incorporate leaching catchbasins and country drainage and eliminate direct wetland outfalls.

Part III. Summary of Minimum Control Measures

1. Public Education and Outreach

BMP ID #	BMP Description	Responsible Dept./Person Name	Measurable Goal(s)	Progress on Goal(s) – Permit Year 10 (Reliance on non-municipal partners indicated, if any)
1-C	Lincoln Specific Stormwater Flyers	ConCom	Distribute at Town Hall and public events.	Lincoln has several brochures relating to stormwater awareness and healthy lawns and landscapes available at Town Hall. These are also made available at the annual Town Meeting
1-D	Education via Newspaper Articles	ConCom	Write at least one article per year	Article on stormwater in Lincoln Journal not submitted.
1-E	Education via the Internet	ConCom	Provide stormwater information and links on Town website	Stormwater information is posted on Town Website. Links to other websites including EPA's site also posted. The Town will soon have a brand new website that will greatly enable our ability to manage content and this section will be significantly enhanced.
1-F	Homeowner and Contractor BMP Manual	ConCom	Provide new manual with best current methods.	The draft of this is still in development and will be out shortly. Our Conservation Planner is giving a talk in May on "Lincoln's Water: Sources and Best Practices in the Home Landscape".

1a. Additions

1-F	Open Space Plan	Open Space Committee	State approved Open Space Plan	Land protection opportunities are constantly being evaluated and more projects are in the works for the coming years.
1-G	New Homeowner Information Packet	ConCom	Provide property information to new homeowners.	Distributed packets including Lincoln specific fliers and return postcard to new homeowners. Work is ongoing and effective
1-H	Municipal GIS Website	ConCom	Offer public free GIS website with datalayers for Town.	The revised GIS system is functioning effectively. Layers include wetlands, buffer zone, & floodplain. It has been very well received and is used extensively by residents, realtors etc.
1-I	Conservation Walk Series	ConCom	Provide educational outings for the public.	Spring and fall series of walks to get people on land and educated about conservation issues with a concentration on watershed activities. This is an annual series that is well attended and connects residents to the Town's natural resources.
1-J	Healthy Lawn and Landscape Brochures	ConCom Garden Club	Distribute to residents.	This brochure was fully revised and updated in 2011 and is being distributed at Town Hall and at municipal events. Minimizing or eliminating fertilizer and pesticides are the key components discussed.

2. Public Involvement and Participation

BMP ID #	BMP Description	Responsible Dept./Person Name	Measurable Goal(s)	Progress on Goal(s) – Permit Year 10 (Reliance on non-municipal partners indicated, if any)
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2-B	Annual Meeting on NPDES Plan and Report	Town Administrator	Hold Committee meeting each year	NPDES meeting Including Town Planner, Conservation Director, and Public Works Director.
2-C	Watershed Group Involvement	ConCom Local Groups	Continue ongoing activities to protect the health of our wetlands & watersheds.	We are working closely with the City of Cambridge's Water Department on stormwater issues. ConCom partnered with Concord for 13 th consecutive year on water chestnut removal. ConCom representatives active with the Suasco River Stewardship Council. We also continue to participate with the Suasco CISMA.
2-D	Involve Lincoln Children's Groups	ConCom	Involve Lincoln Children's Groups in watershed clean-up and other activities.	Worked with various classes and groups on local ecological issues, including teaching importance of stormwater management for drinking water quality.

2a. Additions

2-E	Wetland buffer restoration through invasive species removal	ConCom	Work once per year with community and/or school group to restore wetland habitat.	Fourth annual Garlic Mustard pull days held with excellent community participation. This is critical work for maintaining the health of native plant ecosystems.
2-F	Open Space Plan	ConCom Open Space Committee	State Approved Plan with 5-year Action Plan	Following through with 5-year Action Plan for the Open Space and Recreation Plan.
2-G	Elm Brook Stream Restoration	ConCom Minute Man National Historical Park	Stream daylighting with natural stream-bed construction and native plantings	This is a Shawsheen River watershed project. Stream is healthy with native plants and abundant macro-invertebrate and amphibian life.
2-H	Habitat inventory and monitoring	ConCom	Conduct habitat inventories	Baseline monitoring of all conservation lands and holdings is completed.

2-I	Comprehensive Plan (Town's Master Plan)	Planning Board	Work to achieve goals outlined in plan, which include open space preservation and ecological protection.	Work on implementing plan is ongoing. Open space goals mirror what is in the Open Space Plan. A Committee is working on ensuring all Departments and Boards are following through on their initiatives.
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3. Illicit Discharge Detection and Elimination

BMP ID #	BMP Description	Responsible Dept./Person Name	Measurable Goal(s)	Progress on Goal(s) – Permit Year 10 (Reliance on non-municipal partners indicated, if any)
3-A	Illicit Discharge Bylaw	Highway Board of Health	Discussions and review of regulations	Board of Health continues to review and permit all septic system maintenance and construction. Conservation permitting is done for all systems within 100 feet of wetlands or 200 feet to perennial streams.
3-B	Storm Drain Map	Highway Town Administrator	Field-verify and map storm drains and outfalls	Used GPS to field-verify and map outfalls. Lincoln has a new Trimble GPS/computer/receiver unit and we are using it to get accurate field data for all stormwater, culvert, and Water Dept. infrastructure. This work is ongoing.
3-C	Illicit Discharge Detection and Elimination Plan	Highway	Visually screen outfalls during dry weather.	Priority areas are the Tower Road wellhead protection zones A and B and Flint's Pond and Cambridge Reservoir surface water protection Zones 1 and 2. Household hazardous waste coordinated with the Town of Lexington.
3-D	Illicit Discharge Education for General Public and Businesses	ConCom Planning	Include illicit discharge education information in fliers.	ConCom brochures distributed on how to reduce lawn and yard pesticide and chemical fertilizer use. DPW maintains metal "No Dumping – Drains to River" catchbasin markers.

3-E	Illicit Discharge Education for Municipal Employees	Highway Fire Department	Municipal training for Town.	Fire Department continues their training in spill prevention and containment. DPW employees trained on spill prevention and containment.
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3a. Additions

3-F	Annual Monitoring of all public and private Conservation Land.	ConCom Lincoln Land Conservation Trust	Inspect boundaries and interiors of all permanently protected open space	Work completed by LLCT and ConCom staff. Any violations, including illicit discharges, are searched for. This includes 2901 acres which is 31% of the Town and in increase in acreage from earlier years.
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4. Construction Site Stormwater Runoff Control

BMP ID #	BMP Description	Responsible Dept./Person Name	Measurable Goal(s)	Progress on Goal(s) – Permit Year 10 (Reliance on non-municipal partners indicated, if any)
4-A	Construction Site Runoff Bylaw	Planning ConCom	Initial Discussions and review of existing and model bylaws	Construction site runoff is adequately managed through wetlands permitting and site-plan review. Due to nature of Lincoln's character, no bylaw is necessary at this time.
4-B	BMPs for Construction Site Erosion, Sediment, and Waste Controls	Planning ConCom	Stay current with construction-site BMP's	DEP Stormwater Regulations are administered by the Conservation Commission. BMP's required through wetland and site-plan permitting.
4-C	Construction Site Plan Review Procedures	Planning ConCom	Maintain review and communication between land-use boards	Planning Board and ConCom both currently review construction site plans.

4-D	Construction Site Inspection and Enforcement Procedures	Planning ConCom	Inspect and Enforce Construction Site through local boards	Planning and Conservation staff monitor construction sites as does the Building Inspector.
4-E	Response to Public Stormwater Hotline	Highway ConCom	Maintain Stormwater Hotline	Conservation Department phone is the Hotline during working hours and Public Safety Dispatcher during other hours.

4a. Additions

4-F	Zoning Bylaw Revisions for FEMA Floodplain Requirements	Planning Board ConCom	Revise floodplain regulations and get approved by Town Meeting.	In 2010 Town Meeting approved the changes that strengthen regulatory authority to limit floodplain alteration, thus protecting this resource area that is critical to stormwater management.
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5. Post-Construction Stormwater Management in New Development and Redevelopment

BMP ID #	BMP Description	Responsible Dept./Person Name	Measurable Goal(s)	Progress on Goal(s) – Permit Year 10 (Reliance on non-municipal partners indicated, if any)
5-A	Post-Construction Site Runoff Bylaw	Planning ConCom	Initial discussions; review current local/state regulations; review proposed samples	Post-Construction site runoff is adequately managed through wetlands permitting and site-plan review. We are now exploring the establishment of a new bylaw to meet this requirement.
5-B	Choose Structural and Non-structural BMPs	Planning ConCom	Stay current with construction-site BMP's	Continued enforcing current BMPs as shown on 5-year NPDES Stormwater Phase II Compliance Plan.
5-C	Long-Term BMP Operation and Maintenance Procedures	Planning ConCom	Require Operation and Maintenance Plan Procedures for single-family through Bylaw.	OMPs are required under DEP Stormwater Management Regulations for projects requiring a Stormwater Management Plan. General review provided through existing permitting.

5-D	Structural BMP Implementation Procedures	Planning ConCom	Outline structural BMP requirements in Bylaw	Review structural stormwater management controls through existing permitting process. Where possible require low-impact development strategies and non-structural components.
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5a. Additions

5-E	Permits Issued for Major Projects with Drainage Improvements	ConCom	Work with applicants to ensure proper stormwater BMPs are used during and after construction.	Major projects that are still ongoing include: Crosby's Corner/Route 2 Project with extensive stormwater management BMPs and wetlands habitat restoration. This work is fully underway and will be for several years. Hanscom AFB School reconstruction and Lincoln Public School reconstruction. The Town Office Building reconstruction project disconnected a direct discharge to wetlands. Drainage now includes deep-sump catchbasins and discharge to an infiltration trench in the upland.
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6. Pollution Prevention and Good Housekeeping in Municipal Operations

BMP ID #	BMP Description	Responsible Dept./Person Name	Measurable Goal(s)	Progress on Goal(s) – Permit Year 10 (Reliance on non-municipal partners indicated, if any)	Planned Activities – Permit Year 10
6-A	Employee Training to Prevent/Reduce Stormwater Pollution	Highway Fire Department	Municipal training for Public Works and Fire Department employees.	Fire Department and Public Works Department continues ongoing spill prevention and cleanup training. Containment booms have been placed in the DPW garage. These booms will be available to be placed around catch basins in the event of a fluid spill.	Continue Fire and Public Works Dept. training to prevent any stormwater pollution.

6-B	Maintenance/Inspection of Storm Sewers and Structural/Non-Structural Controls	Highway	Assess existing controls, maintenance activities, schedules, and long-term inspection procedures	- The Town of Lincoln annually cleans approx. 510 catch basins. Continued assessment of existing maintenance/inspection of storm drainage system. - The Public Works Department continued to clean the Town's road shoulder areas to remove built-up material and improve natural drainage runoff. During 20012 and 2013 shoulders on Conant Road, Woods End Road, Brooks Road, Tower road, and Weston Road will be cleaned. - The Public Works Department continued to clean and maintain the newly constructed sedimentation basins, which were very successful in trapping sediment and keeping it out of the Cambridge water supply system. These newly constructed sediment basins work extremely well in reducing sediment flow into wetland areas. - The Public Works Department has replaced or cleaned-out several drain lines, including lines on: - Old Sudbury Road - Morningside Lane - Lincoln Road - Further research was performed in regards to the best practices regarding the Town's snow and ice control. Presentations and other supporting research & data were presented in previous NPDES submittals. - In 2013, the Department will likely begin work on replacing an old leaching drainage system that was first built in 1955. The new system will incorporate leaching basins to replace the old and failed existing leaching basins. Please refer to attached	Continue to develop new and improved activities, schedules, and procedures.
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6-C	Pollutant Source Reduction/Elimination from Municipal Facilities and Activities	Highway	Assess existing facilities, activities, and BMPs and continue additional or improved BMPs	The Public Works Dept. continues review of a 1971 Town regulation that restricts the snow & ice removal to 10% salt, 90% sand.	- Review of 1971 Town regulation that restricts the snow & ice removal procedures to 10% salt and 90% sand - Public Works Roadside Maintenance Program - Commence Public Works materials handling procedures - Continue roadside sweeping activities - Continue sweeping and maintenance of Public Works Barn - In 2012, the Public Works Department began purchasing newer snow and ice control equipment. The newer equipment will serve to better regulate and control the amount of material used in snow and ice control. Please refer to the attached.
6-D	Waste Disposal Procedures from Storm Sewers and Municipal Facilities/Activities	Highway	Assess existing waste disposal procedures, review MA guidelines, brainstorm improved and new procedures	Proper disposal methods as approved by DEP on the material are undertaken each year.	A comprehensive materials handling program will be developed for the Public Works site.

Part IV. Summary of Information Collected and Analyzed

Incorporation of watershed, stream, wetland and other water related layers in GIS database	yes	Now accessible to public via web-based GIS viewer
GPS identification of storm drains, outfalls and other water-related information	(85%)	
Water quality data	yes	Lincoln & Cambridge Water Dept.s

Part V. Program Outputs & Accomplishments (OPTIONAL)

Programmatic

Stormwater management position created/staffed	no	
Annual program budget/expenditures	(\$0)	

Education, Involvement, and Training

Estimated number of residents reached by education program(s)	(60%)	
Stormwater management committee established	(no)	
Stream teams established or supported	non active	
Household Hazardous Waste Collection Days		
▪ days sponsored	(8)	
▪ community participation	(60%+/-)	
▪ material collected		
School curricula implemented	Needs updating	
On-going open space and watershed planning, education and outreach	(yes)	
Habitat, wetland, stream and biological inventory and monitoring	(yes)	

Legal/Regulatory

		In Place Prior to Phase II	Under Review	Drafted	Adopted
Regulatory Mechanism Status (indicate with "X")					
▪	Illicit Discharge Detection & Elimination				
▪	Erosion & Sediment Control	X			Wetlands
▪	Post-Development Stormwater Management	X			Wetlands/ Site-Plan
Accompanying Regulation Status (indicate with "X")					

Mapping and Illicit Discharges

Outfall mapping complete	(85%)	
Estimated or actual number of outfalls	(200)	
System-wide mapping complete	(85%)	
Mapping method(s)		
▪ Paper/Mylar	(80%)	
▪ CADD	(0%)	
▪ GIS	(85%)	
Outfalls inspected/screened	(0)	
Illicit discharges identified	(0)	
Illicit connections removed	(0)	
% of population on sewer	(0)	
% of population on septic systems	(100%)	

Construction

Number of construction starts (>1-acre)	(0)	redevelopment
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Estimated percentage of construction starts adequately regulated for erosion and sediment control	(75%)	all w/wetlands
Site inspections completed	(90%)	
Tickets/Stop work orders issued	(0)	
Fines collected	(0)	
Complaints/concerns received from public	(0)	

Post-Development Stormwater Management

Estimated percentage of development/redevelopment projects adequately regulated for post-construction stormwater control	(100%)	
Site inspections completed	100%	
Estimated volume of stormwater recharged		

Operations and Maintenance

Average frequency of catch basin cleaning (non-commercial/non-arterial streets)	(1 time/yr)	
Average frequency of catch basin cleaning (commercial/arterial or other critical streets)	(1 time/yr)	
Total number of structures cleaned	(510)	
Storm drain cleaned	(200 LF)	
Qty. of screenings/debris removed from storm sewer infrastructure	650 CY	
Disposal or use of sweepings (landfill, POTW, compost, recycle for sand, beneficial use, etc.)	Hwy yard	
Cost of screenings disposal	TBD	

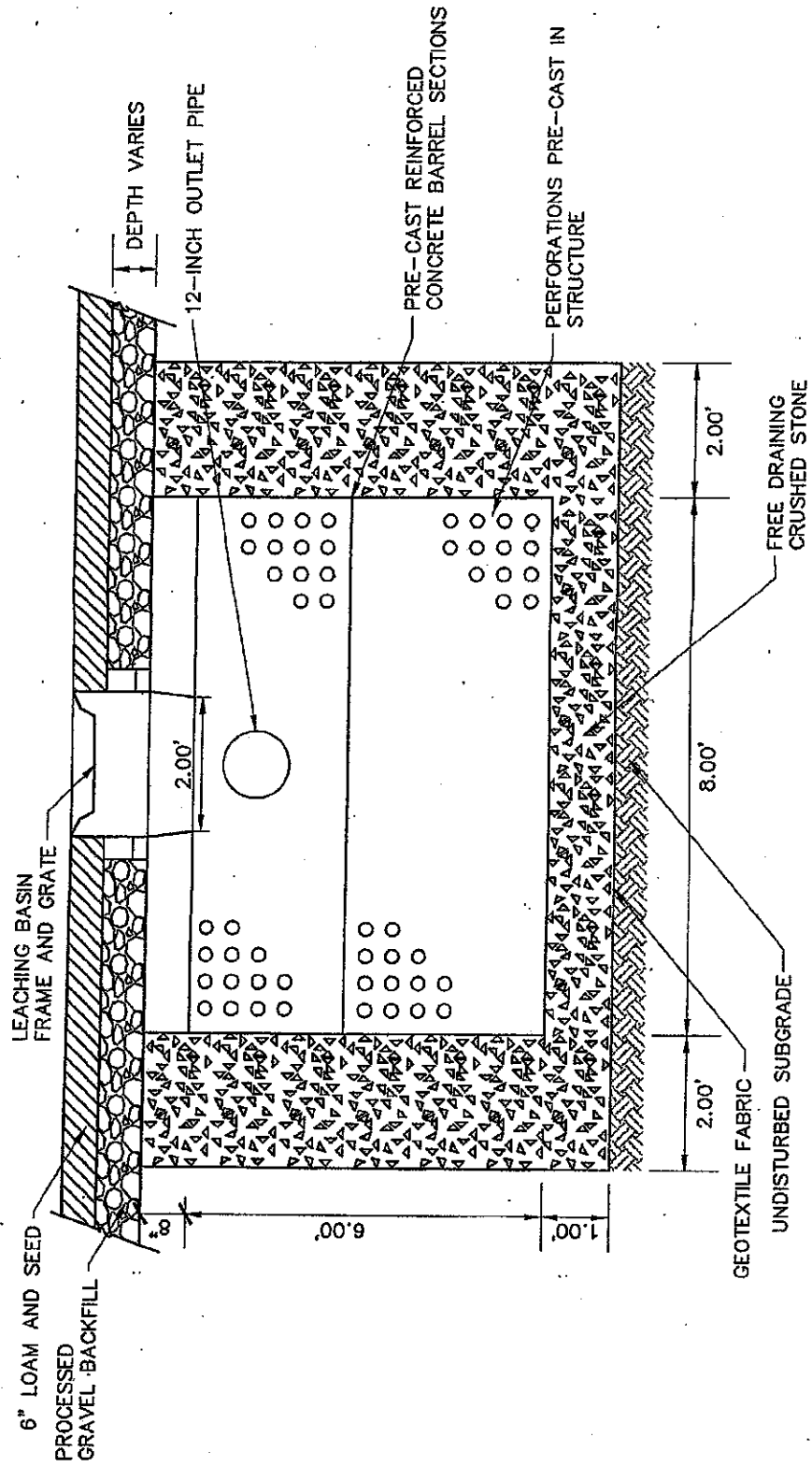
Average frequency of street sweeping (non-commercial/non-arterial streets)	(1 time/yr)	
Average frequency of street sweeping (commercial/arterial or other critical streets)	(1 time/yr)	
Qty. of sand/debris collected by sweeping	2,000 CY	
Disposal of sweepings (landfill, POTW, compost, beneficial use, etc.)	Hwy yard	
Cost of sweepings disposal	TBD	
Vacuum street sweepers purchased/leased	0	
Vacuum street sweepers specified in contracts	No	

Reduction in application on public land of: ("N/A" = never used; "100%" = elimination)	
▪ Fertilizers	Ag & sports field only
▪ Herbicides	Not used
▪ Pesticides	Ag Only
Elimination of chemical pesticides and fertilizers on lawn in buffer zone resource areas	All OOC's
Require organic or IPM practices on licensed conservation lands	done
Anti-/De-Icing products and ratios	25% NaCl 75% Sand
Pre-wetting techniques utilized	no
Manual control spreaders used	yes
Automatic or Zero-velocity spreaders used	no
Estimated net reduction in typical year salt application	(lbs. or %)
Salt pile(s) covered in storage shed(s)	yes
Storage shed(s) in design or under construction	n/a

Attached are

- *plans for Brown's Wood where leaching catch basins will be installed*
- *specification for the basins*
- *information about the value of moving to brine pre-treatment for de-icing*
- *photos of DPW's retrofitted sanding truck*





LEACHING BASIN
NOT TO SCALE

2.06 LEACHING BASIN STRUCTURES

A. Precast Concrete Leaching Basins Structure shall be constructed of the materials as shown on the Drawings and shall be similar to those manufactured by Concrete Systems, Inc., Hudson, NH, Rotondo and Sons, Inc., Chase Precast Corporation, or approved equal. Shop drawings and design details shall be submitted to the Engineer for approval.

1. Precast reinforced concrete leaching basin structure, top slab and grade rings shall conform to the specification of ASTM Designation C478. Leaching basin structure shall be set so that the frame and grate will be at the final finished grade. Brick masonry used for adjustment shall be smooth on the inside and parged on the exterior.

2. Backfill and bedding material for installation of the leaching basin structures shall be free draining crushed stone wrapped in filter fabric as shown on the drawings. Free draining crush stone shall be installed as shown on the Drawings.

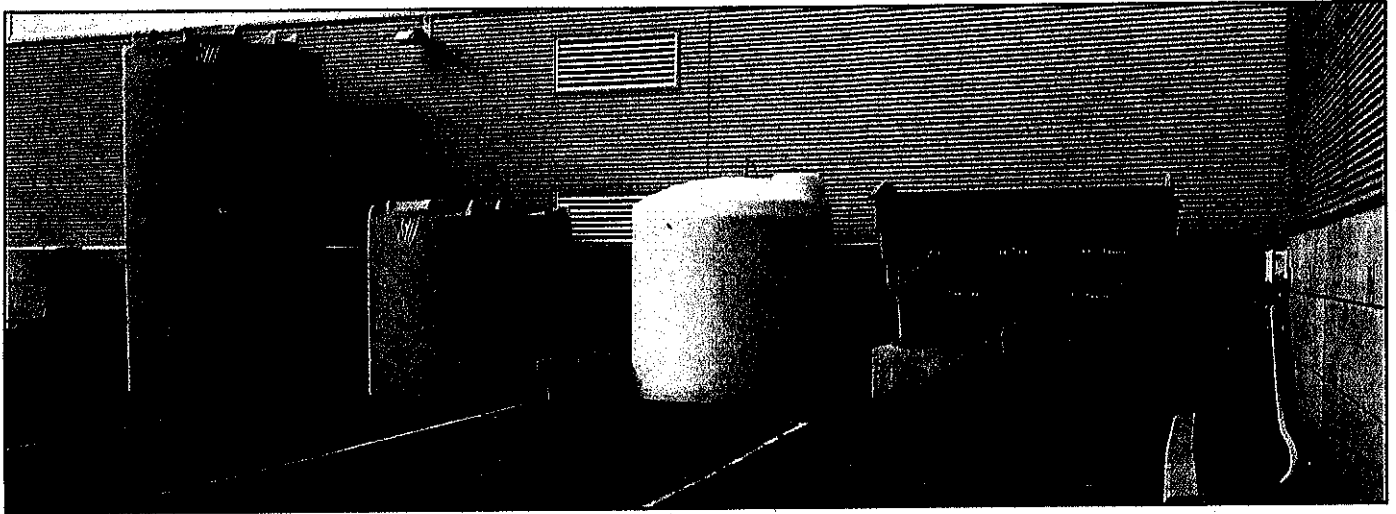
Filter fabric shall be Type II conforming to the requirements specified in Subsection M9.50.0, Geotextile Fabrics of the Massachusetts Highway Department's Standard Specification for Highways and Bridges referred to hereinafter as "Standard Specifications".

3. Leaching basin structure frame and grates shall be of tough, gray cast iron conforming to ASTM Specification A48-74, Class 30, and shall be true to pattern and free from flaws. The bearing surface of frame and grates against each other shall be machined to give continuous contact throughout their entire perimeter. Standard frame and grate shall have a clear opening of at least 22 inches and a depth of not less than 8 inches. The bearing surface similar to Lebaron Catalog No. LK 121 in both cross-section and exterior pattern. Total weight of frame and grate shall be not less than 475 pounds.

B. Free Draining Crushed Stone Base:

1. Shall consist of inert angular material derived from a stone quarry that is hard, durable, washed stone, free of deleterious materials. Gradation shall conform to the following:

Sieve Designation	% Passing by Weight	
	Minimum	Maximum
1 in.	100	--
3/4 in.	90	100
1/2 in.	30	60
3/8 in.	25	45
No. 4	5	30
No. 10	0	10



New Road Anti-Icing: Better for the Environment

On November 14, 2012, MassDOT Secretary & CEO Richard A. Davey and Highway Administrator Frank DePaola unveiled the Department's new salt brine production plant at Sagamore Beach.

For the first time, MassDOT will blend its own anti-icing liquid for use on roadways in Highway District 5 during the snow and ice season, saving money and improving environmental conditions.

"MassDOT works diligently to find cost-effective and environmentally friendly ways to our improve operations," said Secretary Davey. "This plant allows us to trim costs and treat our roads in a smarter, innovative way."

MassDOT will make, store, and apply its own anti-icer for approximately \$.07/gallon. Currently, MassDOT purchases large amounts of magnesium chloride at \$.89/gallon. The mix produced at the plant will be 85% salt brine and 15% magnesium chloride. MassDOT purchased brine last winter for treatment on certain bridges and frost prone areas in Highway District 1 at a cost of \$.55/gallon.

"With salt brine we are able to pre-treat our roads up to 48-hours in advance of a storm. We can be more proactive and reduce overtime costs by closely monitoring the forecast," said Administrator DePaola. "Magnesium chloride has a much shorter window; it

must be applied 2-3 hours prior to the snow and ice event."

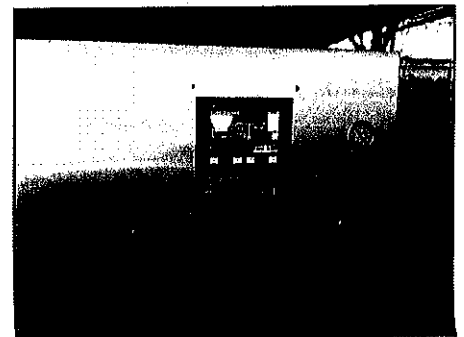
The location was chosen because salt brine works best in the average winter temperatures found in this region. Construction of the plant, including equipment and infrastructure, cost approximately \$250,000. Based on weather conditions, MassDOT anticipates the plant paying for itself in 2-3 years.

Environmental Benefits of Salt Brine

Reducing Salt Use

The use of salt brine provides cost savings. Salt brine reduces the impact on soils, vegetation, rivers, streams, wetlands, and water supplies. It also helps reduce vehicle corrosion and deterioration to concrete and steel structures.

The Town of Lexington, through the use of brine, has been able to minimize rock salt applications in certain instances. Marc Valenti, Superintendent for the Town of Lexington said, "The brine is great for providing a 'bond breaker' between the snow and roadway, reducing hard pack. It is also highly effective for events with low accumulation minimizing rock salt applications." According to Valenti brining technology has been a great asset to the town. "Under the proper weather conditions, we have successfully



(Top photo and above) The Town of Lexington's salt brine machine.

Photos by Marc Valenti

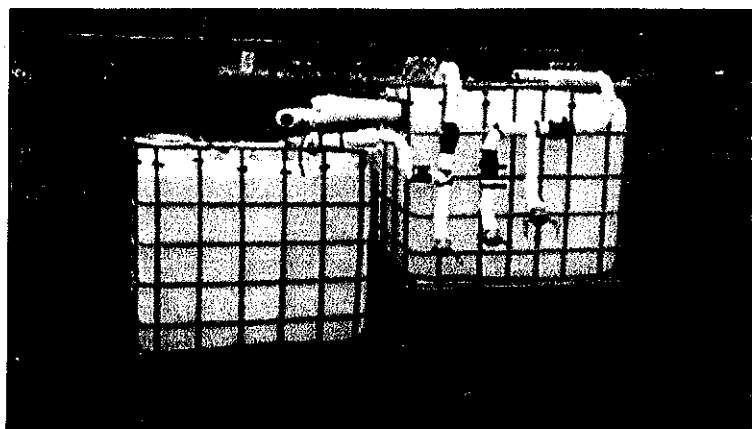
pretreated 48 hours ahead of the storm event and received good results," said Valenti.

Chris Doherty, Highway Foreman for the City of Woburn wanted to see first hand the results of brine use so he built a salt brine machine for his department. Doherty said it was much less expensive to build a salt brine machine for the town to try, rather than invest in a commercial machine. "We still haven't used any brine yet, because the weather conditions haven't been exactly right. I have 2,500 gallons of brine stored", said Doherty. Doherty added, "We decided to try brine not only for the cost savings associated with the reduction of rock salt and sand applications, but also for environmental reasons."



Reducing Sand Use

Traction benefits of sand are limited and temporary. Sand



The City of Woburn's new salt brine Machine.

Photo by Chris Doherty.

accumulates on roadside edges, catch basins, and drainage pipes which can lead to flow restrictions and blockages in the storm-water drainage systems. The collection and disposal of sand adds considerable cost to the operation. Sand contributes to the sedimentation in streams, impacting fish species and aquatic ecosystems. Suspended in water, sand increases

turbidity and can result in the death of fish and invertebrates, and reduces photosynthesis in aquatic plants.

Siltation and sediment deposits have been cited as one of the leading causes of water quality impairments in various regions around the country. 

Mass.gov Commonwealth Conversations: Transportation, <http://transportation.blog.state.ma.us/blog/>

Typical Road Treatment Materials used during Snow and Ice operations:			
Common Chemicals	Use	Advantages	Disadvantages
Rock Salt (Sodium Chloride)	Chemical used to either break the bond of ice to the pavement or used to prevent it from forming by lowering the freezing point of water.	Inexpensive. Very effective. Readily available.	Impact on the Environment. Corrosivity. Doesn't work at low temperatures.
Sand	Used only in Reduced Salt Zones and at very low temperatures when Rock Salt will not work effectively.	Inexpensive. Works at low temperatures. Available.	Impact on the Environment. Does not melt snow and ice. Clogs drainage structures. Expenses to sweep and dispose of.
Pre-Mix (Sodium Chloride/Calcium Chloride blend)	The material is used in "reduced-salt areas" and elsewhere when air temperature is very low.	Less harmful to the environment. Works at a lower temperature.	Expensive. Must be stored and kept dry.
Liquid Calcium Chloride	The material works by attracting moisture and releasing heat. When mixed with salt it melts up to eight times as much ice as using salt alone at 20 degrees.	Very effective for pre-treatment or direct liquid application. Works at low temperatures.	Expensive. Applications must be timed correctly.
Liquid Magnesium Chloride	Used as pre-treatment to prevent snow and ice from sticking to pavement.	Less harmful to the environment. Works at low temperatures. Less harmful to equipment.	Expensive. Application must be timed correctly.

Learning

Continued from page 1

Imagine this scenario. You are coming into work the day after having attended a Baystate Roads workshop. Two of your co-workers come up to you. One says, "Hey, how was that class yesterday? Did you get a nice nap in?" The other one chimes in, "Yeah. Enjoy your day off?" Instead of bantering back and forth with them, consider this your first opportunity to use what you learned the day before. Tell your buddies what the workshop was about and share any information that would be helpful to them. Explain a new procedure that was introduced. If you were given any printed materials, photocopy them and pass them around.

When you make these simple efforts, a number of important things happen:

1. You have "transferred the training." In the workplace education field, transfer of training means taking what you learned in a class and applying it back on the job. Information you received in a workshop is valuable, but only if you use it. That is, after all, why the Baystate Roads sessions are held in the first place: to help you perform better when you get back to work.
2. You have practiced "knowledge management," which is merely a fancy term for sharing what you know. Knowledge is a commodity, and managing that commodity means capturing what's in people's heads and making it accessible to others.
3. You have assumed the role of teacher. Those of you who are supervisors or managers realize that giving instructions and helping people learn is one of your most important responsibilities.
4. Finally, all these efforts — transferring training, managing knowledge, teaching others — create



*Please see **LEARNING** on page 8*

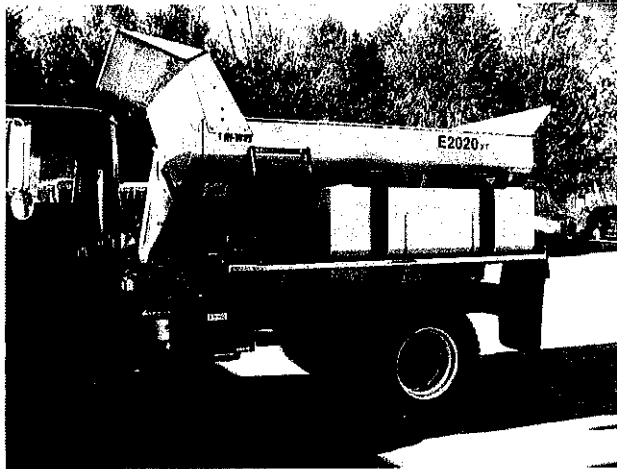
Town of Lincoln

Department of Public Works

1985 International



Before



After



Truck Costs

Initial Cost:	\$3,000
Sander:	\$27,500
Sand Blast & Paint:	\$5,300
Tires & Wheels:	\$4,000
Misc.	\$10,700
Total:	\$50,500