

**STORMWATER POLLUTION PREVENTION PLAN
289 PINWOOD ROAD
ALLENSTOWN, NH**

Prepared for:
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Auburn NH, 03032

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September 2017

**Niyati Realty, LLC
289 Pinewood Road
Allenstown, New Hampshire**

PROJECT NARRATIVE

EXISTING CONDITIONS

Niyati Realty, LLC proposes the development of the existing property located at 289 Pinewood Road (Route 28) in Allenstown, NH. The property is identified on tax map 409 as lot 32. The property has 243' of frontage along the east side of Pinewood Road. The primary access is through an existing driveway easement over the Gelinas property, tax map 409 lot 32.1. The subject property consists of 8.28 acres of land with the majority of the property being wooded and sloping from east to west.

The predominant soil type on the property is classified as Canton, consisting of very deep, well drained soils formed in a loamy mantle underlain by sandy till. Existing soil conditions were identified by Gove Environmental Services, Inc. using *Site-Specific Soil Mapping Standards for New Hampshire and Vermont*. SSSNNE Special Publication No. 3, Version 4.0, February 2011.

This parcel has previously housed cabin like buildings along the frontage of Pinewood Road (in the area of proposed development) but have been removed. The remainder of the property is wooded with primarily hard wood trees and slopes from 2 to 20%. To the north the property abuts an existing gravel pit and residential dwelling owned by William Gelinas. To the south and east the subject property abuts Catamount Hill Cooperative mobile home park.

The Catamount Hill Cooperative property will be used as the primary access for the proposed development. The Catamount property has existing driveway access on Pinewood Road (Route 28) as this state highway is a limited access road. The frontage of the property is relatively flat but immediately slopes up at a 10 to 12%. Between Presidential Drive and southerly property line of the subject lot are two existing leaching fields that services 10 mobile homes.

PROPOSED DEVELOPMENT

The proposed development on lot 32 will encompass just over 2 acres of the 8.28 acre lot. This project proposes to construct a 3,600 SF convenience store with drive through services, three gasoline and one diesel pump islands, 25 paved parking spaces and stormwater management features. The site will be constructed in an approximate cut of 10 feet and is boarded by three retaining walls. Grading at the rear of the site will only extend approximately 450 feet from Route 28.

Proposed Access is provided with a shared driveway through the southerly Catamount Hill Cooperative (lot 33) and existing driveway entrance. The proposed driveway modification will require grading and other disturbances on lot 33. All proposed grading on this lot are within areas previously disturbed.

The proposed improvements on the Catamount lot will include an updated driveway entrance configuration, realignment of presidential Drive and an expanded school bus turnaround. This portion of development will encompass 1.5 acres, with a total of 155,000 sf of disturbance.

Stormwater management for the proposed development will be managed through three types of best management practices. An infiltration Basin at the rear of the property will capture and infiltrate uncontaminated runoff to satisfy ground water recharge requirements as there is no opportunity post development to infiltrate runoff within the developed site. This is due to the large cut required to access the site and location of the development close to Route 28.

Proposed impervious areas will be captured and filtered through 4 Filterra Tree Box filters before entering lined underground Cultec Recharger 150XLHD heavy duty retention chamber systems.

WETLAND IMPACTS

There are no wetland impacts proposed for this project.

FLOOD PLAIN IMPACTS

No portion of the project area is within a special flood hazard area designated by the Federal Emergency Management Agency on community panel number 33013C0569E, effective date: April 19, 2010.

HYDROLOGY

This site is located along the easterly banks of the Suncook River drainage basin. Stormwater from this site flows to Suncook River through an existing 18" RCP traversing under Route 28 and discharges to a woodland channel before entering the Suncook River.

The 18" RCP was constructed in the 50's during the reconstruction of Route 28 and impounds a catchment approximately 22 acres in size. This includes the majority of the subject and dwelling lot to the north and a portion of the Catamount Hill Cooperative development.

STORMWATER MANAGEMENT

METHODOLOGY

The SCS TR-20 Method was used to determine peak flow rates as well as the open and closed conduit drainage system. The analysis is based on runoff flows generated from the 2, 10, 25 and 50-year storm events. HydroCAD™ Version 10.0 software was used to perform drainage calculations. Drainage pipe sizes and peak flow rates are detailed and summarized in the analysis section of the report. A comparison of pre and post development peak runoff flow rates is summarized below.

EXISTING DRAINAGE

Pre-development stormwater runoff is defined in seven subcatchment areas which all flow into the 18" RCP and eventually to the Suncook River, as explained above.

- Subcatchment 1E is the largest area with the majority being wooded and undeveloped. This flows east to west into the existing ditch along Route 28 and into catch basin 1264 and through a 12" RCP outleting in a shallow swale on the south side of Presidential Drive approximately 150' north of the 18" RCP.
- Subcatchment 2E, 3E, 4E, 5E, 6E and 7E include flows from the developed area of Catamount Hill Cooperative mobile home park. These areas flow over grassed and paved surfaces into closed and open drainage channels. Eventually collecting in an existing wooded drainage swale before entering the 18" RCP under Route 28.

PROPOSED DRAINAGE

Under the post-development conditions twenty subcatchment areas are identified. In all storm events the proposed stormwater design peak runoff rates are less than the pre development runoff rates. The post 2 year stormwater volume has increased by 4,423 cf or 0.101 acre feet.

- Subcatchment 1P is a smaller version of 1E and flows a similar path into the road side ditch and into catch basin 1264 and 12" CMP before reaching the 18" RCP.
- Subcatchment 2P includes the remainder of undeveloped area on the subject lot and introduces an infiltration basin to satisfy groundwater requirements and to reduce the amount of runoff introduced to the developed site.
- Subcatchment 3P, 13P, 14P, 15P and 16P are the same as existing that include flows from the developed area of Catamount Hill Cooperative mobile home park. These areas flow over grassed and paved surfaces into closed and open drainage channels. Eventually collecting in an existing wooded drainage swale before entering the 18" RCP under Route 28.
- Subcatchment 4P is the area of the proposed 3600 SF building that discharges through a roof drain into a 4'x8' Filterra unit "A".
- Subcatchment 5P includes the northwest portion of the developed site and is collected and filtered through a 6'x8' Filterra unit "B".
- Subcatchment 6P includes the northeast portion of the developed site and is collected and filtered through a 4'x8' Filterra unit "A".

Filtterra units A and B collect into an 85'x 18' Cultec-150XLHD (CT-1) subsurface detention system. These systems are lined by an impermeable liner as they will be within the S.W.H.T. and not able to infiltrate stormwater.

- Subcatchment 7P is the graded area around the east and southeast portion of the site. This subcatchment is collected in an interceptor under-drain to divert surface and groundwater away from the developed site.
- Subcatchment 8P includes the southeast portion of the developed site and is collected and filtered through a 4'x8' Filtterra unit "C".
- Subcatchment 9P includes the southwest portion of the paved parking area and is collected and filtered through a 4'x8' Filtterra unit "D".

Filtterra unit C and D is then connected to a 64'x 28' Cultec-150XLHD (CT-2) subsurface detention system that works in conjunctions with CT-1 to detain the developed sites stormwater to reduce off site peaks.

- Subcatchment 10.1P area covers half the access drive from Route 28 to the proposed site and includes a grass lined swale with discharge to deep sump catch basin "A".
- Subcatchment 10.2P area covers the other half the access drive from Route 28 to the proposed site and is discharge into deep sump catch basin "B".
- Subcatchment 11P includes the remained of the original subcatchment 1E and is collected into deep sump catch basin "C".

Catch basin A, B and C combine flows with the Cultec detention system flow and are discharged through an 18" HDPE culvert onto a rip rap apron. This apron is designed to handle flows from the 18" HDPE. The rip rap apron opens to the grassed channel leading to the 18" RCP culvert under Route 28.

- Subcatchment 12c though 12e are similar to existing 4E and includes the realignment of Presidential Drive and the improved school bus turnaround. These flows are collected into three deep sump catch basins before discharging into an 85'x28' Cultec-150XLHD (CT-3) subsurface detention system. This is then connected to DMH "C" and discharged through the 18" HDPE.
- Subcatchment 12f is the remaining area flowing into catch basin 1547. The existing drainage system in this area is severely under sizes and in poor condition. The proposed reconstruction will improve water quality and increase detention before being released.

COMPARISON OF PRE & POST DEVELOPMENT PEAK RUNOFF RATES

Storm (years)	Discharge Point - 1		Change
	Pre	Post	
2-(2.85")	3.7	3.7	-0.0 (cfs)
10-(4.25")	10.6	10.3	-0.3 (cfs)
25-(5.33")	14.7	13.9	-0.8 (cfs)
50-(6.33")	23.4	19.4	-4.0 (cfs)

This table demonstrates that the Post peak flow rates to the 18" RCP culvert are equal or less than Pre flow rates in all storm events, 2-year, 10, 25 and 50-year storms. It is concluded that this project will not create any adverse effects to the existing stormwater infrastructure.

INSPECTION and MAINTENANCE MANUAL

Proper operation and maintenance of the stormwater management features of the Niyati Realty, LLC facility will ensure that the stormwater system and individual best management practices (BMPs) will remain effective at removing pollutants as designed, and that water quality objectives will be maintained.

Upon completion of all terrain alteration activities that direct stormwater to a certain practice, the management of the Niyati Realty, LLC facility shall initiate inspection and maintenance of that practice. Sandeep Patel of Niyati Realty, LLC, shall be responsible to implement these activity.

If the ownership of the property is transferred, the new owner shall become the responsible party.

INSPECTION CHECKLISTS AND MAINTENANCE LOGS

Inspection checklists and maintenance log templates are included at the end of this section.

Checklists have been adapted from checklists developed by the Virginia Department of Conservation and Recreation. The checklists state the minimum frequency of inspections. BMPs shall also be inspected after large storm events, and corrective action shall be implemented as required.

Any special concerns observed during routine or special inspections shall be reported to the owner immediately.

Maintenance logs have been adapted from logs developed by the Special Services Department of New Castle County in Delaware.

Maintenance logs shall be completed by the assigned inspector with initials to indicate which items were inspected. Comments shall be provided as necessary to document the state of the BMPs. Comments shall be dated.

The completed log, along with appropriate checklists, shall be submitted to the owner and kept on file.

DEICING

A deicing log is part of this long-term maintenance plan because proper application of deicing materials for winter maintenance is critical to the protection of water quality.

The NHDES fact sheet (WD-WMB-4) about Road Salt and Water Quality is included in this section. This document can also be found at

<http://des.nh.gov/organization/commissioner/pip/factsheets/wmb/documents/wmb-4.pdf>

INVASIVE SPECIES

If invasive species begin to grow in the stormwater management practices, immediate action should be taken to control or eradicate the species.

For your reference, this section includes a copy of portions of a publication entitled *New Hampshire Guide to Upland Invasive Species*, including “WHAT YOU CAN DO”, and “CONTACT INFORMATION”.

The entire document can be downloaded at

http://www.nh.gov/agric/divisions/plant_industry/documents/invasive-species.pdf

Niyati Realty, LLC IN Allenstown, NH

STORMWATER FACILITY MANAGEMENT

INSPECTION AND MAINTENANCE LOG FOR BMP'S

2017

OWNER / RESPONSIBLE PARTY: Sandeep Patel

INSPECTOR:

STORMWATER PRACTICE IDENTIFICATION NAME / NUMBER: Cultec Chambers

month: **JAN** **FEB** **MAR** **APR** **MAY** **JUN** **JUL** **AUG** **SEP** **OCT** **NOV** **DEC**
 date:

OBSERVATION PORTS													
SEDIMENT													
OUTLETS													

WRITE COMMENTS
HERE & REPORT TO
RESPONSIBLE PARTY

Fill in the date of inspection below the month and write your initials for each item inspected. Use one maintenance log per practice facility each year.
 See inspection checklist for inspection frequency. Reference New Hampshire Stormwater Manual, Volume 2, chapter 5
 Contact SFC Engineering Partnership, Inc. at (603) 647-8700 will questions or concerns regarding inspection and maintenance

Niyati Realty, LLC IN Allenstown, NH

STORMWATER FACILITY MANAGEMENT

INSPECTION AND MAINTENANCE LOG FOR BMP'S

2017

OWNER / RESPONSIBLE PARTY: Sandeep Patel

INSPECTOR:

STORMWATER PRACTICE IDENTIFICATION NAME / NUMBER: Infiltration Basin

month: **JAN** **FEB** **MAR** **APR** **MAY** **JUN** **JUL** **AUG** **SEP** **OCT** **NOV** **DEC**
 date:

EROSION													
GRASS CUTTING													
SEDIMENT REMOVAL													
SOIL AMENDMENTS													

WRITE COMMENTS HERE & REPORT TO RESPONSIBLE PARTY

Fill in the date of inspection below the month and write your initials for each item inspected. Use one maintenance log per practice facility each year.
 See inspection checklist for inspection frequency. Reference New Hampshire Stormwater Manual, Volume 2, chapter 5
 Contact SFC Engineering Partnership, Inc. at (603) 647-8700 will questions or concerns regarding inspection and maintenance

Niyati Realty, LLC IN **Allenstown, NH**
STORMWATER FACILITY MANAGEMENT
INSPECTION AND MAINTENANCE LOG FOR BMP'S

2017

OWNER / RESPONSIBLE PARTY: Sandeep Patel

INSPECTOR:

STORMWATER PRACTICE IDENTIFICATION NAME / NUMBER: Tree Box (Filterra)

month: **JAN** **FEB** **MAR** **APR** **MAY** **JUN** **JUL** **AUG** **SEP** **OCT** **NOV** **DEC**
 date:

TRASH													
SEDIMENT													
MULCH													
TREE DAMAGE													

**WRITE COMMENTS
 HERE & REPORT TO
 RESPONSIBLE PARTY**

Fill in the date of inspection below the month and write your initials for each item inspected. Use one maintenance log per practice facility each year.

See inspection checklist for inspection frequency. Reference New Hampshire Stormwater Manual, Volume 2, chapter 5

Contact SFC Engineering Partnership, Inc. at (603) 647-8700 will questions or concerns regarding inspection and maintenance

Operation and Maintenance Inspection Checklist EXTENDED DETENTION PONDS

Date _____
Project _____ **Site Plan/Permit Number** _____
Location _____ **Date BMP Placed in Service** _____
Date of Last Inspection _____ **Inspector** _____
As-Built Plans available: Y / N

Type of stormwater wetland (check all that apply)

- Extended detention
- Ties into groundwater
- Pond with some wetland plantings
- Multiple pond system

- Type of wetland
- Emergent
 - Forested

Choose one of the following three:

- Permanent pool sized for full Tv
- Shallow wetland sized for full Tv
- Micropool

Type of pretreatment facility

- Sediment forebay
- Grass filter strip
- Other: _____

Element of BMP	Potential Problem	Does Problem Exist? Yes/No	How to Fix Problem	Who Will Address Problem	Comments
Contributing Drainage Area	Excessive trash/debris				
	Bare/exposed soil				
	Evidence of erosion				
	Excessive landscape waste/yard clippings				
Pretreatment <i>(Every 5 years)</i>	Maintenance access to pretreatment facility				
	Excessive trash/debris accumulation				
	Excessive sediment accumulation				
	Evidence of clogging				
	Dead vegetation/exposed soil				
Inflow <i>(monthly)</i>	Evidence of erosion				
	Inlets provide stable conveyance into facility				
	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion at/around inlet				
	Conveyance capacity is plugged		Sources of sediment and debris shall be identified and corrected	Owner or Professional	
	Undercut, eroded, and bare soil areas are seen		Repair as needed by reintroducing vegetation	Owner or Professional	
	More than 1 inch of settlement		Add fill material and compact soils	Owner or Professional	
Alignment is faulty		Correct immediately	Owner or Professional		

	Cracks or openings exist indicated by evidence of erosion at leaks		Repair or replace pipe as needed	Owner or Professional	
Hardened Pad (Every two years)	All or part of pad are worn		Replace	Professional	
Forebay (Every 2-5 years)	Sediments are not properly filtering down		Remove debris and trash. Sediment buildup exceeding 50% of the facility capacity shall be removed every 2-5 years, or sooner if performance is being affected	Professional	
Overflow/Emergency Spillway (Every two years)	Excess stormwater does not drain through the spillway		Remove debris and blockages		
	Undercut, eroded, and bare soil areas are seen. Evidence of spalling, joint failure, leakage, corrosion, etc.		Repair as needed by reintroducing vegetation	Owner or professional	
	50% of the conveyance capacity is plugged		Overflow structure shall be cleared when. Sources of sediment and debris shall be identified and corrected.	Owner or professional	
	Only one layer of rock exists above native soil.		Rocks or other armoring shall be replaced	Owner or professional	
Berm/Embankment (monthly)	There is sparse vegetative cover, erosion channels deeper than 2 inches, slumping, or cracks exist		Stabilize and repair immediately	Owner or professional	
	Cracking, bulging or sloughing				
	Soft spots or sinkholes				
	Evidence of erosion				
	Evidence of animal burrows				
	Presence of woody vegetation				
Vegetation	Plant composition consistent with approved plans				
	Presence of invasive species/weeds				
	Dead vegetation/ exposed soil				
	Reinforcement planting recommended				
Permanent Pool (monthly)	There is trash in the pool		Remove immediately while supervised	Owner or professional	
	1 foot of sediment accumulates in the pond		Wet pond shall be dredged	Professional	
	Releases of pollutants have occurred		Measures shall be exercised when handling substances that can contaminate stormwater. Correct as soon as identified.	Professional	
Aquatic Bench (monthly)	Plants growth is sparse		Pond buffer reinforcement plantings and planting of aquatic benches One time - after first year	Professional	
	Area is disheveled		Remove trash, debris, and floatables	Professional	
Low Flow Orifice (yearly)	There is evidence of clogging		Manually remove by hand, or if needed, use an industrial vacuum/hose	Owner or professional	
	Trash/debris accumulation				
	Adjustable control valve accessible and operational				
Riser (yearly)	Maintenance access to riser				
	Structural condition of riser				
	Condition of joints				

	Trash/debris accumulation				
	Pieces of the riser are broken or missing		Replace immediately	Owner or professional	
Outfall <i>(monthly)</i>	Treated water is not leaving the practice		Remove debris and blockages	Owner or Professional	
	Outlets provide stable conveyance out of facility				
	Excessive trash/debris/sediment accumulation at outlet				
	Evidence of erosion at/around outlet				
Pond drain (underdrain) system	Broken				
	Clogged				
	Adjustable control valve accessible and operational				
Maintenance Access <i>(monthly)</i>	Access is blocked by woody vegetation, or anything else		Manually remove blockage immediately. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.	Professional	
	Valves, manholes, or locks cannot be opened and operated		Replace any broken fixtures	Professional	
Safety Bench and Other Safety Features <i>(monthly)</i>	Vegetation is overgrown		Mowing – twice a year	Professional	
	Area is disheveled		Remove trash, debris, and floatables	Professional	
	Warning sign is illegible		Broken or defaced signs shall be replaced or repaired.	Professional	
	Fences are inadequate		Collapsed fences shall be restored to an upright position. Jagged edges and damaged fences shall be repaired or replaced	Professional	
	Insects/rodents are present within or near the practice		Pest control measures shall be taken when insects/rodents are found to be present. If sprays are considered, then a mosquito larvicide, such as Bacillus thurendensis or Altoside formulations can be applied only if absolutely necessary and only by a licensed individual or contractor. Holes in the ground shall be filled.	Professional	
	Maintenance access to facility				
	Sediment accumulation, Bathymetric study recommended				
	Abnormally high or low water levels				
	Evidence of pollution/hotspot runoff				
	Complaints from local residents				
Mosquito proliferation					

	Encroachment on facility or easement by buildings or other structures				
	Adequate safety signage				
Vegetation <i>(monthly)</i>	Vegetation is producing foul odors		Remove	Owner or professional	
	Grass (where applicable) is overgrown		mow to 4"-9" high and remove grass clippings	Owner or professional	
	Newly planted vegetation is struggling to establish itself. Vegetation, large shrubs or trees that limit access or interfere with wet pond operation		Trees planted in the pond buffer need watering during the first growing season. Water every three days for first month, and then weekly during first year (Apr – Oct), depending on rainfall. If vegetation hinders performance, remove.	Owner or professional	
	Plants are not healthy and dense enough to provide filtering while protecting underlying soils from erosion and minimizing solar exposure of open water areas		Monitor the growth of wetland plants, trees and shrubs planted. Record species and approximate coverage, and note presence of any invasive plant species	Owner or professional	
	Plant composition consistent with approved plans				
	Presence of invasive species/weeds				
	Dead vegetation/ exposed soil				
	Reinforcement planting recommended				

This checklist is based on a template prepared by the Virginia Department of Conservation and Recreation

Operation and Maintenance Inspection Checklist FILTERING PRACTICES

Date _____
Project _____ **Site Plan/Permit Number** _____
Location _____ **Date BMP Placed in Service** _____
Date of Last Inspection _____ **Inspector** _____
As-Built Plans available: **Y / N** **Sand Filter Type:** _____

Warning: If the filtration facility has a watertight cover; be careful regarding the possibility of flammable gases within the facility. Care should be taken lighting a match or smoking while inspecting facilities that are not vented. If the filtration facility is in a completely enclosed vault, the **OSHA Confined Space Entry** procedures must be followed.

Facility location:

- aaa'Surface
- aaa'Underground

Hydraulic configuration

- aaa'On-line facility
- aaa'Off-line facility

Filtration Media

- aaa'No filtration media (e.g. dry well)
- aaa'Sand
- aaa'Bioretention soil
- aaa'Peat
- aaa'Other: _____

Type of pretreatment facility

- aaa'Sediment forebay (above ground)
- aaa'Sedimentation chamber
- aaa'Grass channel
- aaa'Grass filter strip
- aaa'Plunge pool
- aaa'Stone diaphragm
- aaa'Other: _____

Element of BMP	Potential Problem	Does Problem Exist? Yes/No	How to Fix Problem	Who Will Address Problem	Comments
Contributing Drainage Area	Excessive trash/debris				
	Bare/exposed soil				
	Evidence of erosion				
	Excessive landscape waste/ yard clippings				
Pretreatment	Maintenance access to pretreatment facility				
	Excessive trash/debris/sediment				
	Evidence of standing water: Ponding, Noticeable odors, Water stains, Presence of algae or floating aquatic vegetation				
	Evidence of clogging				
	Dead vegetation/exposed soil				
	Evidence of erosion				
Inlets	Inlets provide stable conveyance into facility				
	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion				

	at/around inlet				
Overflow or Emergency Spillway <i>(Every two years)</i>	50% of the conveyance capacity is plugged.		Overflow spillway shall be cleared of sediment and debris	Owner or professional	
	erosion channels are forming		Source of erosion damage shall be identified and controlled	Owner or professional	
	sand is exposed and eroding from wind or rain		Rocks or other armament shall be replaced	Owner or professional	
Flow Bypass Structure <i>(twice a year)</i>	Flows through the strip short circuit the overflow control section		Check that the structure is not clogged. Manually clean out debris immediately. Repair rills and gulls.	Owner or professional	
Observation Well	Condition of element is poor.		Replace observation well if needed and make sure it is still capped.	Professional	
Sediment/ Debris Management <i>(yearly)</i>	The capacity volume of the infiltration basin is compromised by sedimentation. Gauges located at the opposite ends of the basin indicate too much debris		Sediment and debris exceeding 4" in depth shall be removed every 2-5 years or sooner if performance is affected. Restricted sources of sediment and debris, such as discarded lawn clippings, shall be identified and prevented.	Professional	
Underdrain <i>(every 5-7 years)</i>	The drawdown rate should be measured at the observation well for three days following a storm event in excess of 0.5 inches in depth. If standing water is still observed in the well after three days, this is a clear sign that clogging is a problem.		Immediately contact a professional to clear debris.	Professional	
	Standing water is present 48 hours after a rain event		The underdrain may be clogged. It is imperative to clear out the debris using a high pressure hose (if needed) or manually.	Professional	
Vegetation <i>(monthly)</i>	Invasive vegetation contributes 25% or more of vegetation of all species		Nuisance or prohibited vegetation shall be removed when discovered	Owner or professional	
	Vegetative density is less than 90% cover in the boundary zone or grass filter		Reseed and fertilize (if necessary) exposed soil	Owner or professional	
	Fallen leaves and debris from deciduous plant foliage is present		rake and remove immediately	Owner or professional	
	Plant composition consistent with approved plans				
	Presence of invasive species/weeds				
	Dead vegetation/exposed soil				
Level Spreader <i>(twice a year)</i>	Level spreader is not performing properly. Flows are concentrating on the outflow side of the element		Search the spreader for chips, cracks, or any other fundamental compromise of the structure. Immediately repair.	Professional	
Basin Inlet <i>(twice a year)</i>	Stormwater flow to the vegetated basin is restricted. Weedy growth on rock surfaces might indicate sediment deposition or clogging.		Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present. Inlet shall be cleared when conveyance capacity is	Owner or Professional	

			plugged. Rock splash pads shall be replenished to prevent erosion.		
	40% of the conveyance capacity is plugged. Sediment is more than 4 inches thick or so thick as to damage or kill vegetation		Inlet shall be cleared of sediment and debris. Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures	Owner or Professional	
Filter Media (yearly)	Stormwater does not percolate uniformly through the planter. If water remains 36-48 hours after storm, sources of possible clogging shall be identified and corrected.		Filter media may need to be raked, excavated and cleaned, or gravel/soil shall be replaced to correct the problem. Holes that are not consistent with the design and allow water to flow directly through the planter to the ground shall be plugged. Sediment accumulation shall be hand removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation. Litter and debris shall be removed routinely (e.g., no less than quarterly) and upon discovery.	Owner or professional	
Observation Well (every 2 years)	Condition of element is poor.		Replace observation well if needed and make sure it is still capped.	Professional	
Forebay (Every 2-5 years)	Stormwater runoff is not properly filtering down		Remove debris and trash. Sediment buildup exceeding 50% of the facility capacity shall be removed. Structural deficiencies in the sand filter box including rot, cracks, and failure shall be repaired upon discovery.	Professional	
Outlet	Outlets provide stable conveyance out of facility				
	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion at/around inlet				
Overall	Maintenance access to facility				
	Condition of structural components				
	Condition of hydraulic control components				
	Excessive trash/debris/sediment				
	Evidence of erosion				
	Evidence of oil/chemical accumulation				
	Evidence of standing water: Ponding, Noticeable odors, Water stains, Presence of algae or floating aquatic vegetation				
Complaints from local residents					

	Mosquito proliferation				
	Encroachment on facility or easement by buildings or other structures				

This checklist is based on a template prepared by the Virginia Department of Conservation and Recreation

Operation and Maintenance Inspection Checklist INFILTRATION PRACTICES

Date _____ NHDES/Permit Number _____
 Project _____ Date BMP Placed in Service _____
 Location _____
 Date of Last Inspection _____ Inspector _____
 As-Built Plans available: Y / N
 Infiltration Facility Type: Basin _____ Trench _____ Perm. Pavement _____

Facility location:

- aaa'Surface
- aaa'Underground

Hydraulic configuration

- aaa'On-line facility
- aaa'Off-line facility

Filtration Media

- aaa'No filtration media (e.g. dry well)
- aaa'Sand
- aaa'Bioretention soil
- aaa'Peat
- aaa'Other: _____

Type of pretreatment facility

- aaa'Sediment forebay (above ground)
- aaa'Sedimentation chamber
- aaa'Grass channel
- aaa'Grass filter strip
- aaa'Plunge pool
- aaa'Stone diaphragm
- aaa'Other: _____

Spill Prevention measures should be used when handling substances that contaminate stormwater. Releases of pollutants should be corrected as soon as identified.

Element of BMP	Potential Problem	Does Problem Exist? Yes/No	How to Fix Problem	Who Will Address Problem	Comments
Contributing Drainage Area	Excessive trash/debris				
	Bare/exposed soil				
	Evidence of erosion				
	Excessive landscape waste/ yard clippings				
Pretreatment	Maintenance access to pretreatment facility				
	Excessive trash/debris/sediment				
	Evidence of standing water: Ponding, Noticeable odors, Water stains, Presence of algae or floating aquatic vegetation				
	Evidence of clogging				
	Dead vegetation/exposed soil				
	Evidence of erosion				
Inlets	Inlets provide stable conveyance into facility				

	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion at/around inlet				
Downspout <i>(twice a year)</i>	Flow of stormwater is impeded to the practice		Debris and damaged pipe shall be repaired upon discovery.	Owner or professional	
Basin Inlet <i>(twice a year)</i>	Stormwater flow to the vegetated basin is restricted. Weedy growth on rock surfaces might indicate sediment deposition or clogging.		Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present. Inlet shall be cleared when conveyance capacity is plugged. Rock splash pads shall be replenished to prevent erosion.	Owner or professional	
Splash Blocks <i>(yearly)</i>	Stormwater entering practice is splashing against adjacent structures and conveyance is disrupting media.		Any deficiencies in structure such as cracking, rotting, and failure shall be repaired.	Professional	
Filter Media <i>(yearly)</i>	Stormwater does not percolate uniformly through the planter. Water remains 48 hours after storm		Filter media may need to be raked, excavated and cleaned, or gravel/soil shall be replaced to correct the problem. Holes that are not consistent with the design and allow water to flow directly through the planter to the ground shall be plugged. Sources of possible clogging shall be identified and corrected.	Owner or professional	
	Sediment/debris accumulation is more than 4 inches thick or so thick as to damage or kill vegetation		Remove by hand with minimum damage to vegetation using proper erosion control measures. Litter and debris shall be removed routinely and upon discovery.	Owner or professional	
Planter Reservoir <i>(yearly)</i>	Element is unable to receive/detain stormwater prior to infiltration. Water does not drain from reservoir within 3-4 hours of storm event.		Sources of clogging shall be identified and corrected. Topsoil may need to be amended with sand or replaced all together.	Owner or professional	
Planter <i>(twice a year)</i>	Structural deficiencies in the planter including rot, cracks, and failure are present. Planter is unable to contain the filter media/vegetation		Repair as necessary immediately	Owner or professional	
Embankment , Dikes, Berms & Side Slopes <i>(yearly)</i>	Water is not retained in the infiltration basin		Slopes shall immediately be stabilized using appropriate erosion control measures when soil is exposed/ flow channels are forming. Sources of erosion damage shall be identified and controlled.	Owner or professional	
Overflow or Emergency Spillway <i>(twice a year)</i>	Pipe does not successfully carry excess water to an approved receiving system		Overflow pipe shall be cleared of sediment and debris when 50% of the conveyance capacity is plugged. Damaged pipe shall be repaired or replaced upon discovery.	Owner or professional	

	The reservoir does not perform as per specifications		Overflow shall be cleared when 25% of the conveyance capacity is plugged. Sources of erosion damage shall be identified and controlled when soil is exposed. Rocks or other armament shall be replaced when only one layer of rock exists.	Owner or professional	
Vegetation (monthly)	Vegetation is not providing adequate filtering/is unable to protect underlying soils from erosion.		Mulch shall be replenished at least annually. Vegetation shall be replaced within a specific timeframe, e.g., 3 months, or immediately if required to maintain cover density and control erosion where soils are exposed.	Owner or professional	
	Nearby plants unrelated to the practice are interfering with BMP's effectiveness		Vegetation, large shrubs or trees that limit access or interfere with planter operation shall be pruned or removed. Fallen leaves and debris from deciduous plant foliage shall be raked and removed. . Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced. Dead vegetation shall be removed to maintain less than 10% of area coverage or when planter function is impaired.	Owner or professional	
	Grass within practice is overgrown		Grass shall be mowed to 4"-9" high and grass clippings shall be removed.	Owner or professional	
	Vegetative quality of the adjacent grass buffer is poor		Spot reseed if cover is less than 90%	Owner or professional	
	Plant composition consistent with approved plans				
	Presence of invasive species/weeds				
	Dead vegetation/exposed soil				
Observation Well (every 2 years)	Condition of element is poor.		Replace observation well if needed and make sure it is still capped.	Professional	
Sediment/ Debris Management (yearly)	The capacity volume of the infiltration basin is compromised by sedimentation. Gauges located at the opposite ends of the basin indicate too much debris		Sediment and debris exceeding 4" in depth shall be removed every 2-5 years or sooner if performance is affected. Restricted sources of sediment and debris shall be identified and prevented.	Professional	
Underdrain (every 5-7 years)	The drawdown rate should be measured at the observation well for three days following a storm event in excess of 0.5 inches in depth. If standing water is still observed after 48 hours, this is a clear sign that clogging is a problem.		Immediately clear debris from underdrain. It may need to be replaced.	Professional	

Overall (yearly)	Access to the stormwater planter is unsafe and inefficient. Egress and ingress routes are not maintained to design standards. Roadways are unable to accommodate size and weight of vehicles.		Obstacles preventing maintenance personnel and/or equipment access to the stormwater planter shall be removed. Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.	Owner or professional	
	Insects & Rodents are harbored in the stormwater planter.		Pest control measures shall be taken when insects/rodents are found to be present. If sprays are considered, then a mosquito larvicide, such as Bacillus thurendensis or Altoside formulations can be applied only if absolutely necessary and only by a licensed individual or contractor. Holes in the ground located in and around the stormwater planter shall be filled and compacted.	Professional	
Outlet	Outlets provide stable conveyance out of facility				
	Excessive trash/debris/sediment accumulation at inlet				
	Evidence of erosion at/around inlet				
Overall	Maintenance access to facility				
	Condition of structural components				
	Condition of hydraulic control components				
	Excessive trash/debris/sediment				
	Evidence of erosion				
	Evidence of oil/chemical accumulation				
	Evidence of standing water: Ponding, Noticeable odors, Water stains, Presence of algae or floating aquatic vegetation				
	Complaints from local residents				
	Mosquito proliferation				
Encroachment on facility or easement by buildings or other structures					

This checklist is based on a template prepared by the Virginia Department of Conservation and Recreation

Maintenance Visit Procedure



1. Inspection of Filterra® and surrounding area

- Record individual unit **before** maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes no
Damage to Box Structure	yes no
Damage to Grate	yes no
Is Bypass Clear	yes no

If yes answered to any of these observations, record with close-up photograph (numbered).

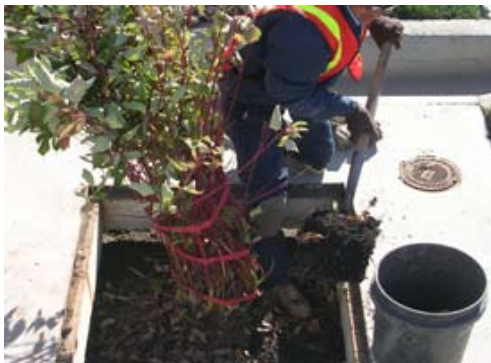


2. Removal of tree grate and erosion control stones

- Remove metal grates for access into Filterra® box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

Record on Maintenance Report the following:

Silt/Clay	yes no
Cups/ Bags	yes no
Leaves	yes no
# of Buckets Removed	



3. Removal of debris, trash and mulch

- After removal of mulch and debris, measure distance from the top of the Filterra® engineered media soil to the bottom of the top slab. If this distance is greater than 12", add Filterra® media (not top soil or other) to recharge to a 9" distance.

Record on Maintenance Report the following:

Distance to Bottom of Top Slab (inches)	
# of Buckets of Media Added	

Filterra® Stormwater Bioretention Filtration System

toll free: (866) 349 3458 | fax: (804) 798 8400 | maintenance@filterra.com | filterra.com



4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Ensure correct repositioning of erosion control stones by the Filterra[®] inlet to allow for entry of trash during a storm event.
- Replace Filterra[®] grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.



5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if dead.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	(feet)
Width at Widest Point	(feet)
Health	alive dead
Damage to Plant	yes no
Plant Replaced	yes no



6. Clean area around Filterra[®]

- Clean area around unit and remove all refuse to be disposed of appropriately.



7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Americast during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check For	Conditions That Should Exist	Actions
Inlet	Excessive sediment or trash accumulation	Accumulated sediments or trash impair free flow of water into Filterra	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks	Cracks wider than ½ inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.

Maintenance is ideally to be performed twice annually.
 Inspection to be performed after every major storm event >1 inch total depth, subject to climate.

Filterra® Stormwater Bioretention Filtration System

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Filterra® Project Maintenance Order

Project

Address

Directions

Project

Company

Owner

Contact Name

Telephone #

Owner Notified

of Mtce on (date)

Filterra Units on this Order

Total Units on this Project

Date of Maintenance

Arrival Time

Departure Time

of Workers

Notes on Project

Maintenance Supervisor

Filterra® Structure Maintenance Report

Project	<input type="text"/>	Structure Number	<input type="text"/>
Plant Type	<input type="text"/>	Structure Size	<input type="text"/>
Date	<input type="text"/>	GPS	<input type="text"/>
		Pre Mtce Photo #	<input type="text"/>

Initial Observations

Standing Water	<input type="text"/> Y	<input type="text"/> N	Damage to Grate	<input type="text"/> Y	<input type="text"/> N
IF Yes, STOP NOW & call 804-798-6068			Is Bypass Clear	<input type="text"/> Y	<input type="text"/> N
Damage to Box Structure	<input type="text"/> Y	<input type="text"/> N	Notes		
If YES to any observation take close up photo					

Waste

Silt / Clay	<input type="text"/> Y	<input type="text"/> N	Buckets Removed (# of)	<input type="text"/>
Cups/Bags	<input type="text"/> Y	<input type="text"/> N	Notes	
Leaves	<input type="text"/> Y	<input type="text"/> N		
Other	<input type="text"/>			

Media

Distance to Bottom of Top Slab (in.)	<input type="text"/>	Notes
Buckets of Media Added (# of)	<input type="text"/>	

Mulch

Netting Replaced	<input type="text"/> Y	<input type="text"/> N	Bags of Mulch Added (# of)	<input type="text"/>
Stones Replaced	<input type="text"/> Y	<input type="text"/> N	Notes	

Plant

	#1	(#2)		#1	(#2)
Height above Grate (feet)	<input type="text"/>	<input type="text"/>	Plant Replaced	<input type="text"/> Y / N	<input type="text"/> Y / N
Width at Widest Point (feet)	<input type="text"/>	<input type="text"/>	Notes		
Health	Alive/Dead				
Damage to Plant	<input type="text"/> Y / N	<input type="text"/> Y / N			
If YES to plant damage take close up photo					

Other Notes

(use back if necessary)

Niyati Realty, LLC

IN

Allenstown, NH

DEICING MATERIAL LOG

WINTER SEASON BEGINNING IN:

WRITE YEAR

TYPE OF DEICING MATERIAL:

IN THE SPACES BELOW, LIST THE POUNDS OF DEICING MATERIAL APPLIED ON EACH DAY.

SUM MONTHLY TOTAL OF MATERIAL APPLIED ON BOTTOM LINE

DATE	OCT	NOV	DEC	JAN	FEB	MAR	APRIL
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
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28							
29							
30							
31							
MONTHLY TOTAL							

WD-WMB-4

2011

Road Salt and Water Quality

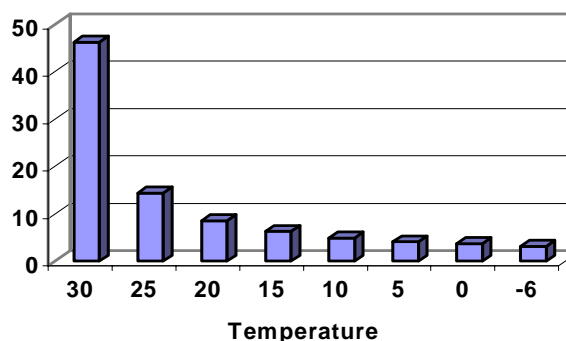
The amount of snowfall in New Hampshire and the necessity of overland travel require winter snow and ice management by the state, the municipalities, and the private sector. Deicing materials are often used in order to keep the public safe during these winter weather events. The most commonly used de-icing chemical is sodium chloride (NaCl) also known more commonly as road salt. Road salt is relatively inexpensive with an average cost of \$50 - \$60 per ton. Road Salt is readily available and easy to handle, store, and spread. Its purpose is to reduce the adherence of snow and ice to the pavement, preventing the formation of hard pack. Once hard pack forms, it is difficult to remove by plowing alone.

In the United States from 2005-2009 an average of 23 million tons of salt were applied to our roads, parking lots, sidewalks and driveways each year.¹ Studies have shown that, in urbanized areas, about 95 percent of the chloride inputs to a watershed are from road and parking lot deicing. In four impaired watersheds in the southern I-93 corridor of New Hampshire, road salt sources were 10-15 percent from state roads, 30-35 percent from municipal roads, and 45-50 percent from private roads and parking lots.

How Salt Works

The first step in melting ice is to lower its freezing point. This is done through the formation of brine where salt crystals pull water molecules out of ice formation. Once the brine is formed, melting is greatly accelerated. The rate at which melting occurs is dependent on the temperature. Sodium chloride loses its effectiveness (has difficulty going into solution) when temperatures fall below 15° F. Applications below this temperature, even at high rates, will not result in significant snow or ice melting; therefore, it is critical to know the current and expected temperature range of the winter weather event.

Pounds of Ice Melted per Pound of Salt



Graph obtained from The Salt Institute FY03 Snow & Ice Fact #20

What Happens to Salt in the Environment

The applied salt dissolves into 40 percent sodium ions (Na⁺) and 60 percent chloride ions (Cl⁻) in the melting snow and ice and make their way into our environment.

¹ U.S. Geological Survey, Mineral Commodity Summaries, January 2010

Chloride(Cl⁻): Chloride is highly soluble, very mobile, and its density allows for it to settle to the bottom of a waterbody. Chloride is toxic to aquatic life at levels above 230 mg/l, which is the state water quality standard. There is no natural process by which chlorides are broken down, metabolized or taken up by vegetation. In 2008, New Hampshire listed 19 water bodies impaired by chloride; in 2010 that number increased to 40. Trends show that chloride levels continue to rise with increasing use of road salt. Although chloride does not pose a human health concern, it can affect the taste of drinking water.

Sodium (Na⁺): The transport of sodium in the environment is not as prominent as chloride due to ion exchange; however, this exchange can alter the soil chemistry by replacing and releasing nutrients such as calcium, magnesium and potassium into the groundwater and surface water. This can lead to increased nutrient concentrations and affect the ability of the water to buffer acid deposition impacting the aquatic environment. Contamination of sodium in drinking water is a concern for individuals restricted to low-sodium diets due to hypertension (high blood pressure). The USEPA has set an advisory limit for drinking water for public water systems at 20mg Na/L to assist doctors in making recommendations for those patients on a salt restricted diet.

Road Salt Additives: Additives to road salt like ferrocyanide, which is used as an anti-caking compound in large salt supplies, can have impacts on both the environment and human health due to cyanide ions being released by certain types of bacteria as well as from exposure to sunlight. The USEPA in 2003 added this compound to its list of toxic pollutants under section 307(a) of the Clean Water Act.

Road Salt Management Issues

For many road managers and parking lot maintainers the winter maintenance goal is to obtain bare and dry pavements at the earliest practical time following cessation of a storm for effective regular high speed travel and pedestrian safety. Traffic, volume, speed and gradient are the primary factors in determining the level of winter maintenance service for State and municipal roads. Pedestrian travel along with slip and fall liability are the priority for land owners and private sector operators.

A road manager's duty entails awareness of the current and expected weather events, temperatures, equipment capabilities, de-icing chemical inventories, application rates, driving routes, as well as staffing availability for each winter storm event. Expectations from the driving public, property managers and customers along with balancing the environmental effects of de-icing chemicals makes the job of these managers challenging.

Another concern to road managers, property owners, and to citizens is the damage and cost to infrastructure and vehicles associated with road salt use. Corrosion of concrete reinforcing rods in roads, bridges, parking garages along with the cost of corrosion protection practices for highways and the automobile industry cost a staggering \$16 billion-\$19 billion a year.² Road salt alternatives that help reduce the cost to infrastructure and limit the environmental impact are critical.

² Adapted from Report of the Salt Use Subcommittee to the Commission on the Environment on Road Salt Use and Recommendations City of Madison, Wisconsin December 2006

Best Management Practices

Following best management practices and recommendations can help in effective and efficient use of de-icing materials while reducing the impact and preserving the quality of our freshwaters.

Application of Road Salt

- Plow, shovel, and blow the snow. Use mechanical means to remove snow, do not use salt or other de-icing chemical to “burn-off” snow and ice.
- Calibrate your equipment. Knowing your equipment is calibrated and the application rate is accurate will save chemical cost and will reduce the environmental impacts. Calibrate annually and keep a record in the vehicle for spreader settings.
- Choose the right material and apply the correct amount. Know the limits of deicing chemicals. Rock salt is not effective at temperatures below 15°F no matter how much is applied. Check application rates given the current weather conditions.
- Use ground speed controls on your spreader. Application rates should correspond with vehicles speed.
- Pre-wet the salt. Adding brine to salt before it is applied will jump start the melting process and help keep the salt in place by reducing bounce and scatter. Pre-wetting salt can reduce application rates by 20 percent. Typical rates are 8-10 gallons of pre-wet liquid to 1 ton of salt.
- For road applications place salt in a windrow near the centerline. Less salt is wasted and traffic will help work the salt into brine and move it to the shoulder of the road.
- Use anti-icing. Be proactive by applying de-icing chemical prior to snow and ice accumulation. It can reduce the amount of chemical needed by 30 percent. Know when to take action; time plowing operations to allow maximum melting by salt before snow is plowed off the road or parking lot.
- Don't mix salt and sand. Salt is for melting and sand is for traction on top of the ice, they work against each other.
- Be familiar with sensitive areas, such as public water supplies, impaired waters and other water sources. Consider designating reduced salt areas or identifying safe alternatives to road salt in these areas.
- Create a winter snow and ice control policy. Outlining your levels of service, application rates, and plowing frequency and practices provide a reference for decision makers and staff.
- Keep a winter storm log. Record storm events, time, application rates, and other important information describing maintenance activities and results.
- Attend training workshops and stay up to date with new technologies and practices.
- For additional information on training, please refer to UNH Technology Transfer Center at <http://www.t2.unh.edu/>

Storage and Handling

Salt, sand, and snow storage facilities have the potential to cause water pollution due to runoff. For maximum environmental protection, all salt storage facilities and piles should be covered and placed on an impervious surface with adequate drainage controls to prevent runoff. This is also important for sand piles that may contain a small percentage of salt to prevent the pile from

freezing. Take care while loading salt, sand or chemicals and clean up any spills that occur. Snow piles should be kept away from water sources and below areas where salt is stored. Vehicle washing facilities should have proper drainage to avoid discharge into surface and ground waters.

To obtain more information, please see the following DES fact sheets at:

<http://des.nh.gov/organization/commissioner/pip/factsheets>

- Snow Dumping [WD-WMB-3](#)
- Holding Tanks for Floor Drains [WD-DWGB-22-8](#)
- Wastewater Discharges from Vehicle Washing [WD-DWGB-22-10](#)
- Storage and Management of Salt Deicing Materials [WD-DWGB-22-30](#)

Alternatives to Road Salt

Environmental impact should be considered when selecting any de-icing chemical or product. Many of the road salt alternatives have a relatively short history or limited amount of use. It is unclear what the potential long term impacts will be for many of these chemicals. Ongoing research, data analysis, and documentation in scientific literature of non-corrosive and environmentally friendly chemicals are necessary.

Calcium Chloride (CaCl) – is the second most common used chemical, it is available in flake, pellet or liquid. It is effective at lower temperatures with a practical melting temperature of -20°F. In liquid form it can be used to pre-wet salt or applied directly as an anti-icing technique which can help in preventing snow and ice from bonding to the pavement and reduce the application amount needed. Several disadvantages to CaCl include a higher cost, environmental impact due to chloride, corrosive to metal, it can be difficult to handle and store, and can contribute to slippery conditions if applied incorrectly.

Potassium chloride (KCl) – is a naturally occurring material (muriate of potash) that also is used as fertilizer. It is available in liquid or crystal with a practical melting temperature of 20°F. It can be damaging to concrete, has environmental impacts due to chloride and can inhibit plant growth and burn foliage.

Magnesium Chloride (MgCl) – is available in liquid or crystal form that melts faster than rock salt; it has a practical melting temperature of 5°F. MgCl attracts moisture and can lead to slippery conditions if applied incorrectly. It is corrosive and contributes to the chloride load in our waters.

Urea – is used primarily as fertilizer with a practical melting temperature of 25°F. It releases nitrogen into the soil and can lead to a chemical imbalance in water systems due to nutrient loading. Urea is corrosive and breaks down rapidly into ammonia, which is released into the environment.

Potassium Acetate (KA) – has a practical melting temperature of -15°F and is biodegradable and non-corrosive. It can cause slick road conditions if applied in excess and can lower oxygen levels in the waterbody. This is a commonly used deicer in the airline industry and is relatively non corrosive.

Calcium Magnesium Acetate (CMA) – is made from limestone and acetic acid. Its lowest practical melt temperature is 20°F. It is less damaging to soils and vegetation, less corrosive to concrete and steel, less toxic to aquatic organisms, and has limited impact on ground water in comparison to road salt. It is much more expensive than road salt but a full cost analysis may show that is it an economically viable choice given its benefits. It is currently being used in environmentally sensitive areas and on bridges prone to salt corrosion.

Agricultural by-products – are mostly proprietary to the manufacturer and can be derived from sources such as corn, beet, grain, alcohol, or molasses. These products are not good at melting snow and ice; however, they do slow down the formation of ice crystals by having a lower freezing point. They are less corrosive than conventional materials and in many cases act as tackifiers to keep product on the road surface. These attributes make the product good for anti-icing and pre-treating salt. They do have environmental impacts in aquatic systems due to their organic nature and can lead to biological oxygen demand, heavy metals, and nutrient enrichment by nitrogen and phosphorus in our waters.

For Additional Information

For more road salt and water quality information, visit the DES New Hampshire Road Salt Reduction Initiative website at <http://des.nh.gov/organization/divisions/water/wmb/was/salt-reduction-initiative/index.htm> or contact the DES Watershed Assistance Section at (603) 271-7889 or watershed@des.nh.gov .

For information on road salt and drinking water, see fact sheet “DWGB-3-17 Sodium and Chloride in Drinking Water” at <http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/documents/dwgb-3-17.pdf> , or contact the Drinking Water and Ground Water Bureau at (603) 271-2513.

Note: This fact sheet is accurate as of December 2010. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.

New Hampshire Guide to Upland Invasive Species



**New Hampshire
Department of Agriculture
Markets and Food, Plant Industry Division**

**3rd Edition
2011**

Douglas Cygan



New Hampshire Department of Agriculture, Markets & Food Terrestrial Invasive Plant Species

Introduction

Throughout the world, non-native invasive species have become an overwhelming problem resulting in impacts to the natural environment and managed landscapes. Invasive species typically possess certain traits that give them an advantage over most native species. The most common traits include the production of many offspring, early and rapid development, and adaptability and high tolerance to many environmental conditions. These traits allow invasive species to be highly competitive and, in many cases, suppress native species. Studies show that invasives can reduce natural diversity, impact endangered or threatened species, reduce wildlife habitat, create water quality impacts, stress and reduce forest and agricultural crop production, damage personal property, and cause health problems.

Invasive species began arriving in North America in the mid-to-late 1700s by various means. Many were brought here for ornamental uses, erosion control, or to provide for wildlife habitat. Others arrived inadvertently through international travel and commerce.

Impacts and Actions

Biologists have found that invasive species cover more than 100 million acres of land in the U.S. and their population numbers continue to spread. The repeated process of spread has become so extreme that invasive species cost the United States billions of dollars per year. This is a result of lost agricultural and forest crops, impacts to natural resources and the environment, and the control efforts required to eradicate them.

On February 3, 1999, President Clinton signed Executive Order 13112, which established the National Invasive Species Council. The Council is responsible for assessing the impacts of invasive species, providing the nation with guidance and leadership on invasive species

New Hampshire Invasive Species Committee

The New Hampshire Invasive Species Committee (ISC) is an advisory group for the Commissioner of the NH Department of Agriculture, Markets & Food (DAMF) on matters concerning invasive species in the state. The ISC consists of 11 appointed members representing the following: the NH Department of Agriculture, the NH Department of Environmental Services, the NH Department of Resources & Economic Development, the NH Department of Transportation, the NH Department of Fish & Game, The College of Life Science & Agriculture of the University of NH, the UNH Cooperative Extension, environmental interests, horticultural interests, general public interests, and livestock owners & feed growers interests. The ISC meets regularly to conduct the following efforts:

- Review information;
- Evaluate and discuss potentially invasive plant, insect and fungi species of concern;
 - Host guest presentations on related topics;
 - Develop outreach and educational materials;
- Formulate management practices as guidance for the control of invasive species; and
- Prepare lists of proposed prohibited and restricted species.

(Note: This committee is not charged with the evaluation or listing of aquatic plant species, which is conducted by the Department of Environmental Services under RSA-487:16-a. However, a brief description of the program and four of the aquatic species are described on pages 29 & 30 of this book).

New Hampshire Rules

Invasive Upland Plant Species (Agr 3800)

<u>Common Name</u>	<u>Scientific Name</u>	<u>Page</u>
Norway Maple	<i>Acer platanoides</i>	6
Tree of Heaven	<i>Ailanthus altissima</i>	7
Garlic Mustard	<i>Alliaria petiolata</i>	8
Japanese Barberry	<i>Berberis thunbergii</i>	9
European Barberry	<i>Berberis vulgaris</i>	10
Oriental Bittersweet	<i>Celastrus orbiculatus</i>	11
Spotted Knapweed	<i>Centaurea biebersteinii</i>	12
Black Swallow-Wort	<i>Cynanchum nigrum</i>	13
Pale Swallow-Wort	<i>Cynanchum rosicum</i>	13
Autumn Olive	<i>Elaeagnus umbellata</i>	14
Burning Bush	<i>Euonymus alatus</i>	15
Giant Hogweed	<i>Heracleum mantegazzianum</i>	16
Dame's Rocket	<i>Hesperis matronalis</i>	17
Perennial Pepperweed	<i>Lepidium latifolium</i>	18
Blunt-Leaved Privet	<i>Ligustrum obtusifolium</i>	19
Showy Bush Honeysuckle	<i>Lonicera x bella</i>	20
Japanese Honeysuckle	<i>Lonicera japonica</i>	20
Morrow's Honeysuckle	<i>Lonicera morrowii</i>	21
Tatarian Honeysuckle	<i>Lonicera tatarica</i>	21
Japanese Stilt-grass	<i>Microstegium vimineum</i>	22
Japanese Knotweed	<i>Polygonum cuspidatum</i>	23
Mile-a-Minute Vine	<i>Polygonum perfoliatum</i>	23
Bohemian Knotweed	<i>Reynoutria japonica</i>	23
Common Buckthorn	<i>Rhamnus cathartica</i>	24
Glossy Buckthorn	<i>Rhamnus frangula</i>	24
Multiflora Rose	<i>Rosa multiflora</i>	25

Invasive Insect Species

(To see the complete list of all 16 invasive insects refer to rules Agr 3800)

Hemlock Woolly Adelgid	<i>Adelges tsugae</i>	26
Emerald Ash Borer	<i>Agrilus planipennis</i>	27
Asian Longhorned Beetle	<i>Anoplothora glabripennis</i>	28

Invasive Aquatic Plant Species

To see the complete list of invasive aquatic plants refer to DES's Env-Wq 1300 rules

Variable Milfoil	<i>Myriophyllum heterophyllum</i>	29
Purple Loosestrife	<i>Lythrum salicaria</i>	30
Common Reed	<i>Phragmites australis</i>	30

WHAT YOU CAN DO

There are many things that you, as an individual, can do to help control the spread of invasive species and preserve native flora and fauna:

- Minimize impacts to natural vegetation, soils, and drainage.
- Learn how to identify invasive plants and know how to tell them apart from native species.
- Control invasives on your property by following recommended practices.
- When landscaping, ask your local garden center or contact your County Extension Service about alternative plantings.
- Become active in local or regional initiatives to control invasives.
- After working in an area with invasive species remove any soil, or propagules that may have adhered to clothing, shoes, vehicle tires, etc.

CONTROL METHODS

Mechanical: Mechanical control involves hand pulling, digging, cultivation, mowing, cutting or utilizing some type of physical barrier such as a tarpaulin, mulch, wood chips, etc. This method is most effective when populations of unwanted species are low.

Cultural: Cultural control is the manipulation of a plant community to prevent the introduction or spread of an unwanted species. This can be accomplished by modifying the growing environment such as the soil, available light or moisture, or planting trees or shrubs that can outcompete the invasive species.

Chemical: Chemical control involves the use of an approved herbicide to manage a targeted species. The application method must be chosen to avoid damage to beneficial or native species. The applicator must adhere to all State and Federal pesticide regulations and in many cases be licensed by the state. For more information, contact the NH Department of Agriculture's Pesticide Control Division at 603-271-3550 or www.agriculture.nh.gov.

Biological: Biological control is the use of native or introduced beneficial organisms to naturally reduce populations of unwanted species. Most biological controls are found to be self-sustaining and host specific.



CONTACT INFORMATION

TERRESTRIAL PLANTS

Douglas Cygan, Invasive Species Coordinator, NH Department of Agriculture, Markets & Food, Division of Plant Industry, 29 Hazen Drive, Concord, NH 03301
(603) 271-3488, douglas.cygan@agr.nh.gov
Website: www.agriculture.nh.gov

AQUATIC PLANTS

Amy Smagula, Clean Lakes and Exotic Species Coordinator, NH Department of Environmental Services, 29 Hazen Drive, PO Box 95, Concord, NH 03302
(603) 271-2248, asmagula@des.state.nh.us.

RESOURCES

NH Coastal Watershed Invasive Plant Partnership (CWIPP)

www.des.nh.gov/organization/divisions/water/wmb/coastal/cwipp/index.htm

Invasive Plant Atlas of New England (IPANE)

<http://invasives.eeb.uconn.edu/ipane>

Natural Resource Conservation Service (NRCS)

<http://plants.usda.gov>

New England Wildflower Society (NEWS)

www.newfs.org

New Hampshire Department of Agriculture, Markets & Food (DAMF)

www.agriculture.nh.gov

**New Hampshire Department of Resources & Economic Development,
Natural Heritage Bureau (DRED)**

<http://www.naturalheritage.org>

**New Hampshire Department of Resources & Economic Development,
Division of Forests and Lands (DRED)**

http://www.nhdfl.org/organization/div_nhnhi.htm

New Hampshire Department of Environmental Services (DES)

www.des.state.nh.us/wmb/exoticspecies

New Hampshire Fish & Game Department

www.wildlife.state.nh.us

The Nature Conservancy (TNC)

www.nature.org

**U.S. Department of Agriculture's Animal Plant Health Inspection Service (USDA
APHIS)**

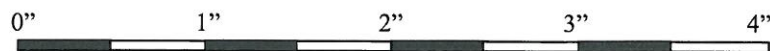
www.aphis.usda.gov

University of New Hampshire Cooperative Extension (UNHCE)

www.ceinfo.unh.edu

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SOURCE CONTROL PLAN

Niyati Realty, LLC, development is considered a “high-load area” because of its proposed vehicle fueling facility features (Env-Wq 1502.26(b)(4)). This plan demonstrates that there will be appropriate Best Management Practices (BMP) features to reduce the exposure of regulated substances to precipitation or stormwater runoff.

AN OVERVIEW OF HOW SOURCE CONTROLS, INCLUDING STRUCTURAL OR OPERATIONAL MANAGEMENT PRACTICES, WILL PREVENT OR MINIMIZE THE AMOUNT OF REGULATED SUBSTANCES FROM MIXING WITH CLEAN STORMWATER

The vehicle fueling facility at 289 Pinewood Road in Allenstown, NH will consist of two underground storage tanks, four gasoline dispensing islands and one diesel dispensing island. Underground storage tank one will be a 10,000 gallon diesel tank, tank two will be a 20,000 gallon gasoline tank (14,000/6,000). Both dispensing islands will be constructed with canopies and a concrete floor surface with appropriately sized Positive Limiting Barriers (PLB).

Petroleum fuels are brought to the facility via fuel transport tanker trucks. Fuel transfer shall be performed within a designated area that has appropriately sized containment.

Site grading is designed so that surfaces are sloped away from fueling areas. Stormwater is thus diverted from mixing with possible spilled substances within the PLB area. See the Site Development design plans.

Designated snow storage areas are shown on attached design plans and snow removal procedures area fallowed as to not interfere with stormwater flow.

A plan for unloading operations shall be developed and executed with care to avoid spills and contamination of stormwater.

A LIST OF REGULATED SUBSTANCES EXPECTED TO BE PRESENT ON THE SITE IN QUANTITIES OF 5 GALLONS OR MORE

10,000 gallons diesel fuel
20,000 gallons gasoline

**THE LOCATION(S) OF GROUNDWATER PROTECTION AREAS, IF ANY,
WITHIN 1,000 FEET OF THE SITE PERIMETER**

The entire site is within the Allenstown groundwater protection overlay district and approximately 800 feet from the Groundwater Classification Area GA2 as depicted on NHDES ONE-STOP GIS mapping.

**A PLAN DEPICTING THE DRAINAGE AREA WITH EXPOSED REGULATED SUBSTANCES
AND THE LOCATION(S) OF STORMWATER PRACTICE(S) OR DISCHARGE POINT(S)
SERVING THOSE AREAS, INCLUDING LATITUDE-LONGITUDE POINT(S) OF THE
PRACTICE OR DISCHARGE POINT(S) TO WITHIN PLUS OR MINUS 5 METERS OF THE
PRACTICE OR DISCHARGE POINT**

See attached site development plans for depicted location of gas and diesel pump islands, stormwater practices and discharge point.
The GPS coordinates of the subject discharge point are 43° 09' 07.09"N, 71° 24' 24.23"W.

**THE LOCATION(S) AND CONTAINMENT METHOD(S) TO BE EMPLOYED
FOR STORAGE OF REGULATED SUBSTANCES**

See attached site development plans for location of positive limiting barriers in reference to "Filterra" tree box filter BMP's.

Positive Limiting Barriers shall be designed by others to meet appropriate local and state regulations.

**A PLAN DEPICTING THE LOCATION(S) WHERE REGULATED SUBSTANCES WILL BE
HANDLED, INCLUDING THE STORAGE, LOADING AND UNLOADING,
TRANSPORTATION, OR CONVEYANCE OF ANY RAW MATERIAL, INTERMEDIATE
PRODUCT, FINISHED PRODUCT, BY-PRODUCT, OR WASTE PRODUCT**

See attached site development plans depicting the location of the storage, loading and unloading area for petroleum products.

A PLAN SHOWING THE LOCATION(S) OF SNOW STORAGE AREAS

See attached site development plan depicting snow storage areas.

A DESCRIPTION OF SPILL PREVENTION AND CONTROL OR CONTAINMENT MEASURES

In compliance with Env-Or 400 and NFPA 30A *Code for Motor Fuel Dispensing Facilities and Repair Garages*, both underground tanks and all underground piping will be double-walled and rated for use with petroleum. The interstitial spaces between tank walls and pipe walls will be constantly electronically monitored. This monitoring will extend to all underground cofferdam and transition sump spaces. All tank fill ports will feature a spill box and mechanical overflow protection valves. Each fuel dispenser will feature a UL listed over-fill preventing hose nozzle. Each dispenser hose will feature an emergency shear dry-break valve to prevent spillage from drive-away hose breakage. The forecourt design is such that no filling hose can extend beyond a positive limiting barrier. All dispensers will be protected from vehicle impact with bollards. These systems are integral to the tank, piping and dispensing equipment and as such will be located where fuel equipment is located (see site plan).

Spill kit drums will be on hand for use by trained staff in the event of a spill.

A LIST OF THE PHONE NUMBERS AND MAILING ADDRESSES OF THE OWNER OF THE FACILITY

Sandeep Patel, Niyati Realty, LLC.
239 Steam Mill Road, Auburn NH 03032
(603) 485-2242

A PROGRAM OF TRAINING TO FAMILIARIZE EMPLOYEES WITH THE PLAN AND TO ENSURE ITS IMPLEMENTATION

All operational staff at this site will receive induction and continual periodic training as to the safe operation of the fuel systems on site. This training will include:

- safe operation of fuel systems;
- vehicle movement controls;
- fire emergency procedures;
- spill containment procedures;
- system inspection procedures; and
- record keeping.

Record of this training will be kept by the site operator as well as records of inspections and incident reports. Filling of the bulk petroleum tanks will only be performed by trained fuel transport personnel.

WD-DWGB-22-5

2010

Developing A Source Control Plan for High-Load Areas

Applicability

When land use development requires a DES Alteration-of-Terrain (AoT) permit and involves certain activities that release hydrocarbons, metals, or suspended solids in concentrations greater than typically found in stormwater runoff, a source control plan is required. Land use activities, such as petroleum storage, fuel dispensing areas and hazardous waste facilities often have areas (e.g. fuel transfer or loading zones) for activities that may expose “regulated substances” (e.g. oil, gasoline) to precipitation or mix with relatively clean stormwater runoff. These areas are referred to as “High-Load Areas” under the AoT regulations. Sites with no regulated substances being used or demonstrating through the use of best management practices (BMPs) no contact between regulated substances and precipitation/ runoff from any portion of the site do not need to develop a source control plan.

Required Content for a Source Control Plan

A source control plan developed for High-Load Areas must include a narrative and map(s) describing the use of structural and/or non-structural BMPs to minimize the volume of stormwater coming in contact with regulated substances. BMPs related to the storage, transfer and handling of regulated substances should be consistent with Env-Wq 401, Best Management Practices for Groundwater Protection. (See Summary of Env-Wq 401 BMP below)

A source control plan must include the content described within AoT regulations (see Env-Wq 1504.07):

1. An overview of how source controls including structural or operational management practices will prevent or minimize the amount of regulated substances from mixing with clean stormwater.
2. A list of regulated substances expected to be present on the site in quantities of five gallons or more.
3. Groundwater Protection Areas, if any, within 1,000 feet of the site perimeter.
4. A plan depicting the drainage area with exposed regulated substances and the location(s) of stormwater practice(s) or discharge point(s) serving those areas, including latitude-longitude point(s) of the practice or discharge point(s) to within plus or minus 5 meters of

Table 1 High Load Areas Include the Following Land Use Activities per Env-Wq 1502.26
Industrial facilities subject to the NPDES Multi-Sector General Permit
Petroleum storage facilities
Petroleum dispensing facilities
Vehicle fueling facilities
Vehicle service, maintenance and equipment cleaning facilities
Fleet storage areas
Public works storage areas
Road salt facilities
Commercial nurseries
Non-residential facilities having uncoated metal roofs with a slope flatter than 20%
Facilities with outdoor storage, loading, or unloading of hazardous substances, regardless of the primary use of the facility
Facilities subject to chemical inventory under Section 312 of the Superfund Amendments and Reauthorization Act of 1986 (SARA).

the practice or discharge point.

5. The location(s) and containment method(s) to be employed for storage of regulated substances.
6. A plan depicting the location(s) where regulated substances will be handled, including the storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, finished product, by-product, or waste product.
7. A plan showing the location(s) of snow storage areas.
8. A description of spill prevention and control or containment measures.
9. A list of the phone numbers and mailing addresses of the owner of the facility.
10. A program of training to familiarize employees with the plan and to ensure its implementation.

Under AoT regulations, stormwater discharge, filtration/infiltration restrictions or additional design requirements apply to sites within certain high-value water supply resources areas. Source control plans should identify water supply well setbacks, Groundwater Protection Areas or Water Supply Intake Protection Areas and indicate how the plan complies with the restrictions or additional design requirements.¹ For a summary of the discharge restrictions and additional design requirements in these areas review Section 3-1 of the New Hampshire Stormwater Manual (Volume 2).

The source control plan is evaluated by DES as to whether the plan meets the following criteria:

- Source controls minimize the volume of stormwater coming into contact with regulated substances and segregate relatively clean stormwater from stormwater with a higher concentration of pollutants.
- Source controls and narrative on plan include necessary information required by Env-Wq 1507.04.
- BMPs applicable to regulated substances in regulated containers (greater than or equal to five gallons) are consistent with Env-Wq 401.
- Plan meets the discharge setbacks, restrictions and additional design requirements within water supply well setbacks, Groundwater Protection Areas and Water Supply Intake Protection Areas.

Summary of Env-Wq 401 BMP Requirements

Storage

- Store regulated substances on an impervious surface.
- Secure storage areas against unauthorized entry.
- Inspect storage areas weekly.
- Have secondary containment areas for outdoor storage that includes a cover.
- Keep containers stored outside more than 50 feet from surface water, 75 feet from private wells, and up to 400 feet from public water supply wells.
- Keep containers at least 50 feet from storm drains, if no secondary containment.
- Label containers clearly and visibly.

Handling

- Maintain good housekeeping practices, e.g., clean up of small spills, within High-Load Areas.
- Keep containers closed and sealed.
- Place drip pans under spigots, valves, and pumps.

¹ Groundwater Protection Areas and Water Supply Protection Areas may be located using DES's One Stop Web GIS after registration with DES. See <http://www2.des.state.nh.us/OneStop/>.

- Use funnels and drip pans when transferring regulated substances; perform transfers over impervious surfaces.

Spill and Release Response

- Employee training and information posted concerning response procedures in the event of a spill.
- Availability and capacity of spill control and containment equipment

Floor Drains and Work Sinks

- Cannot discharge into or onto the ground.

Env-Wq 401, Best Management Practices for Groundwater Protection can be reviewed online at <http://des.nh.gov/organization/commissioner/legal/rules/index.htm#envwq401>

Industry-Specific Requirements

In addition to the BMPs listed above, plans for industrial facilities must evaluate the appropriateness of industry-specific controls, and include provisions for the implementation of those that are found to be appropriate.

Consistency with Other Permits, Plans or Controls

Many land uses or activities already operate under local, state or federal permits that require pollution prevention controls, permits and/or plans. Source control plans should be consistent with other applicable permit requirements, plans or controls including Spill Prevention, Control, and Countermeasures plans (SPCCs) required under 40 CFR 112, National Fire Protection Association (NFPA) standards, specifically NFPA 30 Flammable and Combustible Liquids Code and Stormwater Pollution Prevention Plans (SWPPP) approved by U.S. EPA through the National Pollutant Discharge Elimination System (NPDES) program. EPA-approved SWPPPs may be submitted to the AoT program in lieu of a source control plan.

For Additional Information

For additional information, please contact the Drinking Water and Groundwater Bureau at (603) 271-2513 or dwgbinfo@des.nh.gov or visit www.des.nh.gov, click on A-Z List and choose Drinking Water and Groundwater Bureau. All of the bureau's fact sheets are on-line at <http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm>.

Note: This fact sheet is accurate as of August 2010. Statutory or regulatory changes or the availability of additional information after this date may render this information inaccurate or incomplete.