Resources for BMPs

Site Design BMPs


Center for Watershed Protection. The Practice of Watershed Protection, 2000, editors Thomas R. Schueler and Heather K. Holland, Ellicott City, MD. Available online at www.stormwatercenter.net/Library/Practice/46.pdf or from the Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043, (410) 461-8323.

Center for Watershed Protection. Stormwater Manager’s Resource Center at www.stormwatercenter.net is a website designed for stormwater practitioners, local government officials, and others that need technical assistance on stormwater management issues.

Center for Watershed Protection – The Stormwater Manager’s Resource Center has sample O&M checklists available for download from its Web site: http://www.stormwatercenter.net On the homepage, click “Manual Builder” and choose “Construction and Maintenance Checklists” from the pull-down list. There are checklists for the following practices: ponds, infiltration trenches, infiltration basins, bioretention facilities, sand filters, and open channel practices.
Containment Solutions, Inc. Website showing various oil water separators, underground storage tanks, aboveground storage tanks, etc. [http://www.containmentsolutions.com/products/oilwater_seps/system.html](http://www.containmentsolutions.com/products/oilwater_seps/system.html)


DES Phase II Website: [www.des.nh.gov/stormwater/](http://www.des.nh.gov/stormwater/)

DES Fact Sheets:


DES. *Comprehensive Shoreland Protection Act.* Available at: [www.des.nh.gov/cspa/](http://www.des.nh.gov/cspa/)


USEPA. Fact sheets on each of the minimum measures and other aspects of the Phase II rule are available on the EPA’s website: http://cfpub.epa.gov/npdes/stormwater/swfinal.cfm 16

USEPA. *Stormwater Program* online at http://cfpub.epa.gov/npdes/home.cfm?program_id=6
Erosion & Sediment Control BMPs

The DES Phase II website address for construction requirements is: www.des.nh.gov/stormwater/construction.htm

DES Fact Sheets:


The Staff Transportation Board of the National Research Council. *Environmental Impact of Construction and Repair Materials on Surface and Ground Waters.* 2000. Non-technical language bulletin explaining how test methods and supporting computer software can provide answers to questions about the environmental impact of new construction or the repair or rehabilitation of existing highways. Published reports from NCHRP are available from http://www.trb.org.

The Transportation Research Board (TRB) published several studies that investigate the environmental impacts of activities related to transportation infrastructure available at: http://www4.trb.org/trb/onlinepubs.nsf


*Highway Deicing: Comparing Salt and Calcium Magnesium Acetate* (available electronically at http://trb.org/publications/st/sr235.html or for $22 from the online bookstore)


*Guidelines for the Selection of Snow and Ice Control Materials To Mitigate Environmental Impacts* (Draft). Available at http://www.trb.org


USEPA. Information on erosion, sediment, and runoff control from roads, highways and unpaved roads available from the EPA online at [www.epa.gov/owow/nps/roadshwys.html](http://www.epa.gov/owow/nps/roadshwys.html)
Septic Systems


DES Fact Sheets:

There are 12 DES fact sheets related to septic systems. They are available on the web at [www.des.nh.gov/sub.htm](http://www.des.nh.gov/sub.htm) and [www.des.nh.gov/factsheets/bb/bb-11.htm](http://www.des.nh.gov/factsheets/bb/bb-11.htm) or call (603) 271-2975.

DES. *You and Your Septic, a brochure.* Available if you call (603) 271-2975.

National Small Flows Clearinghouse Environmental Technology Initiative. Provides support for localities in wastewater treatment systems. Information on alternative technologies is available at: [http://www.nesc.wvu.edu/nsfc/nsfc_ETI.htm](http://www.nesc.wvu.edu/nsfc/nsfc_ETI.htm) and at [http://www.epa.gov/owm/decent/treat.htm](http://www.epa.gov/owm/decent/treat.htm). An extensive list of links to public and private sector OWTS resources can be found at [http://centreforwaterresourcessudies.dal.ca/cwrs/onsite/info.htm](http://centreforwaterresourcessudies.dal.ca/cwrs/onsite/info.htm). For information on loading rates, design, and performance capabilities for conventional and alternative treatment systems, refer to the Onsite Wastewater Treatment System Manual (USEPA, 2002a). Table 6.9 provides a summary of capital and maintenance cost data for selected OWTS technologies.
Road Maintenance BMPs


DES Fact Sheets:


Federal Highway Administration. *Manual of Practice for an Effective Anti-Icing Program: A Guide For Highway Winter Maintenance Personnel*. 1996. A guide for maintenance personnel in developing a systematic and efficient practice for maintaining roads in the best condition possible during a winter storm. It describes the factors that should be understood and addresses the specific needs of the site or region. It focuses on weather information and materials and methods that will best address site conditions such as level of service, highway agency resources, climatological conditions, and traffic. The manual can be downloaded in HTML format from: http://www.fhwa.dot.gov/reports/mopeap/mop0296a.htm.


UNH Technology Transfer Center. *Pros and Cons of Sand on Ice and Snowpack*. Fall 2001 newsletter, online at www.t2.unh.edu/fall01/pg6-7.html

UNH. The following publications are available from UNH Technology Transfer Center, 33 College Road, Durham NH 03824. (603) 862-2826. They are listed at www.t2.unh.edu/video_pub/publist.html
Calcium Chloride Package. A package of articles and pamphlets explaining the benefits of deicing with calcium chloride.

Deicing, Anti-Icing, and Chemical Alternatives. Informative sheet discusses the benefits of anti-icing, deicing, prewetting, and liquid chemical alternatives.

Road Salt and Water Quality. Environmental fact sheet discusses road salt management, alternatives to road salt, and the DOT Reduced Salt Pilot Program.

The Salt Storage Handbook. A practical guide for handling deicing salt. Published by the Salt Institute.

Series of Quick Guides for New Hampshire Towns. A set of pamphlets developed by the UNH Technology Transfer Center and distributed as a set. Topic #9 is Snow and Ice Control.

The Snowfighter’s Handbook. A practical guide for snow and ice control before, during, and after a storm. Published by the Salt Institute.

Winter Operations Snow Removal and Ice Control Policy. From NHDOT, describes general policies, maintenance techniques, and equipment for snow and ice management.


Washington State Department of Transportation. (2002) The Pacific Northwest Snowfighter’s Association Web site: http://www.wsdot.wa.gov/partners/pns/ provides resources pertaining to deicing and anti-icing products and practices, such as a list of approved products, deicing specifications, a fact sheet on magnesium chloride, and testing methods and protocols for deicing products.
Sand & Gravel Pit BMPs

DES Fact Sheets:


NH Office of State Planning. RSA 155-E: Earth Excavations.1998. A 20-minute video on gravel pit regulation. This video provides a basic understanding of RSA 155-E, the law governing earth excavations and covers the operational and reclamation standards and common questions and answers. Available for $12 from the Municipal and Regional Planning Assistance section of OSP. For more information see www.state.nh.us/osp/publications/start.html or contact OSP, 57 Regional Drive, Concord, NH 03301 (603) 271-2155.

Southwest Regional Planning Commission. The Law Governing Earth Excavations. A manual about state statutes governing gravel pits and local regulatory options, including recommended procedures for addressing gravel pits locally, a model ordinance, application checklist, and sample application form. Contact the Southwest Regional Planning Commission at 20 Central Square, 2nd Floor, Keene, NH 03431, (603) 357-0557, www.swrpc.org/library/index.html


Underground & Aboveground Storage Tank BMPs

DES Fact Sheets:

Fact sheets related to hazardous wastes can be found at www.des.nh.gov/hw.htm
Fact sheets related to oil can be found at www.des.nh.gov/oil.htm

DES publications available from the DES Public Information Center by calling (603) 271-2975 or writing pip@des.nh.gov

List of Underground Storage Tanks (USTs) - CD-ROM. $30, No Code #.
List of Leaking Underground Storage Tank (LUST) Sites. $25, No Code #.
List of All Contaminated Groundwater Sites. $25, No Code #.
Case Studies and Evaluations of Remedial Technologies at Leaking Underground Storage Tank Sites in NH, R-WSPCD-95-5.

Summary Requirements for Management of Used Oil Being Recycled (as provided in New Hampshire’s Hazardous Waste Rules Env-Ws 100-1000). Available online at www.des.nh.gov/hwcs/requirements.pdf


USEPA. Catalog of EPA Materials on Underground Storage Tanks. EPA-510-B-00-001, January 2000. This updated, revised booklet provides an annotated list of UST materials and includes ordering information. Many of the informational leaflets, booklets, videos, and software items listed are designed to provide UST owners and operators with information to help them comply with the federal UST requirements. Available online at www.epa.gov/swerust1/pubs/index.htm.

Commercial & Industrial BMPs

Household BMPs

Center for Watershed Protection. “Toward a Low Input Lawn,” article #130 in The Practice of Watershed Protection, 2000, editors Thomas R. Schueler and Heather K. Holland, Ellicott City, MD. Available online at www.stormwatercenter.net under “Publications” or from the Center for Watershed Protection, 8391 Main Street, Ellicott City, MD 21043, (410) 461-8323


DES Clean Cars Program and Energy Star Program. Online at www.des.nh.gov/ard/clean_cars.htm For more information contact the Air Resources Division at (603) 271-6284.

DES. The schedule for household hazardous waste collection days in New Hampshire is posted on the DES website at www.des.nh.gov/hhw/hhwevent.htm

DES Fact Sheets:


Hillsborough County Conservation District and the USDA Natural Resources Conservation Service Greenscaping (Reducing Pollution in Your Backyard). Chappell Professional Center, 468 Route 13 South, Milford, NH 03055 or call (603) 673-2409.
The Hubbard Brook Research Foundation. *Acid Rain Revisited: Advances in Scientific Understanding Since the Passage of the 1970 Clean Air Act Amendments.* Online at [www.hbrook.sr.unh.edu/hbfound/hbfound.htm](http://www.hbrook.sr.unh.edu/hbfound/hbfound.htm) or contact the Foundation at 6 Sargent Place, Hanover, NH 03755, (603) 653-0390.


Massachusetts Department of Food and Agriculture. *Pesticide Storage and Handling Practices for Homes.* July 1997. Online at [www.state.ma.us/dfa/pesticides/publications](http://www.state.ma.us/dfa/pesticides/publications)


USEPA. *Do’s & Don’ts Around the Home.* This EPA article has text on household chemicals, landscaping and gardening, septic systems, water conservation, other areas where you can make a difference (e.g., cleaning up pet waste), and community action. Online at [www.epa.gov/OWOW/NPS/dosdont.html](http://www.epa.gov/OWOW/NPS/dosdont.html)

USEPA. *Healthy Lawn Healthy Environment: Caring for Your Lawn in an Environmentally Friendly Way.* Available through the NH Department of Agriculture, Markets & Food Division of Pesticide Control, call (603) 271-3550

USEPA. Pet waste poster at EPA’s website: [www.epa.gov/region01/eco/lis/posters/pet.html](http://www.epa.gov/region01/eco/lis/posters/pet.html)

Glossary

The following are commonly used technical terms related to aquifer protection and Best Management Practices. The glossary is not intended as a source for precise scientific definitions or for specific legal interpretations.

**AESTHETICS:** Pleasing in appearance or effect. A subjective determination based on an individual’s preference.

**ALLUVIAL:** Pertaining to material that is transported and deposited by running water.

**AQUIFER:** A geologic formation or structure that transmits water in sufficient quantity to supply the needs for water development.

**ASSOCIATION:** A legal entity operating under recorded land agreements or contracts through which each unit owner in a conservation development is a member and each dwelling unit is subject to charges for a proportionate share of the expenses of the organization’s activities.

**BACKGROUND LEVEL:** Naturally occurring concentration of a substance or chemical element dissolved in surface or ground water.

**BACKGROUND LOAD:** Naturally occurring levels or concentrations of pollutants and non-pollutants in a stream prior to watershed development.

**BANKFULL DISCHARGE:** A flow condition where streamflow completely fills the stream channel up to the top of the bank. In an undisturbed watershed, the discharge condition occurs on average every 1.5 to 2 years and controls the shape and form of natural channels.

**BASEFLOW:** The portion of stream flow that is not due to storm runoff, and is supported by ground water seepage into a channel.

**BEDROCK:** The solid rock underlying unconsolidated surface material (as soil). NH bedrock types include granitic and metamorphic rock.

**BEST MANAGEMENT PRACTICES (BMPs):** Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the risk of contamination of ground water.

**BUFFER:** Preservation of natural areas adjacent to channels, wetlands, or lakes for purpose of stabilizing banks and reducing contaminants in stormwater that flows to such areas.
CATCH BASIN: A conventional structure for the capture of stormwater in streets and parking areas. It typically includes an inlet, sump, and outlet and provides minimal removal of suspended solids. In most cases a hood also is included to separate oil and grease from the stormwater.

CONSERVATION DEVELOPMENT: A contiguous area of land to be planned and developed as a single entity, in which buildings are accommodated under more flexible standards, such as building arrangements and setbacks, than those that would normally apply under conventional regulations, allowing for the flexible grouping of structures in order to conserve open space and existing natural resources.

CONSERVATION EASEMENT: A legal interest in land which restricts development and other uses of the property in perpetuity for the public purpose of preserving the rural, open, natural or agricultural qualities of the property.

CONTAMINANTS: Substances that become entrained in stormwater and degrade water quality. Sources include process waste, raw materials, toxic pollutants, hazardous substances, or oil and grease.

CONTOUR: 1) An imaginary line on the surface of the earth connecting points of the same elevation. 2) A line drawn on a map connecting point of the same elevation.

CUT AND FILL: Process of earth moving by excavating part of an area and using the excavating material for adjacent embankments or fill areas.

DETENTION TIME: The amount of time a parcel of water actually is present in an impoundment. Theoretical detention time for a runoff event is the average time parcels of water reside in the basin over the period of release from the BMP.

DISCHARGE: Water or effluent released to a receiving waterbody.

DRAINAGE AREA: Land area from which water flows into a stream or lake (see also watershed).

DRIFT: Sediments deposited by glaciers that repeatedly advanced and retreated across the North American landscape until about 10,000 years ago.

EFFLUENT: Solid, liquid, or gaseous wastes that enter the environment as a byproduct of man-oriented processes.

ERODIBLE: Susceptible to erosion with reference to soil.

EROSION: Weathering of soil by running water, wind, or ice.

EROSION AND SEDIMENT CONTROL PLAN: A plan for the control of erosion and sediment resulting from a land-disturbing activity.
EVAPORATION: The process by which a liquid is changed to a vapor or gas.

EXFILTRATION: The downward movement of runoff through the bottom of an infiltration BMP into the soil layer.

FERTILIZER: Any organic or inorganic material of natural or synthetic origin that is added to a soil to supply elements essential to plant growth.

FINISHED GRADE: The final grade or elevation of the ground surface forming the proposed design.

FIRST FLUSH: The run-off at the very beginning of a storm event carrying pollutants, including suspended sediments, at concentrations typically higher than at the middle or end of a storm.

FLOATABLES: Materials in stormwater or sanitary flows that float to the surface.

FOREBAY: An extra storage area provided near an inlet of a BMP to trap incoming sediments before they accumulate in a water impoundment BMP.

GPM (GALLONS PER MINUTE): The unit of measure for discharge determining how many gallons of a liquid are released through a pipe in one minute.

GROUND WATER: Subsurface water occupying the zone of saturation. In a strict sense, the term is applied only to water below the water table.

HABITAT: The environment in which the life needs of a plant or animal organism, population, or community are supplied.

HEAVY METALS: Any element with an atomic weight of greater than twenty (20), such as copper, cadmium, lead, selenium, arsenic, mercury, and chromium. Heavy metals are typically found in minimal quantities in stormwater, but can be toxic at trace amounts.

HERBICIDE: A chemical substance designed to kill or inhibit the growth of plants, especially weeds.

HYDRAULIC GRADIENT: A measurement used in ground water science to calculate directions and rates of ground water flow. In a stratified drift aquifer (unconfined), the hydraulic gradient is the slope of the water table between any two points. The hydraulic gradient is a ratio of the difference in vertical elevation between two places on the water table and their horizontal difference apart.

INfiltration: The gradual movement of water (from precipitation, irrigation, or runoff) into the soil.
**IMPERVIOUS:** The property of a material that does not allow the infiltration of water into and through the pores of the soil, such as pavement or rooftops.

**IMPOUNDMENT:** The collection and confinement of water as in an artificial reservoir or dam.

**INLET:** An entrance into a ditch, storm sewer, or other waterway.

**INTEGRATED PEST MANAGEMENT (IPM):** A pest control strategy that uses an array of complementary methods: natural predators and parasites, pest-resistant varieties, cultural practices, biological controls, various physical techniques, and pesticides as a last resort.

**LEACHATE:** Liquids that have percolated through a soil and that contain a substance(s) in solution or suspension.

**LEACHING:** The removal or dissolving of a compound from a soil, waste, or other material into the surrounding fluid (water).

**NONPOINT SOURCE (NPS) POLLUTION:** Pollution of surface or ground water supplies originating from land use activities and/or the atmosphere, having no well-defined point of entry.

**NUTRIENTS:** Elements, or compounds, essential as raw materials for organism growth and development, such as carbon, nitrogen, phosphorus.

**OIL AND GREASE:** This includes hydrocarbons, fatty acids, soaps, fats, waxes, and oils.

**OIL/WATER SEPARATOR:** A device installed, usually at the entrance to a drain, which removes oil and grease from water flows entering the drain.

**OPEN SPACE:** An area that is intended to provide light and air. Open space may include, but is not limited to, meadows, wooded areas, and waterbodies.

**PEAK DISCHARGE:** The maximum instantaneous flow from a given storm condition at a specific location.

**PERCOLATION:** The downward movement of water through soil, especially the downward flow of water in saturated or nearly saturated soil.

**PERMEABILITY:** The quality of a soil horizon that enables water or air to move through it. The permeability of a soil may be limited by the presence of one nearly impermeable horizon even though the others are permeable.
PERVIOUS SURFACE: A porous surface, which allows for the infiltration of water. This typically implies unaltered, natural surfaces without pavement or development.

PESTICIDE: Any chemical agent or compound used for control of plant or animal pests. Pesticides include insecticides, herbicides, fungicides, nematocides, and rodenticides.

POLLUTANT: Anything introduced into the environment (soil, water, or air) that degrades the usefulness of a resource.

POROSITY: The volume of open spaces in rock or soil; if pores are large and abundant more water can be stored.

PRECIPITATION: Water that falls to the earth in the form of rain, snow, hail, or sleet.

PRETREATMENT: Techniques employed in stormwater BMPs to provide removal (storage, filtration, etc.) and help trap coarse materials before they enter the system.

RECHARGE: Addition of water the saturated zone of an aquifer.

REGULATED CONTAMINANT: Any physical, chemical, biological, radiological substance or other matter, other than naturally occurring substances at naturally occurring (background) levels, in water which adversely affects human health or the environment.

RETENTION: The holding of runoff in a basin without release except by means of evaporation, infiltration, or emergency bypass.

RETROFIT: The installation of a new BMP or improvement of an existing BMP in an already developed area.

RIPARIAN: A relatively narrow strip of land that borders a stream or river, and often coincides with the maximum water surface elevation of the 100 year storm.

RISER: The inlet portions of a drop inlet spillway that extend vertically up from the pipe conduit barrel to the water surface.

RUNOFF: Precipitation, snowmelt, or irrigation that flows over the land, eventually making its way to surface water (such as a stream, river, pond).

SATURATED ZONE: The subsurface locations where all the available pores and spaces are filled with water.

SEDIMENT: Eroded soil and rock material and plant debris transported and deposited by runoff.
SETBACK: The required distance between a building and a lot line, street right-of-way, pavement, stream or riverbank, wetland or other delineated site feature.

SHEET FLOW: Water, usually storm runoff, flowing in a thin layer over the ground surface; also called overland flow.

SITE PLANNING: In terms of stormwater management, a preliminary component of a development plan, where the appropriate BMP structures are properly selected and installed.

SLOPE: The degree of deviation of a surface from horizontal, measured in a numerical ratio, percent, or degrees. Expressed as a ratio or percentage, the first number is the vertical distance (rise) and the second is the horizontal distance (run), as 2:1 or 200 percent. Expressed in degrees, it is the angle of the slope from the horizontal plane with a 90-degree slope being vertical (maximum) and 45 degree being a 1:1 slope.

STABILIZATION: The process of establishing an enduring soil cover of vegetation and/or mulch or other ground cover in combination with installing temporary or permanent structures for the purpose of reducing to a minimum the transport of sediment by wind, water, ice or gravity.

STORM DRAIN: An inlet for the capture of stormwater.

STORMWATER: Runoff from a storm event, snowmelt runoff, and surface runoff and drainage.

STRATIFIED DRIFT AQUIFER: A geologic formation of predominantly well-sorted sediment deposited by or in bodies of glacial meltwater, including gravel, sand, silt, or clay, which contains sufficient saturated permeable material to yield significant quantities of water to wells.

STREAMFLOW: Water flowing in a natural channel, above ground.

STRUCTURAL PRACTICES: Soil and water conservation measures, other than vegetation, utilizing the mechanical properties of matter for the purpose of changing the surface of the land or storing, regulating, or disposing of runoff to prevent excessive sediment loss. Including, but not limited to, riprap, sediment basins, dikes, level spreaders, waterways or outlets, diversion, structures, sediment traps, etc.

SUBSTRATE: The natural soil base underlying a BMP.

SURFACE WATER: Inland waters, except ground water, which are on the land surface, such as reservoirs, lakes, rivers, transitional waters, coastal waters and, under some circumstances, territorial waters.

SWALE: A natural depression or wide shallow ditch used to temporarily store, route or filter runoff.
TARGET POLLUTANTS/CONTAMINANTS: The pollutants or contaminants at a specific site that will be removed upon implementation of a BMP.

TOPSOIL: Earthy material used as top-dressing for house lots, ground for large buildings, gardens, road cuts, or similar areas. It has favorable characteristics for production of desired types of vegetation or can be made favorable.

TOTAL SUSPENDED SOLIDS (TSS): Matter suspended in water or stormwater.

TRANSMISSIVITY: The rate at which water is transmitted through a unit width of a water-bearing formation under a unit hydraulic gradient. It is equal to the hydraulic conductivity times the thickness of the formation, and is given in units of distance squared per unit time.

TURBIDITY: Reduced clarity in a body of water caused by suspended matter such as clay, silt, algae, and other material, which causes light to be scattered and absorbed, not transmitted in straight lines through the water.

ULTRA-URBAN: Densely developed urban areas in which little pervious surface exists.

UNDERDRAIN: Plastic pipes with holes drilled through the top, installed on the bottom of an infiltration BMP, or sand filter, which are used to collect and remove excess runoff.

UNSATURATED ZONE: The area just below the ground surface and above the seasonal-high ground water table, which is filled with air.

VACTORING: The act of using a vacuum to remove accumulated sediment and other contaminants from containment areas of stormwater treatment devices.

VEGETATION PRACTICES: Stabilization of erosive or sediment-producing areas by grading and covering the soil with: (a) Permanent seeding; producing long-term vegetation cover or (b) Short-term seeding; producing temporary vegetative cover or (c) Sodding; producing areas covered with a turf of perennial sod-forming grass.

WATERSHED: A geographic area in which all surface water drains into a given stream, lake, wetland, estuary, or ocean.

WATER TABLE: The upper surface or top of the saturated portion of the soil or bedrock layer indicating the uppermost extent of ground water.

WATERWAY: A natural course or constructed channel for the flow of water.
WELL RECHARGE AREA: That portion of an aquifer from which ground water can be diverted to a well (sometimes referred to as area of contribution), and upgradient areas from which water flows naturally into the drawdown area of a well.

WELLHEAD PROTECTION AREA: The surface and subsurface area surrounding a water well or wellfield, supplying a public water system, through which contaminants are reasonably likely to move toward and reach such water well or wellfield.
References


New Hampshire Department of Environmental Services Fact Sheets:


Appendix A. Regulatory Checklist
# Regulatory Checklist

<table>
<thead>
<tr>
<th>Regulated Activity</th>
<th>Requirements</th>
<th>Definition</th>
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</table>
| Construction on ≥1 acre site  
http://www.des.nh.gov/Stormwater/construction.htm | Construction General Permit (CGP) | Construction activity that disturbs one or more acre of land, including that conducted by a municipality. |
| Ground Water Discharge  
http://www.des.state.nh.us/dwsspp/gwdisch.htm | Ground Water Release Detection Permit | The proposed facility or activity includes a hazardous waste disposal facility, lined solid waste landfill, lined wastewater lagoon, or a facility for processing soil contaminated with petroleum products; or the facility or activity (such as a new solid waste composting operation or an existing outdoor storage facility for deicing chemicals, junk/salvage yard, or snow dump) will be located in a Class GAA wellhead protection area. |
| Ground Water Discharge  
http://www.des.state.nh.us/dwsspp/gwdisch.htm | Underground Injection Control Registration for Floor Drains | Non-domestic, non-hazardous wastewater free of “regulated contaminants” and human sanitary wastes, that has been or will be generated as a result of commercial or industrial operations discharged through a floor drain to the ground or surface. |
| Ground Water Discharge  
http://www.des.state.nh.us/dwsspp/gwdisch.htm | Temporary Ground Water Discharge Permit | Nonrenewable permit issued for the temporary discharge to the ground or ground water of non-domestic wastewater that has received treatment by best available technology (typically, granular activated carbon) including, but not limited to, the discharge generated from the rehabilitation or redevelopment of a public water supply well or the discharge generated from the dewatering of tank excavations |
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<tr>
<th>Regulated Activity</th>
<th>Requirements</th>
<th>Definition</th>
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<tbody>
<tr>
<td>On-site Septic System Installation</td>
<td>Approval for Septic System Construction/Operation</td>
<td>Commercial or industrial non-domestic, non-hazardous wastewaters generated and discharged through a floor drain, work sink, or other similar release point, located in an area that “regulated contaminants” are used or stored.</td>
</tr>
<tr>
<td>On-site Septic System Installation</td>
<td>Approval for Septic System Construction/Operation</td>
<td>Two separate approvals are needed for septic systems: an Approval to Construct and an Approval to Operate. The first approval is required prior to construction of a septic system or for any building from which wastewater will discharge; the second is required for actual use of the septic system. This rule applies to alternative technologies as well.</td>
</tr>
<tr>
<td>Excavation and Road Construction</td>
<td>Alteration of Terrain Permit</td>
<td>Sand and gravel pits which will disturb more than 100,000 square feet of contiguous area or 50,000 square feet within the area protected by NH RSA 483-B, The Comprehensive Shoreland Protection Act.</td>
</tr>
<tr>
<td>Regulated Underground or Aboveground Storage Tanks</td>
<td>Registration of New and Substantially Modified Aboveground Petroleum Storage Tank (AST) Systems</td>
<td>At least 45 days prior to commencing the construction or installation of a new or replacement AST system having a capacity of more than 660 gallons, or a new or replacement underground or over-water piping system, a completed application along with a complete set of plans that have been prepared and stamped by a New Hampshire licensed professional engineer will be submitted to DES.</td>
</tr>
<tr>
<td>Regulated Activity</td>
<td>Requirements</td>
<td>Definition</td>
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<tr>
<td>Registration of Aboveground Petroleum Storage Tank (AST) Systems</td>
<td>The owner of a regulated AST facility will register all ASTs with DES. A regulated AST facility is one that has a single petroleum AST with a capacity of more than 660-gallons, or two or more petroleum ASTs having a combined storage capacity of more than 1,320-gallons. If a facility stores less than 1,320-gallons of virgin heating oil used only for on-premise use heating of structures, then that virgin heating oil storage is not included in calculating the combined regulated storage capacity.</td>
<td></td>
</tr>
<tr>
<td>Registration of New and Substantially Modified Underground Petroleum Storage Tank (UST) Systems</td>
<td>At least 45 days prior to commencing the construction or installation of a new or replacement UST system having a capacity of more than 1,100 gallons, or a new or replacement underground or over-water piping system, a completed application along with a complete set of plans that have been prepared and stamped by a New Hampshire licensed professional engineer will be submitted to DES.</td>
<td></td>
</tr>
<tr>
<td>Registration of Underground Petroleum Storage Tank (UST) Systems</td>
<td>The owner of a regulated UST facility will register all USTs with DES. A regulated UST facility has at least one petroleum UST with a capacity of more than 1,100-gallons, or at least one UST containing hazardous chemicals and motor fuels with a capacity greater than 110 gallons.</td>
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Source: NH DES
Appendix B. Matrix of Site Design (Structural) BMPs
### Matrix of Site Design (Structural) BMPs

<table>
<thead>
<tr>
<th>Practice &amp; Specifications</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Cold Climate Restrictions</th>
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<tbody>
<tr>
<td><strong>Infiltration BMPs</strong></td>
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</tbody>
</table>
| **Infiltration Basin**    | - Provides ground water recharge  
- Can serve large developments  
- High removal capability for particulate pollutants and moderate removal for soluble pollutants  
- When basin works, it can replicate pre-development hydrology more closely than other BMP options  
- Basins provide more habitat value than other infiltration systems | - Possible risk of contaminating ground water if used at high-risk sites  
- Only feasible where soil is permeable and there is sufficient depth to bedrock and water table  
- Fairly high failure rate  
- If not adequately maintained, can be an eyesore, breed mosquitoes, and create undesirable odors  
- Regular maintenance activities cannot prevent rapid clogging of infiltration basin | - Avoid areas with permafrost  
- Monitor ground water for chlorides  
- Do not infiltrate road/parking lot snowmelt if chlorides are a concern  
- Increase percolation requirements  
- Use 20’ minimum setback between road subgrade and BMP |
| **Size of drainage area**: Moderate to large  
**Site requirements**: Deep, permeable soils  
**Maintenance burdens**: High  
**Longevity**: Low  
**Comparative Cost**: Construction moderate but rehabilitation cost high |            |               |                          |
| **Infiltration trench**   | - Provides ground water recharge  
- Can serve small drainage areas  
- Can fit into medians, perimeters and other unused areas of a development site  
- Helps replicate predevelopment hydrology, increases dry weather baseflow and reduces bankfull flooding frequency | - Possible risk of contaminating ground water  
- Helps replicate predevelopment hydrology, increases dry weather baseflow, and reduces bankfull flooding frequency  
- Possible risk of contaminating ground water if used at high-risk sites  
- Only feasible where soil is permeable and there is sufficient depth to bedrock and water table  
- Since not as visible as other BMPs, less likely to be maintained by residents  
- Requires significant maintenance | - Avoid areas with permafrost  
- Monitor ground water for chlorides  
- Do not infiltrate road/parking lot snowmelt if chlorides are a concern  
- Increase percolation requirements  
- Use 20’ minimum setback between road subgrade and BMP |
<table>
<thead>
<tr>
<th>Practice &amp; Specifications</th>
<th>Advantages</th>
<th>Disadvantages</th>
<th>Cold Climate Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pervious or Porous Surfaces</strong>&lt;br&gt;Size of drainage area: Small  &lt;br&gt;Site requirements: Deep, permeable soils, low slopes, and restricted traffic  &lt;br&gt;Maintenance burdens: Moderate to high  &lt;br&gt;Longevity: Low  &lt;br&gt;Comparative Cost: low to high - based on type of surfacing or pavers</td>
<td>- Can provide peak flow control  - Provides ground water recharge  - Provides water quality control without additional consumption of land</td>
<td>- Requires regular maintenance  - Not suitable for areas with high traffic volume  - Possible risk of contaminating ground water if used at high-risk sites  - Only feasible where soil is permeable, there is sufficient depth to bedrock and water table, and there are gentle slopes</td>
<td>- Only use on non-sanded surfaces  - Pavement may be damaged by snow plows  - Maintenance is essential</td>
</tr>
</tbody>
</table>

| **Open Channel System BMPs** |  |  |  |

| **Grassed Swale**<br>Size of drainage area: Small  <br>Site requirements: Low-density areas with < 15% slope  <br>Maintenance burdens: Low  <br>Longevity: High if maintained  <br>Comparative Cost: Low |  - Requires minimal land area  - Can be used as part of the runoff conveyance system to provide pretreatment  - Can provide sufficient runoff control to replace curb and gutter in single-family residential subdivisions and on highway medians  - Economical |  - Low pollutant removal rates  - Leaching from culverts and fertilized lawns may actually increase the presence of trace metals and nutrients |  - Avoid areas with permafrost  - Use cold- and salt tolerant vegetation  - Plowed snow can be stored in the swale  - Increase underdrain pipe diameter and size of gravel bed  - Provide ice-free culverts  - Ensure soil bed is highly permeable |

<p>| <strong>Dry Swale</strong>&lt;br&gt;Size of drainage area: Small  &lt;br&gt;Site requirements: Low-density areas with &lt; 15% slope  &lt;br&gt;Maintenance burdens: Low  &lt;br&gt;Longevity: High if maintained  &lt;br&gt;Comparative Cost: Low to moderate |  - Requires minimal land area  - Can be used as part of the runoff conveyance system to provide pretreatment  - Can provide sufficient runoff control to replace curb and gutter in single-family residential subdivisions and on highway medians  - Can be used with additional pretreatment BMPs to provide peak flow control |  - Low pollutant removal rates  - Leaching from culverts and fertilized lawns may actually increase the presence of trace metals and nutrients |  - Avoid areas with permafrost  - Use cold- and salt tolerant vegetation  - Plowed snow can be stored in the swale  - Increase underdrain pipe diameter and size of gravel bed  - Provide ice-free culverts  - Ensure soil bed is highly permeable |</p>
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<tr>
<td><strong>Wet Swale</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>Size of drainage area:</strong> Small</td>
<td>• Requires minimal land area</td>
<td>• Possible risk of contaminating ground water if used at high-risk sites</td>
<td>• Avoid areas with permafrost</td>
</tr>
<tr>
<td><strong>Site requirements:</strong> Low-density areas with &lt; 15% slope</td>
<td>• Can be used as part of the runoff conveyance system to provide pretreatment</td>
<td>• Leaching from culverts and fertilized lawns may actually increase the presence of trace metals and nutrients</td>
<td>• Use cold- and salt tolerant vegetation</td>
</tr>
<tr>
<td><strong>Maintenance burdens:</strong> Low</td>
<td>• Can provide sufficient runoff control to replace curb and gutter in single-family residential subdivisions and on highway medians</td>
<td></td>
<td>• Plowed snow can be stored in the swale</td>
</tr>
<tr>
<td><strong>Longevity:</strong> High if maintained</td>
<td>• Can be used where ground water table is high</td>
<td></td>
<td>• Increase underdrain pipe diameter and size of gravel bed</td>
</tr>
<tr>
<td><strong>Comparative Cost:</strong> Low</td>
<td></td>
<td></td>
<td>• Provide ice-free culverts</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Ensure soil bed is highly permeable</td>
</tr>
<tr>
<td><strong>Vegetated Filter Strip</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Size of drainage area:</strong> Small</td>
<td>• Low maintenance requirements</td>
<td>• Often concentrates water, which significantly reduces effectiveness</td>
<td>• Small setback may be required between filter strips and roads when frost heave is a concern</td>
</tr>
<tr>
<td><strong>Site requirements:</strong> Low-density areas with low slopes</td>
<td>• Can be used as part of the runoff conveyance system to provide pretreatment</td>
<td>• Ability to remove soluble pollutants highly variable</td>
<td>• Avoid areas with permafrost</td>
</tr>
<tr>
<td><strong>Maintenance burdens:</strong> Low</td>
<td>• Can effectively reduce particulate pollutant levels in areas where runoff velocity is low to moderate</td>
<td>• Limited feasibility in highly urbanized areas where runoff velocities are high and flow is concentrated</td>
<td>• Use cold- and salt-tolerant vegetation</td>
</tr>
<tr>
<td><strong>Longevity:</strong> Low if poorly maintained</td>
<td>• Provides excellent urban wildlife habitat</td>
<td>• Requires periodic repair, re-grading and sediment removal to prevent channelization</td>
<td>• Plowed snow can be stored in-practice</td>
</tr>
<tr>
<td><strong>Comparative Cost:</strong> Low</td>
<td>• Economical</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Filtering System BMPs</strong></td>
<td></td>
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<tr>
<td><strong>Underground Sand Filter</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Size of drainage area:</strong> Small</td>
<td>• Provide high removal efficiencies of particulates</td>
<td>• Not feasible for drainage areas greater than 5 acres</td>
<td>• Only effective if placed below the frost line</td>
</tr>
<tr>
<td><strong>Site requirements:</strong> Widely applicable</td>
<td>• Require minimal land area</td>
<td>• Only feasible for areas that are stabilized and highly impervious</td>
<td></td>
</tr>
<tr>
<td><strong>Maintenance burdens:</strong> High</td>
<td>• Flexibility to retrofit existing small drainage areas</td>
<td>• Not effective as water quality control for intense storms</td>
<td></td>
</tr>
<tr>
<td><strong>Longevity:</strong> Low to Moderate</td>
<td>• Higher removal of nutrient as compared to catch basins and oil/grit separator</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Comparative Cost:</strong> High</td>
<td></td>
<td></td>
<td></td>
</tr>
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| **Oil/Grit Separator**    | Captures coarse-grained sediments and some hydrocarbons  
Requires minimal land area  
Flexibility to retrofit existing small drainage areas and applicable to most urban areas  
Shows some capacity to trap trash, debris, and other floatables  
Can be adapted to cold climates | Not feasible for drainage area greater than one acre  
Minimal nutrient and organic matter removal  
Not effective as water quality control for intense storms  
Concern exists for the pollutant toxicity of trapped residuals  
Require high maintenance | Most effective if placed below the frost line |
| **Bioretention**          | Provides ground water recharge  
Enhances aesthetics and provides wildlife habitat  
Low maintenance required if properly designed  
Can be successfully installed as retrofits in existing development facilities | Can concentrate water, which reduces effectiveness  
Ability to remove soluble pollutants highly variable | Reduced treatment effectiveness during cold season  
Pretreatment should be used to prevent sedimentation of vegetation  
Use cold- and salt-tolerant vegetation if adjacent to treated area |
| **Pond and Wetland BMPs** | Can provide peak flow control  
Possible to provide good particulate removal  
Can serve large development  
Requires less capital cost and land area when compared to wet pond  
Does not generally release water or anoxic water downstream  
Provides excellent protection for downstream channel erosion  
Can create valuable wetland and meadow habitat when properly landscaped | Removal rates for soluble pollutants are quite low  
Not economical for drainage area less than 10 acres  
If not adequately maintained, can be an eyesore, breed mosquitoes, and create undesirable odors  
Longevity low if not maintained properly | Protect inlet/outlet pipes  
Use large-diameter (>8”) gravel in underdrain of outfall protection  
Consider seasonal operation  
Provide ice storage volume  
Cold-tolerant vegetation |
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<tr>
<td>Wet Pond</td>
<td>• Can provide peak flow control</td>
<td>• Not economical for drainage area less than 10 acres</td>
<td>• Protect inlet/outlet pipes</td>
</tr>
<tr>
<td>Size of drainage area: Moderate to large</td>
<td>• Can serve large developments; most cost-effective for larger, more intensively developed sites</td>
<td>• Potential safety hazards if not properly maintained</td>
<td>• Use large-diameter (&gt; 8”) gravel in underdrain of outfall protection</td>
</tr>
<tr>
<td>Site requirements: Deep soils</td>
<td>• Enhances aesthetics and provides recreational benefits</td>
<td>• If not adequately maintained, can be an eyesore, breed mosquitoes, and create undesirable odors</td>
<td>• Consider seasonal operation</td>
</tr>
<tr>
<td>Maintenance burdens: Low Longevity: High</td>
<td>• Little ground water discharge</td>
<td>• Requires considerable space, which limits use in densely urbanized areas with expensive land and high property values</td>
<td>• Provide ice storage volume</td>
</tr>
<tr>
<td>Comparative Cost: Moderate to High</td>
<td>• Permanent pool in wet ponds helps to prevent scour and resuspension of sediments</td>
<td>• Not suitable for hydrologic soil groups “A” and “B” (USDA NRCS classification) unless a liner is used</td>
<td>• Cold-tolerant vegetation</td>
</tr>
<tr>
<td></td>
<td>• Provides moderate to high removal of both particulate and soluble urban runoff pollutants</td>
<td>• With possible thermal discharge and oxygen depletion, may severely impact downstream aquatic life</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hydrologic damage to stream channels and aquatic habitat is possible due to flow volume.</td>
<td></td>
</tr>
<tr>
<td>Constructed Wetland</td>
<td>• Can provide peak flow control</td>
<td>• Not economical for drainage area less than 10 acres</td>
<td>• Protect inlet/outlet pipes</td>
</tr>
<tr>
<td>Size of drainage area: Moderate to large</td>
<td>• Can serve large developments; most cost-effective for larger, more intensively developed sites</td>
<td>• Potential safety hazards if not properly maintained</td>
<td>• Use large-diameter (&gt; 8”) gravel in underdrain of outfall protection</td>
</tr>
<tr>
<td>Site requirements: Poorly drained soils, space may be limiting</td>
<td>• Enhances aesthetics and provides recreational benefits</td>
<td>• Requires considerable space, which limits use in densely urbanized areas with expensive land and high property values</td>
<td>• Consider seasonal operation</td>
</tr>
<tr>
<td>Maintenance burdens: Annual harvesting of vegetation</td>
<td>• Allows ground water infiltration</td>
<td>• Not suitable for hydrologic soil groups “A” and “B” (USDA NRCS classification) unless a liner is used</td>
<td>• Provide ice storage volume</td>
</tr>
<tr>
<td>Longevity: High</td>
<td>• Permanent pools and vegetation slow the flow of stormwater and help prevent scour and resuspension of sediments</td>
<td>• Hydrologic damage to stream channels and aquatic habitat is possible due to flow volume.</td>
<td>• Cold-tolerant vegetation</td>
</tr>
<tr>
<td>Comparative Cost: Moderate to High</td>
<td>• Provides moderate to high removal of both particulate and soluble urban runoff pollutants</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Adapted from *National Management Measures to Control Nonpoint Source Pollution from Urban Areas*
Appendix C. Schematics of Site Design (Structural) BMPs
Schematic of an Infiltration Basin

Source: National Management Measures to Control NPS Pollution from Urban Areas

BEST MANAGEMENT PRACTICES GUIDEBOOK FOR THE TRI-TOWN AQUIFER
Lakes Region Planning Commission  April 2007

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Schematic of an Infiltration Trench

Source: National Management Measures to Control NPS Pollution from Urban Areas
Schematic of a Grass Swale

Source: National Management Measures to Control NPS Pollution from Urban Areas
Schematic of a dry swale

Source: National Management Measures to Control NPS Pollution from Urban Areas
Schematic of a wet swale

Source: Center for Watershed Protection
Schematic of a Vegetated Filter Strip

Source: Center for Watershed Protection
Schematic of an underground sand filter

Source: National Management Measures to Control NPS Pollution from Urban Areas
Schematic of a typical oil/grit chamber design

Source: Minnesota Urban Small Sites BMP Manual
Schematic of a typical baffle-type oil/grit separator

Source: Minnesota Urban Small Sites BMP Manual
Schematic of a typical CP-type oil/grit separator

Source: Minnesota Urban Small Sites BMP Manual
Schematic of a Bioretention system

Source: National Management Measures to Control NPS Pollution from Urban Areas
Schematic of a Bioretention parking lot island

Source: National Management Measures to Control NPS Pollution from Urban Areas
Schematic of a dry extended detention pond

Source: National Management Measures to Control NPS Pollution from Urban Areas
Schematic of a wet pond

Source: National Management Measures to Control NPS Pollution from Urban Areas
Schematic of a constructed wetland

Source: National Management Measures to Control NPS Pollution from Urban Areas