

Report

Town of
WEST GREENWICH
Rhode Island

**Phase II
Storm Water
Management Plan**

October 2003

The Louis Berger Group Inc.



TABLE OF CONTENTS

	Page
1.0 INTRODUCTION.....	1-1
1.1 PROJECT PURPOSE	1-1
1.2 BACKGROUND	1-1
2.0 TOWN WATER RESOURCES	2-1
2.1 DESCRIPTION OF TOWN WATER RESOURCES	2-1
2.2 CURRENT WATER QUALITY CONDITIONS.....	2-2
2.3 LAND USE/SOILS DATA.....	2-4
3.0 PUBLIC EDUCATION AND OUTREACH	3-1
3.1 REGULATORY REQUIREMENTS.....	3-1
3.2 PARTNERSHIPS	3-1
3.3 EDUCATIONAL STRATEGIES.....	3-3
3.3.1 Existing School Programs	3-3
3.3.2 Available Educational Resources	3-3
3.4 REACHING DIVERSE AUDIENCES	3-5
3.5 TOWN PUBLIC EDUCATION AND OUTREACH STRATEGIES	3-6
3.5.1 Storm Water Outreach Materials	3-6
3.5.2 Storm Water Web Page	3-6
3.5.3 School Curricula	3-6
3.5.4 Target Audience.....	3-7
3.5.5 Local Access Channel.....	3-7
3.6 MEASURABLE GOALS	3-7
4.0 PUBLIC PARTICIPATION	4-1
4.1 REGULATORY REQUIREMENTS.....	4-1
4.2 VOLUNTEER EFFORTS AND CITIZEN GROUPS.....	4-1
4.3 TOWN PUBLIC PARTICIPATION STRATEGIES	4-3
4.3.1 Public Meetings	4-3
4.3.2 Walk and Ride on the Rural Side.....	4-3
4.3.3 Storm Water Web Page.....	4-3
4.3.4 Storm Drain Marking.....	4-3
4.3.5 Town Co-Sponsored Cleanups	4-4
4.3.6 Tree Seedling Program	4-4
4.4 MEASURABLE GOALS	4-5

TABLE OF CONTENTS (CONTINTUED)

	Page
5.0 ILLICIT DISCHARGE DETECTION AND ELIMINATION	5-1
5.1 REGULATORY REQUIREMENTS.....	5-1
5.2 STORM WATER MAPPING.....	5-2
5.2.1 Existing Mapping	5-2
5.2.2 New Mapping	5-3
5.2.3 Storm Water System GIS Mapping	5-4
5.3 ILLICIT DISCHARGE DETECTION AND ELIMINATION	5-5
5.3.1 Potential Illicit Discharges from Failing Septic Systems	5-6
5.3.2 Potential Illicit discharges from Other Sources	5-6
5.4 MEASURABLE GOALS	5-10
6.0 CONSTRUCTION SITE RUNOFF CONTROLS.....	6-1
6.1 REGULATORY REQUIREMENTS.....	6-1
6.2 EXISTING TOWN ORDINANCES/REGULATIONS	6-1
6.2.1 Subdivision Regulations	6-1
6.2.2 Soil Erosion and Sediment Control Ordinance	6-1
6.3 RECOMMENDED MODIFICATIONS	6-2
6.4 MEASURABLE GOALS	6-3
7.0 POST CONSTRUCTION SITE RUNOFF CONTROL.....	7-1
7.1 REGULATORY REQUIREMENTS.....	7-1
7.2 EXISTING TOWN ORDINANCES/REGULATIONS	7-1
7.2.1 Subdivision Regulations	7-1
7.2.2 Soil and Erosion Control Ordinance	7-2
7.3 RECOMMENDED MODIFICATIONS	7-2
7.4 MEASURABLE GOALS	7-3
8.0 POLLUTION PREVENTION/GOOD HOUSEKEEPING	8-1
8.1 REGULATORY REQUIREMENTS.....	8-1
8.2 CURRENT PRACTICES AND RECOMMENDED MODIFICATIONS	8-1
8.2.1 Storm Drainage System Inspection and Maintenance	8-1
8.2.2 Street Sweeping	8-3
8.2.3 Fleet Vehicle Maintenance	8-3
8.2.4 Sand/Salt Storage and Use	8-4
8.2.5 Building and Landscaped Area Maintenance	8-4

TABLE OF CONTENTS (CONTINTUED)

	Page
8.2.6 Solid Waste Collection and Disposal.....	8-4
8.2.7 Hazardous Materials Handling and Storage	8-5
8.3 MEASURABLE GOALS	8-6
9.0 EVALUATION AND USE ASSESSMENT REPORTING	9-1
9.1 EVALUATION/REPORTING REQUIREMENTS	9-1
9.2 PLANNED REPORTING	9-1
10.0 STORM WATER ABATEMENT OPPORTUNITIES	10-1
11.0 POTENTIAL FUNDING SOURCES	11-1
12.0 PUBLIC PARTICIPATION	11-1
12.1 PUBLIC WORKSHOPS/PUBLIC HEARING	12-1
12.2 PUBLIC COMMENTS.....	12-1
12.3 AGENCY COMMENTS	12-1
12.4 RESPONSIVENESS SUMMARY	12-1

APPENDICES

APPENDIX A:	Storm Water Outreach Materials
APPENDIX B:	Public Meeting Materials
APPENDIX C:	Sample Storm Drain Markers
APPENDIX D:	Existing Land Development and Subdivision Regulations
APPENDIX E:	Existing Soil Erosion and Sediment Control Ordinance
APPENDIX F:	Proposed Modifications – Soil Erosion and Sediment Control Ordinance
APPENDIX G:	Proposed Modifications – Land Development and Subdivision Regulations
APPENDIX H:	Draft Storm Water Ordinance
APPENDIX I :	DEM SRF Facilities Planning Checklist

LIST OF EXHIBITS

EXHIBIT 1-1:	Population Density	1-2
EXHIBIT 2-1:	Sub-basin Areas	2-3
EXHIBIT 2-2:	Landuse	2-5
EXHIBIT 8-1:	Town Facilities	8-2
EXHIBIT 10-1:	Abatement Opportunities	10-3

1.0 INTRODUCTION

1.1 PROJECT PURPOSE

The Rhode Island Pollutant Discharge Elimination System (RIPDES) Program recently enacted Phase II Storm Water regulations that require operators of municipal separate storm sewer systems (MS4s) to implement programs and practices to minimize pollution from storm water runoff. The new regulations require MS4s within urbanized or densely populated areas to develop storm water management programs and to obtain RIPDES Phase II storm water permits.

The Town of West Greenwich has initiated development of their storm water management program by retaining the Louis Berger Group, Inc. (Berger) to develop a Storm Water Management Plan (SWMP) for the Town. Funding for this project is being provided by a grant from RIDEM's Non-Point Source Pollution Grants Program. The goal of the SWMP is to reduce the adverse impacts to water quality, aquatic habitat and human health by instituting the use of controls on the unregulated sources of storm water discharges that have the greatest likelihood of causing continued environmental degradation.

1.2 BACKGROUND

The RIPDES Storm Water Phase II regulations are the next step in the U.S. Environmental Protection Agency's (EPA's) and Rhode Island Department of Environmental Management's (DEM's) effort to preserve, protect and improve the State's waters from polluted storm water runoff. Operators of MS4s within urbanized or densely populated areas are subject to these new regulations.

Urbanized areas are comprised of one or more places and the adjacent densely settled surrounding area that together have population of at least 50,000 people. Densely populated areas are census designated places that are located outside the urbanized area and meet the following criteria: 1- the population density is equal to or greater than 1,000 people per square mile; and 2- it is part of a block of contiguous census designated places with a total population of at least 10,000 people.

The Town of West Greenwich, Rhode Island, encompasses an area of approximately 51 square miles. The Town is located approximately 25 miles south of Providence along interstate 95 in Kent County. It is bounded by Coventry, Exeter, and East Greenwich to the north, south and east respectively, and by the State of Connecticut to the west. West Greenwich contains approximately 560 acres of water area (rivers, ponds and streams) within its boundaries.

Although West Greenwich is essentially a rural, it is required to file for a Phase II storm water permit because of the presence of a few densely populated areas within the Town. West Greenwich's overall population density is approximately 100 persons per square mile, but the population density within the Mishnock Lake and Bailey Pond areas exceed 1,000 persons per square mile. A map depicting the population density of the Town of West Greenwich is shown in Figure 1-1.

Figure 1-1
Population Density

EPA and RIDEM are targeting urbanized areas because numerous studies have shown that the type and density of land use has a direct impact on the volume, rate of runoff and the amount of contaminants present in that runoff. EPA has established six minimum control measures designed to improve water quality by reducing the quantity of pollutants that enter urban drainage systems during storm events.

Under the Phase II Program, West Greenwich is required to develop and submit a SWMP that addresses how the Town will comply with the EPA established six minimum control measures. The control measures include:

1. Public Education and Outreach
2. Public Involvement/Participation
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff Controls
5. Post-Construction Site Runoff Controls
6. Pollution Prevention/Good Housekeeping

This SWMP, incorporated herein, was developed with invaluable input from the public, Town staff and a steering committee developed specifically for this project. Town staff included: Jennifer Paquet, Planner; David Andrews, Highway Supervisor; and Clay Hopper, Building Inspector. The steering committee was comprised of the aforementioned town staff plus Sandy Bockes, Conservation Commission; Mark Tourgee, Land Trust; Mark Boyer & Brad Ward, Planning Board.

The following sections each describe a particular minimum control measure, the regulatory requirements for that control measure, a description of the Town's current and/or planned actions, and specific measurable goals with associated target completion years. As also required, each measurable goal identifies a department within the Town that is anticipated to be responsible for ensuring that measurable goal is achieved. Listed below is the contact information for the Town officials, responsible for each department referenced within the report.

West Greenwich Hall 280 Victory Highway West Greenwich, RI 02817
Planning Department Jennifer Paquet – Town Planner phone 401-392-3800 ext. 111 fax 401-392-3805 email: jrpaquet@wgtownri.org
Highway Department David Andrews – Highway Supervisor phone 401-392-3800 fax 401-392-3805 email: wgdpw@wgtownri.org
Building Department Clay Hopper- Building Inspector phone 401-392-3800 fax 401-392-3805 email: cdhopper@wgtownri.org

2.0 TOWN WATER RESOURCES

2.1 DESCRIPTION OF TOWN WATER RESOURCES

West Greenwich is divided into two main watersheds or sub-basins and several smaller sub-basins. The main watersheds include the Pawtuxet River watershed and the Pawcatuck River watershed. The sub-basins include: Big River, Wood River, Queens River, South Branch Pawtuxet River, Quinebaug River and Hunt River. The significant water resources located within the Town are listed in Table 2-1.

Table 2-1
SIGNIFICANT WATER RESOURCES WITHIN TOWN'S SUB-BASINS

Wood River Sub-basin ▪ Wood River ▪ Falls River ▪ Breakheart Brook ▪ Acid Factory Brook ▪ Eisenhower Lake ▪ Flat River ▪ Tillinghast Pond ▪ Wickaboxet Pond ▪ Hudson Pond ▪ Hazard Mill Pond ▪ Tippencansett Pond ▪ Coney Brook ▪ Phillips Brook and Pond ▪ Kelly Brook ▪ Hudson Pond Queen River Sub-basin ▪ Queen River A ▪ Paradise Brook ▪ Fisherville Brook A	Big River Sub-basin ▪ Big River ▪ Nooseneck River ▪ Yard Pond ▪ Fry Pond ▪ Carr River and Pond ▪ Capwell Mill Pond ▪ Sweet Pond ▪ Breakheart River and Pond ▪ Reynolds Pond ▪ Tarbox Pond ▪ Racoon Brook Hunt River Sub-basin ▪ Frenchtown Brook A Quinebaug River Sub-basin ▪ Great Grass Pond A S.Branch Pawtuxet River Sub-basin ▪ Lake Mishnock ▪ Phelps Pond
--	---

RIDEM has categorized most surface waters of the state according to a water use classification system based on considerations of public health, recreation, propagation and protection of fish and wildlife, and social and economic benefit. Each water body has been designated for specific uses, and the assigned classification is intended to protect the most sensitive uses of that water body.

The following water bodies have been assigned water quality classification Class A by RIDEM:

- Great Grass Pond;
- Big River and all tributaries including Nooseneck, Congdon and Carr Rivers; Carr, Tarbox, Millbrook and all other ponds of the Big River system;
- Fisherville Brook;
- Queen River;
- Wood River and all tributaries including Breakheart Brook, Acid Factory Brook, Flat River, Fall River, and Parris Brook and Breakheart, Tillinghast, Hazard, Wickaboxet and Tipencansett Ponds; and
- Frenchtown Brook.

These water quality classifications denote the water quality goals for the waterbody, not the present conditions. Within West Greenwich waters have been classified as Class A. Following is a description of the applicable water classification from RIDEM's *Water Quality Regulations*, August 6, 1997:

Class A: These fresh waters are designated as a source of public drinking water supply, for primary and secondary contact recreational activities and for fish and wildlife habitat. They shall be suitable for compatible industrial processes and cooling, hydropower, aquacultural uses, navigation, and irrigation and other agricultural uses. These waters shall have good aesthetic value.

RIDEM has further identified several water bodies in West Greenwich as Special Resource Protection Waters. These waters have been identified by RIDEM as having significant ecological or recreational uses, such as public drinking water supplies, or tributaries thereto, waterbodies containing critical habitat or special wetland features. The water bodies in West Greenwich that have been designated as Special Resource Protection Waters include: Big River, Tippencast Pond and Wickaboxet Pond.

West Greenwich watersheds (sub-basins) and significant water resources and their associated water quality classifications are shown on Figure 2-1.

2.2 CURRENT WATER QUALITY CONDITIONS

RIDEM periodically assesses the condition of certain waterbodies in the state utilizing water quality information from a variety of sources including: data collected by state, federal and local agencies; universities; and volunteer monitoring organizations. RIDEM utilizes this information to produce a list of impaired waters called the State 303(d) List, which identifies waterbodies which may not currently meet Rhode Island Water Quality Standards. Total maximum daily loads (TMDLs) are planned to be developed for each of these water bodies. The purpose of a TMDL is to identify the capacity of a water body to assimilate pollutants without impacting its designated uses. The goal of a TMDL is to develop and implement a plan aimed at restoring the impaired water body to an acceptable condition that meets Water Quality Standards and supports its designated uses. The TMDL analysis examines point sources such as industrial discharges as well as nonpoint sources such as storm water runoff.

The list of impaired waterbodies also identifies the priority ranking for a TMDL, and the scheduled time frame for development of a TMDL. RIDEM has indicated that the ranking is not representative of the severity of water quality impacts, but rather reflects the priority given for TMDL development with consideration to shellfishing waters, drinking water supplies and other areas identified by the public as

Insert Figure 2-1
Subbasin Areas

high priority areas. The following five groups are utilized in the 2002 303(d) list to describe the appropriate place in the TMDL process for each waterbody:

- Group 1 - TMDL development underway.
- Group 2 - TMDL development is planned.
- Group 3 - Additional dissolved metals data is required.
- Group 4 - Insufficient data is available and further monitoring is required.
- Group 5 - TMDL or equivalent Control Action Plan developed and implementation is underway.

The West Greenwich waterbody that is on the State 303(d) list is shown below along with a summary of the impairments to that waterbody, and the TMDL priority ranking. A small portion of this waterbody is located in West Greenwich, the remainder is located in East Greenwich.

**Table 2-2
IMPAIRED WATER BODY**

Name of Water Body	Impairment	TMDL Priority Ranking
Frenchtown Brook	Pathogens	Group 2

2.3 LAND USE/SOILS DATA

As described in the West Greenwich Comprehensive Community Plan – Element VII Land Use (dated 1995), 40 percent of the land in West Greenwich is public open space totaling approximately 13,127 acres. Much of this land is in the public trust as part of the Big River Reservoir Watershed. Substantial acreage is also occupied by the W. Alton Jones Campus of the University of Rhode Island. Approximately 3 percent of the Town is zoned for business or industrial purposes and the balance is designated as rural, farming and residential. West Greenwich has two residential zoning districts: RFR-1 (one acre lots) which accounts for approximately 1.5 percent of the land area in Town, and RFR-2 (two acre lots) which accounts for approximately 55 percent of the land area. The Lake Mishnock and Bailey Pond areas, although currently zoned as RFR-1 and RFR-2 respectively, have numerous non conforming lots that are one-half acre or less. According to Census 2000 data, just over 1,800 housing units currently exist in Town.

Current land use in West Greenwich, as depicted utilizing Rhode Island Geographic Information Systems (RIGIS) data, is shown in Figure 2-2. Given the rural nature of most portions of West Greenwich, and the extensive tracts of public open space, potential storm water quality impacts due to land use are expected to be limited. These potential impacts would likely occur in the Lake Mishnock and Bailey Pond areas and in the limited commercial industrial areas within the Town.

As described in the West Greenwich Comprehensive Community Plan – Element I Natural and Cultural Resources, the Town's soils can be grouped in the following RIGIS soil categories. The Town contains approximately 3,000 acres of prime farmland, approximately 3,100 acres of land with moderate constraints to development, 3,900 acres of land where the seasonal high water table is between 19 and 42 inches below the ground surface, 3,400 acres of land with bedrock and slope constraints, and 5,000 acres of hydric soils.

Insert Figure 2-2
Land Use

3.0 PUBLIC EDUCATION AND OUTREACH

3.1 REGULATORY REQUIREMENTS

The success of a SWMP relies heavily on the input of an informed and knowledgeable community. Public education will improve the Town's ability to gain support for the program as more residents will comprehend why it is necessary and important. Additionally, there will be greater compliance with the program as the public understands what personal responsibilities are expected of them. To satisfy the requirements of this minimum control measure, the Town must:

- Implement a public education program to distribute educational materials to the community, or conduct equivalent outreach activities about the impacts of storm water discharges on local waterbodies and the steps that can be taken to reduce storm water pollution; and
- Determine the appropriate BMPs and measurable goals for this minimum control measure.

3.2 PARTNERSHIPS

Operators of MS4s are encouraged to enter into partnerships with other organizations to reap the benefits of outreach services and support. Several organizations exist that currently provide public education resources on storm water quality issues.

The organizations that have the best potential to enter into a partnership with the Town of West Greenwich and provide education and outreach materials are the following:

Southern Rhode Island Conservation District (SRICD)

The SRICD provides a variety of environmental services to southern RI communities. Of particular interest is the Active Watershed Education (AWEsome!) curriculum. The program offers a watershed education curriculum to teachers and is discussed in detail in Section 4.2. The SRICD can be reached at (401) 822-8832 or <http://www.sricd.org>, and is located at 60 Quaker Lane, Suite 46, Warwick, RI 02886-0114. The SRICD is assisted by its cooperating sister agency, the Northern Rhode Island Conservation District (NRICD).

University of Rhode Island (URI)

The University of Rhode Island offers several outreach and educational programs through the URI Cooperative Extension Service. Many of these programs may be beneficial to the Town of West Greenwich in its effort to provide storm water education and outreach.

- URI Nonpoint Education for Municipal Officials (NEMO): NEMO offers training in the science, management, and regulation of water and water resources. This program is geared toward community leaders and volunteer board members. Its goal is to provide decision makers with the skills and resources to identify local water quality problems and to adopt effective pollution controls. Educational programs range from evening or one-day workshops to intensive small group training tailored to meet the participants' needs and interests. For more information, interested parties should contact Lorraine Joubert, Program Director, at (401) 874-2138 or ljoubert@uri.edu. The URI NEMO program has recently joined the National NEMO Network which is located at Middlesex County Extension Center, 1066 Saybrook Road, Box 70, Haddam, CT, 06438 or (860) 345-4511.
- Rhode Island Source Water Assessment Program (SWAP): Rhode Island's EPA-approved Source Water Assessment Program is administered by the RI Health, Office of Drinking Water Quality. There are four basic requirements for this program:
 - Delineate the source water protection areas
 - Inventory all potential sources of contamination to the water supply
 - Assess the overall susceptibility of the water supply to contamination; and
 - Make the results of the assessments known to the water suppliers and consumers.

Additional information on this program can be reviewed online at <http://www.uri.edu/ce/wq/program/html/SWAP.html>. Volunteer opportunities and training for interested participants and volunteers are also available.

Cooperative State Research, Education, and Extension Service (CSREES) Water Quality Program

The CSREES Water Quality Program was authorized under Section 406 of the Agricultural Research, Extension, and Education Reform Act of 1998 for an Integrated Research, Education, and Extension Competitive Grants Program. This program provides the necessary flexibility for CSREES to bring the resources of researchers, instructors, and extension educators to national initiatives and programmatic partnerships that target evolving water quality needs.

The New England Extension Water Quality Program focuses on the following areas:

- Volunteer Water Quality Monitoring;
- Community-Based Watershed Protection;
- Agricultural Best Management Practices; and
- Residential Pollution Prevention.

The community-based watershed management approach may be of most interest to the Town of West Greenwich. This approach addresses the need for watershed-scale research, technical tool development, and education, while also recognizing that the land use decisions that determine watershed health are largely made at the local level. For more information, contact Art Gold of the Department of Natural Resources Science at URI at (401) 874-2903 or agold@uri.edu.

3.3 EDUCATIONAL STRATEGIES

3.3.1 Existing School Programs

The following text is a summary of existing environmental education or non-point source pollution education programs which are taught in the Exeter - West Greenwich Public School District.

Wawaloam School

Walk and Ride on the Rural Side – sponsored by the West Greenwich Land Trust. This program raises cultural awareness of our rich rural heritage. A preservationist focus is presented to instill student ownership in their natural surroundings.

Numerous educational opportunities exist at the classroom level. The school program is involved with clean up and the planting of flowers in the community. Students traditionally take part in Arbor Day celebrations in the two communities.

Metcalf School

Students at Metcalf take part in a nature trail clean up activity in the community. Clean-up efforts are also focused on the Metcalf grounds. Students also take part in the planting of gardens at school.

Junior High School

Ozone monitor in Exeter and West Greenwich – Students are involved in a program in science class that tracks air quality levels through the use of tree ring studies – “The rings tell the story.”

Clean up projects on the school grounds and surrounding areas are also undertaken.

Senior High School

EEL Grass Project – In conjunction with URI, students grow eelgrass, which is eventually transplanted into the Narragansett Bay. The eelgrass assists in the reduction of sediment erosion and provides a nursery for various aquatic species.

Organic Green House – Major effort in the growth of various plants, which are available to students and the public.

Recycling Club - School wide recycling effort headed up by the science department. Recycling focuses on aluminum and paper products.

National Honor Society Clean Up – NHS routinely takes part in clean-up efforts around the school grounds and Route 3.

3.3.2 Available Educational Resources

A variety of educational resources focusing on environmental issues are available for Exeter - West Greenwich School District teachers to utilize. These resources include:

Southern Rhode Island Conservation District: “AWEsome Curriculum”

The Active Watershed Education (AWEsome!) curriculum was developed by the Southern Rhode Island Conservation District (SRICD) and the University of Rhode Island. The AWEsome! curriculum is nationally recognized, and it assists teachers and their students with studying a watershed, participating in hands-on science, and investigating local environmental issues.

The curriculum connects classroom learning with the outside world and encourages active learning. Activities include water quality tests, sampling streams and ponds for aquatic insects, writing and performing watershed plays, creating watershed models, holding mock Town meetings, conducting stream clean-ups, and investigating local environmental issues. These activities were developed in an effort to educate children and adults about their watersheds and the critical importance of protecting the water supply.

The *AWESome!* Curriculum is comprised of twelve study units:

1. What is a Watershed?
2. Wetland Ecology
3. Wetland Exploration: a Field Trip
4. Water Resources
5. Soil Resources
6. Effects of Land Use on a Watershed
7. Cultural Resources in the Watershed
8. Introduction to Water Quality Issues
9. Point Sources of Pollution: a Field Trip
10. Non-Point Sources of Pollution
11. Non-Point Sources of Pollution: a Field Trip
12. Public Hearing and Citizens Action: a Final Look

The program is geared toward grades K-8, and while the curriculum guide is most readily adaptable for middle-school aged students, all grades from first through eighth are welcome to participate. More information on the *AWESome!* Curriculum can be obtained from the Southern Rhode Island Conservation District office at (401) 822-8832, or <http://www.sricd.org>.

U.S. Environmental Protection Agency's Environmental Education Center (EEC)

The Environmental Education Center, an extensive on-line resource, provides teachers with information from across the agency on areas such as curriculum resources and activities, community service projects, and other subjects. (The EEC can be found at www.epa.gov/teachers/) The resource is useful in providing educators with curricula for students in grades K-12. More information on educational resources may be obtained from the USEPA Region 1 (New England) office located at 1 Congress Street, Suite 1100, Boston, MA 02114-2023.

Specific curriculum tools pertaining to storm water management and non-point source pollution can be found at:

- www.epa.gov/teachers/background_water.htm and
- www.epa.gov/teachers/curriculumwater.htm

U.S. Geological Survey's (USGS) Water Science for Schools

The USGS Water Science for Schools web site is found at <http://ga.water.usgs.gov/edu/index.html>. The program offers information on many aspects of water, along with pictures, data, maps, and an interactive opinion and testing center.

U.S. Geological Survey's (USGS) Water Resources Education Initiative

The USGS Water Resources Education Initiative developed through a cooperative effort between public and private education interests. Program partners include the Bureau of Reclamation, the U.S. Fish and Wildlife Service of the U.S. Department of the Interior, the National Oceanic and Atmospheric

Administration, the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the Nebraska Groundwater Foundation, and the National Science Teachers Association.

Poster titles include: “Watersheds: Where We Live”, “Oceans-Coastal Hazards: Hurricanes, Tsunamis, Coastal Erosion”, “Hazardous Waste: Cleanup and Prevention”, “Wetlands: Water, Wildlife, Plants, & People!”, “Water: The Resource That Gets Used & Used & Used for Everything!”, “How Do We Treat Our Wastewater?”, “Navigation: Traveling the Water Highways!”, “Ground Water: The Hidden Resource!”, and “Water Quality...Potential Sources of Pollution”. The posters in the series are designed to be joined to create a large wall mural.

A series of water-resources education posters were developed through the Initiative. All posters are available in color. The reverse sides of the posters contain educational activities for children in either grades 3-5 or 6-8. Copies of the posters in the series can be obtained at no cost from the USGS (specify the poster title and grade levels desired) at:

U.S. Geological Survey
Branch of Information Services
Box 25286 - Denver Federal Center
Denver, CO 80225
Telephone: 1-888-ASK-USGS

Rhode Island Department of Environmental Management (RIDEM): Resources for Students and Teachers

RIDEM offers a variety of student and teacher educational resources on its web site at <http://www.state.ri.us/dem/topics/learning.htm>. The resources are organized by topic and by educational level, ranging from teacher-training opportunities and short courses for environmental professionals to the Adopt-A-Watershed K-12 learning experience. Adopt-A-Watershed uses a local watershed as a living laboratory in which students engage in hands-on activities. The entire inventory of educational resources can be reviewed at the RIDEM web site.

3.4 REACHING DIVERSE AUDIENCES

According to the data compiled by the 2000 U.S. Census for the Town of West Greenwich, approximately 4.1% of West Greenwich residents speak a language other than English, and <1% of West Greenwich residents (over the age of 5) indicated that they speak English less than “very well”. English literacy rates for the Town, are not reported within the 2000 U.S. Census data.

The given Census data indicates that it may be unnecessary to conduct a public education and outreach program in a language other than English, given that over 99% of the Town’s population reports speaking English “very well”. West Greenwich’s public education program will reach a diverse audience by targeting children as well as adults.

3.5 TOWN PUBLIC EDUCATION & OUTREACH STRATEGIES

3.5.1 Storm Water Outreach Materials

A Town-specific water quality educational brochure has been developed based on the RIDEM “10 Simple Things You Can Do to Help Clean Rhode Island Waters” brochure. This brochure provides information

on West Greenwich's watersheds, and ways residents can improve them including: avoidance of feeding waterfowl, proper pet waste disposal, septic system inspection/maintenance, proper use of fertilizers, hazardous waste reduction, water conservation, and volunteering. This brochure also contains valuable web addresses and phone numbers where residents can obtain more information on reducing storm water runoff pollution and improving water quality. The Town plans to print and mail this brochure to every household in West Greenwich, which according to 2000 Census data, totals approximately 1,750 households. Berger tailored the brochure as part of the SWMP contract, therefore the cost to print and distribute this brochure will be limited to printing costs and the cost for the bulk mailing. The cost to print this tri-fold color brochure (1,750 copies) is estimated to be approximately \$800.00. A copy of the brochure is included in Appendix A.

In addition to distributing this brochure directly to residents, the Town also plans on having it available at Town hall and the public library. Additional materials that will be made available at these locations include RIDEM and EPA published storm water outreach materials such as: "What Do You Know About Nonpoint Source Pollution?" brochure, "Please Do Not Feed Waterfowl" brochure, "Healthy Lawn, Healthy Environment, Caring for Your Lawn in an Environmentally Friendly Way" workbook, "Water Efficient Landscaping" manual, "Protecting Water Quality from Urban Runoff" fact sheet, and "Septic System Checkup: The Rhode Island Handbook for Inspection". Samples of these outreach materials are included in Appendix A. These materials are currently available from RIDEM and EPA, therefore some additional printing costs are anticipated to make these materials available at the aforementioned locations. The Town will track the number of brochures collectively taken from the Town hall and public library in the first year of the permit.

3.5.2 Storm Water Web Page

The Town plans to add a storm water web page to its existing web site at www.wgTownri.org. The web page will contain information on how residents and businesses can reduce storm water pollution and improve water quality. Electronic copies of educational brochures will be available, as will Power Point slides on storm water pollution reduction. The web page will show a map of West Greenwich with the significant water resources noted and the watershed boundaries delineated. The web page will contain links to EPA's storm water web page, Save the Bay web page and various other water quality resource sites. Most resources that will be utilized on the web page have been developed by EPA and other organizations or were developed by Berger as part of this SWMP contract. The Town has a fully-functional web site, therefore the cost to implement a storm water web page would be limited to incorporating existing information and resources on a page within the Town's existing site. This is estimated to take approximately 8 to 10 hours of the Town web administrator's time. The Town will also install a hit counter on the storm water web page to track the number of people accessing the page.

3.5.3 School Curricula

The Town will review available storm water and water quality curricula developed by EPA, USGS and other agencies as identified in Section 3.3.2 Available Educational Resources. The Town will identify those curricula that provide the best educational tools for improving storm water quality. Information on the top curricula will be provided to the school board and to each public school in West Greenwich. This effort will be coordinated with the neighboring Town of Exeter. The cost of reviewing and evaluating available educational materials is expected to be limited to staff time, plus some additional minor costs for copying and sending out the educational materials. Copying and postage costs are estimated at under \$100.

3.5.4 Target Audience

The Town of West Greenwich plans to target educational outreach to the densely populated residential areas surrounding Lake Mishnock and Bailey Pond. In the second year of the permit, the Town plans to provide each homeowner in these areas with brochures on the proper maintenance of septic systems. Materials will be distributed either via a direct mailing or door to door by volunteers. The educational materials will also explain the direct effect that a failing septic system has on the lake or pond in their neighborhood. The Town plans to utilize a Home-A-Syst volunteer or a Save the Bay representative to speak at an evening workshop in the area about septic systems. There is no direct cost associated with the evening meeting aside from staff and volunteer time required to arrange and hold the meeting. The cost associated with publishing and distributing education materials to these limited areas is estimated to be approximately \$300 to \$400.

A second audience the Town plans to target with storm water educational materials is auto salvage yards. The Town plans to provide yard owners with EPA educational materials that describe operational measures that prevent storm water pollution. These measures include proper handling techniques for oils, antifreeze and other automotive fluids as well as protective storage for batteries, parts and other automotive equipment. Auto salvage yards should be permitted through DEM's storm water program, so these educational materials are intended to remind salvage yard owners of the importance of proper handling techniques to keep storm water free of pollution. The educational materials are available directly from EPA, therefore the only cost anticipated for this outreach is the cost to mail/deliver the materials to the salvage yard owners. This cost is estimated at less than \$50.

3.5.5 Local Access Channel

The Town of West Greenwich plans to develop storm water public service announcements to air on the local public access channel. These announcements will provide information to residents on how to improve storm water quality in West Greenwich. The Town will investigate airing educational videos on storm water and non-point source pollution prevention if such videos become available from EPA, USGS or other educational resources. It is presumed that the educational videos will be available for free or for a nominal cost, therefore the costs associated with this outreach method is expected to be limited to staff time.

3.6 MEASURABLE GOALS

Table 3-1 outline the measurable goals, target dates and responsibilities that have been established to ensure proper implementation of this minimum control measure.

Table 3-1
PUBLIC EDUCATION MEASURABLE GOALS

TARGET YEAR	ACTIVITY	TOWN DEPARTMENT RESPONSIBLE*
1	Town specific storm water brochure developed.	Planning
	Storm water brochures distributed via a bulk direct mailing.	
	Storm water article published in West Greenwich Land Trust Newsletter.	
2	Storm water web page added to Town web site.	Bldg/Zoning
	Storm water web page hit-counter added.	
	Information on storm water posted at Town hall, and library. Town tracks number of brochures taken.	Planning
	ISDS educational materials distributed to homeowners in Lake Mishnock and Bailey Pond areas.	DPW, Planning
	Evening workshop on ISDS maintenance held in neighborhood.	
3	Storm water pollution prevention educational materials distributed to local auto salvage yards.	Planning
	School curricula developed utilizing EPA and other existing information.	
	Public service announcements posted on local public access channel. Investigate airing educational videos.	
4	Continue posting storm water public service announcements &/or videos on local access channel if deemed effective.	Planning
	Second article published in West Greenwich Land Trust Newsletter	

* See Section 1.2 for names and titles of staff responsible within each Department. The Town is to complete this section in each of the Measurable Goals tables.

4.0 PUBLIC PARTICIPATION

4.1 REGULATORY REQUIREMENTS

The success of any SWMP relies heavily on the interaction with and comments of an informed community. The public can provide valuable input and assistance to the development of a regulated SWMP. The anticipated benefits of public involvement are; broader public support, shorter implementation schedules, a broader base of expertise and economic benefits, and a conduit to other programs as citizens involved in the SWMP provide valuable relationships with other community and government programs. To satisfy the requirements of this minimum control measure, the Town must:

- Comply with applicable State and local public notice requirements; and
- Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

4.2 VOLUNTEER EFFORTS AND CITIZEN GROUPS

University of Rhode Island (URI) Watershed Watch

The URI Watershed Watch Program was developed as a cooperative effort among local governments, watersheds, and other organizations to assess water quality by recruiting and training volunteers to become “citizen scientists.” The Watershed Watch Program research is focused on long-term ecological monitoring of Rhode Island’s fresh and salt water resources, including lakes, ponds, rivers, streams, and coastal waters. Volunteers are provided with training, equipment, supplies, and analytical services for recording weekly measurements. The program is intended to encourage communities and shoreline residents to understand the need to manage and improve the water quality of all water bodies within a given watershed. The goals of the URI Watershed Watch Program are:

- To promote active citizen participation in water quality protection.
- To educate the public about water quality issues.
- To obtain multi-year surface water quality information in order to ascertain current conditions and to detect trends.
- To encourage sound management programs based upon water quality information.

Water quality monitoring requires a time commitment of one to two midday hours per week. Volunteers can choose the day of the week that is most convenient for them. The monitoring season extends from late April to early November, and generally can not be started mid-season. No water quality monitoring experience is necessary. Volunteers must provide the means to get to their monitoring locations (i.e. canoe, kayak, or boat), which are typically the deepest part of the lake, or

mid-stream for rivers. Results of the monitoring are published in a biennial report. Interested parties can contact Elizabeth Herron, Program Coordinator at emh@ri.edu or (401) 874-4552.

Save The Bay (STB)

Volunteers are involved in virtually every facet of Save the Bay's work. These opportunities are listed at www.savebay.org/volunteer/index.htm. For more information about any of the volunteer opportunities, interested individuals should contact Stan Dimock, volunteer coordinator at sdimock@savebay.org or (401) 272-3540, ext. 130. The volunteer opportunities include:

- **BayWatchers:** The BayWatcher Program is STB's citizen monitoring program. It encourages volunteers to become involved with the restoration and protection of Narragansett Bay, discovering it first hand. Volunteers are involved in shoreline surveys, area cleanup projects, sea mammal monitoring (seasonal), and salt marsh cleanups and restoration.
- **Legislative Volunteers:** Legislative volunteers assist STB by writing letters to local newspapers about key Bay issues, attending and testifying at public and legislative hearings, and organizing group meetings with city/Town, state, or federal officials about local or state environmental issues.
- **In-Office Support at Save the Bay:** Volunteers assist with running the reception area, helping with mailings, and answering the phone lines. Opportunities include data entry, becoming a member of the mailing team, and clipping newspaper articles.
- **Fundraising and Special Events:** STB hosts several fundraisers per year. Volunteers can often assist with decorating, registration, bartending, parking and many other tasks.
- **Fairs and Festivals Team:** STB attends approximately fifteen fairs and festivals each season throughout Rhode Island. Volunteers are recruited to assist in selling STB merchandise, encouraging people to join the STB cause, and educating the public regarding current issues facing the bay and the marine life environment.
- **STB also offers internships** which allow college students to earn credits through various assignments including web content development, habitat restoration, program planning and development, communications, and environmental law.

River Network's "River Watch Program"

Through the River Network, over 550,000 people across America are involved in community-based watershed monitoring and assessments. Community-based monitoring programs are carried out by schools, nonprofit organizations, government agencies, and Native American Tribes. River Network's *River Watch Program* provides guidance and support by helping these groups design and implement their programs. River Watch staff have trained thousands of people in designing watershed monitoring programs, benthic macroinvertebrate and habitat monitoring, water quality monitoring, and data reduction and analysis. More information about program details can be found at <http://www.rivernetwork.org>.

4.3 TOWN PUBLIC PARTICIPATION STRATEGIES

4.3.1 Public Meetings

The Town has gathered information regarding storm water issues via its storm water steering committee comprised of representatives from the Town Conservation Commission, Land Trust and Planning Board. The Town held a public meeting on March 19, 2003 to educate residents on the causes and effects of storm water pollution. This meeting also afforded the residents an opportunity to provide their input on the contents of the SWMP. The public meeting was advertised on March 13, 2003 in the Kent County Daily Times, and on March 17, 2003 in the Providence Journal. Notice of the meeting was also posted at Town hall, Louttit Library, and on the local public access channel. Residents were asked for their comments during the meeting and were informed that additional comments or questions could be provided to the Town Planner at their convenience. The Town plans to hold a second public meeting/public hearing at which the final draft SWMP will be presented to the Town council and to the public. The public hearing will be advertised in the Providence Journal, in the Kent County Daily Times, and on the local access channel. After a presentation by Berger on the contents of the plan, the public will be invited to voice comments before the Town Council. The draft SMWP will be revised to address the comments received by the Town, the Town Council, and RIDEM NonPoint Source Program. Copies of the materials from the public meeting are provided in Appendix B.

4.3.2 Walk And Ride on the Rural Side

The West Greenwich Land Trust sponsors an annual festival that celebrates the rural lifestyle in West Greenwich called Walk and Ride on the Rural Side. The event, held in late September, is co-sponsored with the West Greenwich Historical Society and the Town library. The weekend-long festival is intended to heighten public awareness of the cultural, natural and recreational resources in the Town. The festival includes walking tours, open houses, lectures, and agriculture-related demonstrations. The Town intends to display an exhibit regarding storm water management at the next festival and will also distribute storm water educational materials to attendees. The Town will investigate holding a panel discussion or lecture on protecting the quality of storm water runoff in West Greenwich.

4.3.3 Storm Water Web Page

A storm water web page is planned to be added to the Town's website. In addition to the information described in Section 3.5.2 of this report, the web page will also contain information on volunteer opportunities available to residents. These include opportunities to participate in the Town's identification and inspection of storm water outfalls, and opportunities with Save the Bay and URI's watershed monitoring program, among others. The site will either provide the information regarding the opportunity directly on its page or it will provide the user with a link to the sponsor agency where more information will be available.

4.3.4 Storm Drain Marking

A storm drain marking program is planned for visible catch basins that discharge to water bodies within West Greenwich. The drains could be stenciled with a picture of a fish and an inscription that indicates that the contents discharge directly to the bay or river, whichever the case may be. The storm drain marking program is designed to inform (remind) residents that the drains do not go to the sanitary sewer system, but are discharged directly into a local water body. The intent of the program is to discourage any type of dumping into the storm drainage system.

An alternate storm drain marking method, now recommended by Save the Bay, is utilizing epoxy markers in lieu of stenciling. The epoxy markers are expected to last 5 to 7 years compared to the one year life of a painted stencil. These markers are approximately 4 inches in diameter and can be easily installed using volunteer assistance. The markers can be specially designed to the Town's specifications or the Town can choose among existing designs. Save the Bay indicated that the cost of the markers is approximately \$1.25/marker when ordering 500 or more. The adhesive costs approximately \$9.00/tube and each tube covers approximately 20 to 25 markers. West Greenwich would require approximately 100 markers, so it is estimated that each marker (including required adhesive) would cost approximately \$2.50, therefore the cost of materials to mark 100 catch basins is approximately \$250. A photocopy of some sample storm drain markers is included in Appendix C.

4.3.5 Town Co-Sponsored Cleanups

The Town will continue to co-sponsor litter cleanups at the Big River Management Area and at various other locations in conjunction with the Conservation Commission, the Boy Scouts, and the local fire stations. These cleanups provide opportunities for residents to assist in the removal of unsightly litter and prevent its transport into the Towns storm drainage system and ultimately local waterbodies. The Town will also continue to provide for proper disposal of all waste collected at such events. The Town will assist environmental groups in recruiting volunteers by advertising the cleanups on its web page and at Town hall.

4.3.6 Tree Seedling Program

The Town plans to investigate establishing a small tree seedling program. The program would be intended to promote the planting of native trees. It would involve distributing seedlings and educational materials on native landscaping, water efficient landscaping and other techniques that reduce the use of pesticides and fertilizers. These practices are intended to reduce the amount of pesticides and fertilizers that are introduced into storm water runoff.

[THIS SECTION LEFT INTENTIONALLY BLANK]

4.4 MEASURABLE GOALS

The following measurable goals, target dates and responsibilities that have been established to ensure proper implementation of this minimum control measure:

**Table 4-1
PUBLIC PARTICIPATION MEASURABLE GOALS**

TARGET YEAR	ACTIVITY	TOWN DEPARTMENT RESPONSIBLE
1	Volunteers recruited for SWMP steering committee	Planning
	Public meeting regarding storm water pollution prevention and development of SWMP advertised and held.	
	Exhibit displayed and educational materials distributed at Walk and Ride on the Rural Side event.	
	Town continues to co-sponsor cleanup events.	Cons. Comm.
2	Volunteers stencil or mark storm drains.	DPW
	Town continues to co-sponsor cleanup events.	Cons. Comm.
	Storm water lecture given at Walk and Ride on the Rural Side event.	Planning
3	Volunteer opportunities with local environmental organizations advertised on Town web page.	Bldg/Zoning
	Town investigates implementing tree seedling program.	Planning/Cons. Comm.
	Town continues to co-sponsor cleanup events.	Cons. Comm.
4	Town continues to co-sponsor cleanup events.	Cons. Comm.
	Increase in number of volunteers participating in URI water quality monitoring program.	Planning
	Increase in residents participating in clean-ups and volunteering with other local environmental organizations.	Planning, Cons. Comm., Land Trust

5.0 ILLICIT DISCHARGE DETECTION AND ELIMINATION

5.1 REGULATORY REQUIREMENTS

Illicit discharges are illegal and/or improper connections to storm water drainage systems and receiving waters. Sources of illicit discharge can include sanitary wastewater, effluent from septic tanks, floor drains, car wash wastewater, improper oil disposal, radiator flushing disposal, laundry wastewater, spills from roadway accidents, and improper disposal of auto and household toxics. Commonly, elevated levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria are introduced into waterbodies through these illicit discharges.

These discharges are considered “illicit” because MS4s are not designed to accept, process, or discharge such non-storm water wastes. Because of their negative impacts, these discharges must be removed.

RIPDES defines “illicit discharges” in the Phase II Storm Water Regulations as “any discharge to an MS4 that is not composed entirely of storm water with some exceptions.” These exceptions include discharges from RIPDES-permitted industrial sources and discharges from fire-fighting activities. The exceptions also include the following list of allowable non-storm water discharges, provided that these discharges are not identified as significant contributors of pollutants to the MS4:

- | | |
|--|---|
| ▪ Water line flushing | ▪ Irrigation water |
| ▪ Landscape irrigation | ▪ Springs |
| ▪ Diverted stream flows | ▪ Water from crawl space pumps |
| ▪ Rising ground waters | ▪ Footing drains |
| ▪ Uncontaminated ground water infiltration | ▪ Lawn watering |
| ▪ Uncontaminated pumped ground water (i.e. water from basement sump) | ▪ Individual residential car washing |
| ▪ Discharges from potable water sources | ▪ Flows from riparian habitats and wetlands |
| ▪ Foundation drains | ▪ Dechlorinated swimming pool discharges |
| ▪ Air conditioning condensation | ▪ Street wash water |

Program requirements consists of the following:

- A storm sewer system map, showing the location of all outfalls and the names and locations of all receiving waters;
- Through an ordinance, or other regulatory mechanism, a prohibition (to the extent allowable) under State, or local law on non-storm water discharges into the MS4, and appropriate enforcement procedures and actions;
- A plan to detect and address non-storm water discharges, including illegal dumping, into the MS4;

- The education of public employees, businesses, and the general public about the hazards associated with illegal discharges and improper disposal of waste; and
- The determination of appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

5.2 STORM WATER MAPPING

This requirement is intended to demonstrate a basic understanding of the Town's municipal drainage system, in particular the locations of the storm water outfalls and receiving waters. The Town plans to utilize plat maps as base mapping for the storm water system components. It is noted that the Town does not have an extensive storm drainage system. Only a few sections of the Town have formal drainage structures, i.e. catch basins and outfalls. Most of the Town is rural in nature and drainage is accomplished via overland flow and/or by utilizing open ditches and swales where storm water infiltrates into the ground.

5.2.1 Existing Mapping

The Town currently has some mapping of the existing storm drainage system which consists of Town plat maps with hand-drawn notes and sketches of drainage features. The highway department also maintains a list of the streets in Town that have catch basins and the number of basins located on each street. The list was developed for catch basin cleaning activities and it does not include outfalls, nor does it associate catch basins with specific storm lines and/or discharge points. A copy of the list, which identifies approximately 200 catch basins within the Town, is included in Appendix C.

Other information on the existing storm drainage system includes Department of Transportation (DOT) plans for state highway projects in West Greenwich. Berger staff visited DOT's plan room and reviewed all the plans DOT has available for projects in West Greenwich. Available plans that contain storm drainage information are listed in Table 5-1.

**Table 5-1
DOT PLANS THAT CONTAIN DRAINAGE INFORMATION**

DOT CONTRACT NUMBER *	ROAD COVERED BY PROJECT	TITLE OF PROJECT	TYPE OF PROJECT
8904	Hopkins Hill Road	Reconstruction of Hopkins Hill Rd., 700 ft. south of Mishnock Rd. to Route 3	Reconstruction
7314	Nooseneck Hill Road	Plan, Profile & Sections of Proposed State Highway Nooseneck Hill Rd. from Tiogue Rd. to Interstate 95	New Construction
8419	Route 102	Plan, Profile & Sections of Proposed State Highway Reconstruction of Route 102 I-95 to Route 117	Reconstruction

DOT CONTRACT NUMBER *	ROAD COVERED BY PROJECT	TITLE OF PROJECT	TYPE OF PROJECT
9322	Route 3 from Mishnock Road to Exeter/West Greenwich Town line	Improvements to Route 3 (Nooseneck Hill Road) from Harkney Hill Rd to Town line	Modified 3R
9235	Route 3 – from Coventry/West Greenwich Town Line (500' south of Town Line)	Plan, Profile & Sections of Proposed State Highway Improvements to Route 3 & Mishnock Rd.	Improvements
8105	Hopkins Hill Road from Division Street to Mishnock Road	Plan, Profile & Sections of Proposed Route I-95 Interchange at Hopkins Hill Rd & the Reconstruction of Hopkins Hill Road	Reconstruction
3907	Nooseneck Hill Road From West Bank of Big River to Exeter/West Greenwich Town Line	Plan, Profile & Sections of Proposed State Highway Nooseneck Hill Rd	Construction
3316	Division Street East Greenwich/West Greenwich Town Line to New London Turnpike	Plan, Profile & Sections of Proposed State Highway Division Street; East Greenwich – West Greenwich	New Construction
5915	Weaver Hill Road	West Greenwich Weaver Hill Road at Nooseneck Hill Road	Re-Alignment
3502	Division Street From New London Turnpike to Nooseneck Hill Road	Plan, Profile & Sections of Proposed State Highway Division Street, West Greenwich	New Construction
6015	Escoheag Hill Road	Plan, Profile & Sections of Proposed State Highway - Escoheag Hill Road	Reconstruction

*First two digits of contract number indicate the year the project was designed.

5.2.2 New Mapping

In accordance with Phase II requirements, West Greenwich will identify all waters of the state located within the Town. A public participation program and/or internship program will be utilized to ensure all storm water outfalls have been identified in the first year of the permit. Outfalls will be located by following catch basins and other storm water structures to likely discharge points along local water bodies.

As required by EPA's Business Rules for Latitude/Longitude Data Standard (November 21, 2000), the following mandatory location data will be collected for each of the outfalls:

- Latitude Measure and Longitude Measure, recorded in degrees and decimal degrees.
- Horizontal Accuracy Measure. This data element is usually derived, based on the collection method.
- Horizontal Collection Method, reported with standard values for text or code.
- Horizontal Reference Datum, reported with standard values for name or code.
- Reference Point (i.e., the place where coordinates were determined), reported with standard values for text or code.

EPA has identified Global Positioning System (GPS) as the preferred Horizontal Collection Method. West Greenwich will make every effort to meet this accuracy goal.

West Greenwich will first identify the approximate locations of all the storm water outfalls in the field. Town staff will utilize the existing location information including Town plat maps with hand-drawn notes and sketches of drainage features. Any locations not previously identified, will be carefully hand-marked on Town plat maps. Town staff plan to kayak the Mishnock Lake and Bailey Pond coastlines to observe for any outfalls not previously identified.

Town staff will go back to all outfall locations within the first year of the permit and record a more accurate location of the outfalls utilizing a GPS unit. The Town will rent (or borrow) GPS equipment, either a back pack unit with sub-meter accuracy or a handheld unit with 15 meter accuracy. It is estimated that all outfalls could be located via GPS within several days once all outfalls have been identified on plat maps. The cost to rent a sub-meter accuracy GPS unit (i.e. Trimble PRO-XRS) is approximately \$600 per week and a 15 meter accuracy unit (i.e. Garmin GPS III Plus) costs approximately \$60 per week. DEM indicated that they may have GPS units available to loan to the Towns to gather outfall location information. The Town will utilize DEM equipment if at all possible.

It is noted that this level of mapping will meet DEM's accuracy goal when used in conjunction with base mapping consisting of either existing Town plat maps or available Rhode Island Geographical Information System (RIGIS) mapping. This type of mapping is useful for planning purposes and will provide sufficient accuracy for the revisiting of outfalls, but this type of mapping will have limited value for engineering and design applications.

5.2.3 Storm Water System GIS Mapping

If West Greenwich wishes to pursue full-scale Geographical Information System (GIS) mapping of the entire storm drainage system, then the following is a description of what would be required. It is noted that the Town of West Greenwich is predominantly rural in nature and does not have an extensive storm water collection system. Typically the investment for GIS mapping, particularly base mapping, is made because it can be utilized for a multitude of purposes such as development of mapping for other Town infrastructure including water and sewer lines. There are no other Town-owned utilities in West Greenwich, therefore the cost for GIS mapping, particularly base mapping, may prove to outweigh the benefits, given its limited uses.

To develop full-scale GIS mapping of West Greenwich, the Town would first need to develop a GIS database. Base mapping for the GIS system could be developed from aerial photography. Photography would be captured at a scale of approximately 1"=1000' or better, and the topographic mapping developed from the photography would be at a scale of approximately 1 inch = 200 feet. Ground controls would need to be established to support planimetric mapping and all survey coordinates would be tied into the RI state plane coordinate system. The topographic mapping would be developed with contours at five foot intervals.

A field data collection survey of all storm water structures within the Town must be completed. Data collection would include structure location information obtained using a GPS receiver, with an accuracy of approximately one to two feet. Each structure must also be opened and the following information recorded: invert elevations, pipe size, pipe material, street where structure is located, grate type, maintenance problems, sump information, number of pipes serving the structure, and condition of the structure. The specific structure information would be manually entered into a database and the GPS location data would be downloaded directly from the GPS unit into a database then converted into ArcInfo point coverages.

The ArcInfo datasets would include both locational information and detailed attribute information. The attribute information would vary slightly depending on the structure type, but each dataset would contain a field that associates a unique identification number to each entry. The catch basin data set attributes would include: street where basin is located, grate type, maintenance problems, pipe attributes, additional structure information, sump information, number of pipes serving the structure, and condition of the structure. Outfall attributes would include ones similar to the catch basin dataset, plus outlet type, and receiving water information.

The data sets and additional storm water pipe location information would be used to develop a functional database pipe system with line and node topology. Since very little information is currently available on the storm water pipe networks, additional time would be allowed to field confirm flow directions and develop a connectivity topology layer. The connectivity topology layer would allow the Town to integrate future modeling applications, and it could also be used for tracking and asset management.

The approximate cost to develop a full scale GIS storm water map of the entire Town as described above, is estimated to be on the order of \$200,000 to \$250,000. The base topographic mapping developed from aerial photography would make up the majority of that cost, approximately \$175,000. Topographic mapping would cover the entire Town, approximately 33,400 acres. The remaining portion of the cost is attributed to field data collection/verification of drainage lines and structures and development of the GIS storm drainage system layers and associated databases. As previously noted, this level of mapping is not required by DEM and is provided for informational purposes only. Given the small size of the municipal storm water system (approximately 200 catch basins and a handful of outfalls) this level of mapping would likely not be economically feasible for the Town to develop.

5.3 ILLICIT DISCHARGE DETECTION AND ELIMINATION

DPW staff and volunteers will be utilized to inspect and record information about each of the storm water outfalls. These inspections will be made with at least 72 hours of antecedent dry weather. Given the limited number of outfalls, it is anticipated that all outfalls will be observed for dry weather flow two times during year one of the permit. The cost to observe dry weather outfalls is expected to be limited to staff time.

The Town will prioritize its efforts in identifying and eliminating illicit discharges by first observing the outfalls that discharge to FrenchTown Brook, which DEM has identified as impaired by pathogens. Other high priority outfalls include those that discharge to Mishnock Lake and Bailey Pond.

5.3.1 Potential Illicit Discharges from Failing Septic Systems

The entire Town, with the exception of the Technology Park area located off 95, is unsewered. (A few companies within the technology park complex are connected to the West Warwick sewer system.) All of the unsewered areas throughout Town rely on individual sewage disposal systems or cesspools (ISDS or septic systems).

A majority of the Town has two acre (RFR-2) zoning. The Lake Mishnock and Bailey Pond areas, although currently zoned as RFR-1 and RFR-2 respectively, have numerous non-conforming lots that are one-half acre in size or significantly less. According to the West Greenwich Comprehensive Plan, Lake Mishnock and its associated swamp and wetlands have been identified as an important natural resource for a variety of reasons including recreational, drinking water supply, and because it is a critical portion of the recharge area to the Mishnock aquifer. Areas that have inadequate or failed septic systems require immediate attention to prevent pollution of the watershed.

The Town plans to develop an ISDS Wastewater Management Plan and potentially a Wastewater Management District to regulate timely maintenance and repair of systems especially in the densely populated sections of Town. Development of the ISDS Plan and related Wastewater Management District will be dependent on funding availability.

The Town plans on having copies of DEM's RI Septic System Checkup available at Town hall for residents with septic systems. This handbook provides valuable information on the proper operation, inspection and maintenance of systems. The Town's storm water web page will also contain information regarding proper care for septic systems and will inform residents of the availability of the Septic System Handbook at Town hall and from DEM.

5.3.2 Potential Illicit Discharges from Other Sources

Illicit discharges to the storm drainage system are not suspected of being a wide-spread problem in West Greenwich. A majority of the storm drainage system is open in nature, and not conducive to the direct tie-in of illicit connections. Nonetheless, the Town will perform investigations to ensure that illicit discharges are not present in their system. The Town will follow the steps outlined below to identify and eliminate any illicit discharges from its storm water collection system:

- I.** Perform initial screening of all outfalls for illicit discharges,
- II.** Investigate potential sources of illicit discharges,
- III.** Identify and eliminate illicit discharges,
- IV.** Perform follow up inspections to ensure discharges are removed.

I. Perform Initial Screening of Outfalls for Illicit Discharges

The outfalls will be inspected for pipe and flow related attributes. This information will be collected to aid in the location of illicit discharges. All observations will be recorded in the field. The information to be collected includes:

Pipe attributes:

- Location of pipe;
- Approximate height of pipe above water body;
- Diameter of pipe;
- Pipe material; and
- Condition of pipe.

Flow related attributes:

- Presence of dry-weather flow;
- Clarity of water;

- Presence of sediment or other solids;
- Presence of odors;
- Presence of soap suds, oily sheens or other visible pollutants; and
- Presence of excess algae growth in or beneath the pipe.

This information is summarized on an outfall inspection form shown in Figure 5-1. This form, or one similar, will be utilized by DPW staff during the field inspection to assist in determining if any potential illicit discharges are present. When all outfalls have been located, each will be assigned a unique identification number. These identification numbers will be utilized on the storm water system base mapping and on any future reports that may require identification of specific outfalls.

DPW staff or a volunteer/intern qualified in identifying non-storm water discharges will review each of the outfall inspection forms to determine if there is any indication of the presence of an illicit discharge. For those outfalls where a dry weather discharge is observed or an illicit discharge is otherwise suspected, additional investigation will be required.

II. Investigate and Eliminate Potential Sources of Illicit Discharges

For those outfalls where an illicit discharge is suspected, the following procedures will be utilized to investigate the potential sources:

1. *Characterize the discharge and investigate any obvious sources.*
Analyze the information collected during the initial screening of outfalls. Classify type of flow, i.e. sanitary waste, food waste, wash waters. Investigate any obvious sources (i.e. wash waters found in outfall adjacent to car wash).
2. *Sample the flow.*
Dry weather flows that cannot be attributed to an obvious source shall be sampled for temperature, conductivity, pH, and bacteria as required by DEM. If the Town were to hire a laboratory to collect the sample(s) and analyze for the above selected parameters, it is estimated to cost approximately \$200 for the first outfall then \$100 per outfall for each additional outfall that could be sampled in a single day. If the Town were to sample outfalls themselves, it is estimated to cost approximately \$50 per day to rent a YSI meter to measure pH, conductivity and temperature in the field and an additional \$35 per sample for fecal coliform analysis by a laboratory. The Town would be responsible for collection of the sample and delivery to the laboratory.
3. *Inspect the upland drainage system.*
Open structures upstream from the outfall and inspect to determine where a dry weather flow component exists. When inspecting structures, attention shall be paid to potential indicators of illicit connections. The associated structures and drainage ways where the dry weather flow is observed should be mapped. These structures can be identified on the base mapping developed for the identification of outfalls and receiving waters.

**Figure 5-1
DRY WEATHER OUTFALL INSPECTION FORM**

STORM WATER OUTFALL INSPECTION FORM	
<i>Date of Inspection:</i> _____	<i>Name of Inspector:</i> _____
Outfall Number:	Name of Waterbody:
Location:	
Diameter of outfall pipe:	Approximate height of pipe above water body:
Pipe material: (Circle one) Concrete, PVC (plastic), Clay, Metal, Other _____ specify	Condition of pipe:
Is any water flowing from the pipe? (Circle one) Yes No If No, then a dry weather flow is not present at this time. Stop here.	Is there excess algae growth in, or beneath the pipe? (Circle one) Yes No If yes please describe:
Does the water from the pipe appear clear? (Circle one) Yes No If No, describe how the water appears:	Are any solids being discharged from the pipe? (Circle one) Yes No If Yes, describe the solids:
Describe how the water smells:	Do you see any soap suds, oily sheens or other visible pollutants in the water? Describe:
Note any other observations:	
Based on your observations, do you think this discharge is comprised of clean groundwater?	If No, then indicate what you think the discharge could be comprised of: (If not known leave this section blank.)
Signature of Inspector: _____	

4. *Identify the drainage area.*

If the source of the discharge is still not obvious, then the drainage area to that outfall should be delineated. This can be achieved by approximating the drainage divides of the contributing sub-basin utilizing a topographic map or by visually inspecting the upland area surrounding the outfall.

5. *Inventory the drainage area.*

Review land use information, street maps, business directories and other available data to identify what potential sources exist within the drainage area. On-site inventories can also be performed by walking or driving throughout the drainage area and observing any potential sources. When conducting the on-site inventories, valuable information could also be gained by interviewing available property owners in the vicinity of the outfall.

6. *Inspect connections in question.*

Conduct site investigations to further evaluate suspect connections. Investigations can be performed utilizing smoke testing and/or dye testing as described below.

Smoke testing – Smoke testing is performed by blowing non-toxic smoke into isolated sections of the storm drainage system. Smoke testing is intended to detect inflow sources such as floor drain connections, laundry or wash water connections; or other point source connections of non-storm water. Smoke testing is typically conducted between July 1 and November 15, during the periods of low groundwater and with sufficient time having elapsed from a previous rain event. No testing can be conducted unless the groundwater level is below the pipe and the ground is not frozen. Prior to initiating smoke testing, police and fire officials will be notified. Home/business owner notification will be conducted at least 24 hours prior to initiating smoke testing. Smoke testing costs range from approximately \$0.50 to \$0.70 per linear foot plus initial mobilizations costs of approximately \$600 to \$1,000. These costs include the necessary labor, materials and equipment to perform the smoke test. A Town staff member or agent of the Town must be present to oversee the testing. The extent to which smoke testing could be required is completely dependent on the number and complexity of potential discharges detected.

Dye Testing – Dye testing is performed by flushing fluorometric dye into the fixture(s) of suspected sources and observing the outfall for traces of the dye. This method requires access to suspected buildings and structures. Since permission is required to gain entry into each of the potential source locations, this method is typically used to confirm the existence of a suspected illicit discharge as opposed to general investigation of numerous potential sources. The cost for dye testing is essentially labor; dye costs are negligible in comparison (200 fluorometric dye tablets cost approximately \$50). Public Works staff would perform the dye tests, or the Town could hire an outside firm to investigate via dye testing, which is estimated to cost approximately \$140/hour for a two-person team of investigators. The duration of work required is completely dependent upon the number of potential illicit discharges and the complexity of the pipe network in the vicinity of the discharges.

The specific method used to help determine the source of the illicit discharge will depend upon the nature of the suspected discharge and the surrounding land use.

III. Eliminate Illicit Discharges

Require the owner of the illicit discharge to remove the discharge from the storm sewer system. Rule 8 of the DEM RIPDES regulations prohibit the discharge of any pollutants to a water of the state without expressed permission in the form of a RIPDES permit. The Town of West Greenwich will use this regulation in conjunction with a new Storm Water Ordinance to require the owner to remove the discharge from the storm sewer system. A copy of the draft Storm Water Ordinance is provided in Appendix F.

IV. Perform Follow up Inspections to Confirm Elimination of Discharges

DPW staff should inspect the storm sewer in the vicinity of the illicit discharge to confirm that it was properly removed from the system.

5.4 MEASURABLE GOALS

The Table 5-2 lists the measurable goals, target dates and responsibilities that have been set to ensure proper implementation of this minimum control measure:

**Table 5-2
ILLICIT DISCHARGE ELIMINATION MEASURABLE GOALS**

TARGET YEAR	ACTIVITY	TOWN DEPARTMENT RESPONSIBLE
1	Known outfalls and receiving waters mapped.	DPW
	Lake Mishnock and Bailey Pond inspected for any additional outfalls not shown on plat maps (via kayak).	
	Outfalls inspected and observed for dry weather flow.	
	Town samples investigates the source of any dry weather flows detected.	
2	Observe any remaining outfalls for dry weather flow.	DPW
	Town investigates the source of any dry weather flows detected.	
3	Town continues to investigate and eliminate illicit discharges detected.	DPW
4	Illicit discharges detected and eliminated.	DPW

6.0 CONSTRUCTION SITE RUNOFF CONTROLS

6.1 REGULATORY REQUIREMENTS

Construction site runoff controls mitigate sediment runoff to water bodies from construction sites. These controls are also used to eliminate the discharge of other construction-generated pollutants such as fertilizers, pesticides, oil and grease, construction chemicals and construction debris to water bodies from construction sites.

The Phase II Storm Water Program requires the Town to implement and enforce a program to reduce pollutants in storm water runoff from construction activities that result in a land disturbance of greater than or equal to one acre. Specifically the MS4 is required to:

- Have an ordinance or other regulatory mechanism in place that requires the implementation of proper sediment and erosion controls, and controls for other construction site waste;
- Have procedures for site plan review of construction plans that consider potential water quality impacts;
- Have procedures for site inspection and enforcement;
- Establish procedures to accept information submitted by the public; and
- Determine the appropriate BMPs and measurable goals for this minimum control measure.

6.2 EXISTING TOWN ORDINANCES/REGULATIONS

6.2.1 Subdivision Regulations

Construction site runoff controls are required by the Town of West Greenwich Land Development and Subdivision Regulations. The Subdivision Regulations apply only to sites involving the division of land. These regulations, specifically, Section F entitled *Drainage and Erosion and Sediment Control*, require the use of erosion and sediment controls at construction sites. (A copy of Section F of the Subdivision Regulations is provided in Appendix D.) These regulations require that the measures for soil erosion and sediment control meet or exceed the standards within the regulations and in the standards and specifications of the latest edition of the RI Erosion and Sediment Control Handbook. The regulations specifically require that a site plan be submitted along with a soils engineering report, a slope stabilization and revegetation plan, and an engineering hydraulic analysis of storm water runoff under existing site conditions and proposed development site conditions.

6.2.2 Soil Erosion and Sediment Control Ordinance

The Soil Erosion and Sediment Control Ordinance (Ordinance #79 – Adopted October 16, 2002) addresses site disturbances other than those related to the development of subdivisions. (A copy of the ordinance is provided in Appendix E.) It applies to “any situation involving any disturbance to the terrain and topsoil or vegetative ground cover...within the Town of West Greenwich.” The Building

Official or his/her designee determines the applicability of the Ordinance. Since the Ordinance applies to *any* land disturbing activity as determined by the Building Official, it meets the requirements of the Phase II regulations that require controls for construction activities disturbing greater than one acre. West Greenwich currently offers pre-application meetings to potential developers to provide them with detailed information on the Town's soil and erosion control and other construction requirements.

Construction Plan Review

Specific requirements for the contents of a soil erosion and sediment control plan are outlined in the Ordinance. The plan must address grading, site drainage, temporary and permanent erosion controls, monitoring and maintenance. The inspection and enforcement procedures are identified.

Water quality impacts must be considered during review of the application. The Ordinance requires the Building Official to consider impacts to "the quality of any coastal feature, flood plain, or watercourse."

Appropriate BMP's and Measurable Goals

Appropriate BMP's, including vegetative, structural and non-structural controls, perimeter controls, and construction site access/egress to be used at construction sites are outlined in the ordinance.

Public Participation

There is limited opportunity for public input into the review of site runoff controls. Public meetings and public hearings are mandated by the subdivision regulations for certain minor and major subdivisions. These hearings provide an opportunity for the public to comment on all aspects of a project including construction site runoff controls. The current Ordinance does not include a procedure for consideration of public input. Applications under the jurisdiction of this ordinance do not require any public notification.

6.3 RECOMMENDED MODIFICATIONS

A successful site runoff control program will allow for the selection of BMP's appropriate to the community, minimize water quality impacts and maintain pre-development runoff conditions. The existing Town of West Greenwich Subdivision Regulations and Ordinance provide the basis for a successful program. However, the following items should be incorporated to meet all the requirements of the RIPDES Phase II Storm Water Program.

- Controls for construction wastes other than sediment runoff, such as discarded building materials, concrete truck washout and litter, must be addressed through either a new ordinance or revisions to the existing Soil Erosion and Sediment Control Ordinance.
- The Town must implement the use of the Ordinance for all construction sites that disturb more than one acre.
- Ensure consistent and appropriate application of construction site runoff controls to all projects under Town review.
- Add an additional or more specific review for water quality impacts.
- Establish a procedure for the receipt and consideration of information submitted by the public during the review of site applications.
- Establish measurable goals for the site runoff control measures.

Specific language changes to the Town's existing Soil Erosion and Sediment Control Ordinance have been recommended to meet the requirements of the Phase II Storm Water Program. The proposed changes are provided in Appendix F.

6.4 MEASURABLE GOALS

Table 6-1
CONSTRUCTION SITE RUNOFF CONTROL MEASURABLE GOALS

TARGET YEAR	ACTIVITY	TOWN DEPARTMENT RESPONSIBLE
1	Modifications to ordinance developed and introduced to Town Council.	Planning
	Continue holding pre-application meetings with potential developers.	
	Procedures for consideration of information from public in place.	
2	Modifications approved by Town Council and Ordinance in place.	Planning
	SWPPPs for all construction projects > 1 acre reviewed.	
	Procedures in place for site inspection of all construction projects > 1 acre.	Bldg/Zoning, DPW, Planning
	Procedures for referral to the State of non-compliant construction site operators in place.	Bldg/Zoning, Planning
3	Compliance with ordinance.	Bldg/Zoning, Planning
4	Continued compliance with ordinance.	Bldg/Zoning, Planning

7.0 POST CONSTRUCTION SITE RUNOFF CONTROL

7.1 REGULATORY REQUIREMENTS

Post construction runoff controls mitigate both the quantity and quality of storm water runoff from a developed site. These controls protect the water quality of receiving water bodies and prevent flooding of downstream properties.

The Phase II Storm Water Program requires Towns to develop, implement, and enforce a program to reduce pollutants in post-construction runoff from new development and redevelopment projects that result in land disturbance of greater than one acre. Specifically the MS4 is required to:

- Develop and implement strategies which include a combination of structural and/or non-structural BMPs;
- Have an ordinance or other regulatory mechanism in place that requires the implementation of post-construction runoff controls to the extent allowable under state and local law;
- Ensure adequate long-term operation and maintenance of controls; and
- Determine appropriate BMPs and measurable goals for this minimum control measure.

7.2 EXISTING TOWN ORDINANCES/REGULATIONS

7.2.1 Subdivision Regulations

The Town of West Greenwich Land Development and Subdivision Regulations regulate post construction runoff controls on sites involving the division of land. In addition to the requirements set forth for construction runoff controls, the Subdivision Regulations require a zero-net increase in peak runoff for all design storms up to and including the 25 year storm. Damage avoidance consideration is required for increases in peak flow for up to and including the 100 year design storm. The developer must submit an engineering hydraulic analysis of runoff under existing and post-development conditions and a detailed evaluation of the projected effects of surface runoff on adjoining property, on existing drainage facilities, on groundwater quality, and on downstream surface water quality. Conclusions and recommendations regarding the effect of the proposed development on hydrologic conditions and water quality including options and recommendations concerning the adequacy of sites for development are required to be submitted for approval. The Subdivision Regulations indicate that the Planning Board may require specific Best Management Practices as outlined in the Water Quality recommendations of the Storm Water Management Committee – RIDEM – Office of Environmental Coordination. In addition the Planning Board may require specific storm water design and installation standards according to RIDEM Non-Point Source Pollution Program recommendations.

The existing Subdivision Regulations further require that the development be accomplished so as to minimize adverse effects upon the natural or existing topography and soil conditions and to minimize

the potential for erosion. Development is required to be oriented to the site so that grading and other site preparation is kept to an absolute minimum. Wherever feasible, natural vegetation shall be retained and protected. Development proposals are required to strive for maximum retention of the natural features and qualities of the site, and development shall seek to enhance these natural features and qualities. Water runoff shall be minimized and retained on site wherever possible to facilitate groundwater recharge. Sediment shall be retained on site.

The Town of West Greenwich has strict enforcement of its pre and post-construction requirements for subdivisions. The Town requires that new subdivisions complete construction of all utilities including roadways, drainage and water quality structures for the subdivision prior to the Town recording the lots in the land evidence records. This ensures that the required drainage and water quality structures are properly constructed and inspected before a single lot is sold. The Town recently instituted this requirement to combat problems with developers defaulting on construction bonds. They are pleased with the control it affords them over the quality and timeliness of construction of drainage and water quality structures.

Long-term Maintenance

The subdivision regulations require that provisions be made for maintenance of all components of a storm water management system. However, only major subdivisions require the submission of a maintenance plan for review and approval. The parties responsible for long-term maintenance of the post construction controls should be identified during the approval process. The ordinance requires monitoring and maintenance inspections to be scheduled prior to commencing the project.

7.2.2 Soil and Erosion Control Ordinance

The Soil Erosion and Sediment Control Ordinance addresses site disturbance activities and post-construction runoff controls for sites other than those related to the development of subdivisions. The post-construction requirements include the stipulation that the new runoff rates not exceed the pre-development rates and that any increase in storm water runoff shall be retained and recharged as close as feasible to its place of origin by means of detention ponds or basins, seepage areas, subsurface drains, porous pavement, or similar techniques.

7.3 RECOMMENDED MODIFICATIONS

A successful post construction runoff control program will allow for the selection of BMP's appropriate to the community, minimize water quality impacts and maintain pre-development runoff conditions. The Town of West Greenwich subdivision regulations and ordinances provide the basis for a successful program. However, the following items should be incorporated to meet all the requirements of the RIPDES Phase II Storm Water Program.

- Ensure consistent application of post-construction controls to all projects being reviewed.
- Participate in watershed planning efforts.
- Encourage and provide a method to promote public participation.
- Require the submission of a long-term maintenance plan for all storm water systems. The developer should maintain the systems until the improvements are accepted by the Town.
- Develop a schedule to complete all required long-term maintenance for Town-owned storm water systems.
- 0 net increase in peak flow rate and 0 net increase in volume.

Specific language changes to the Town's existing Subdivision Regulations and introduction of a new Storm Water Ordinance has been recommended to meet the requirements of the Phase II Storm Water

Program. The proposed changes to the Subdivision Regulations and a draft Storm Water Ordinance are provided in Appendices G and H respectively.

7.4 MEASURABLE GOALS

Table 7-1
POST-CONSTRUCTION SITE RUNOFF CONTROL MEASURABLE GOALS

TARGET YEAR	ACTIVITY	TOWN DEPARTMENT RESPONSIBLE
1	Modifications to SW ordinance developed and introduced to Town Council.	Planning
	Procedures for consideration of information from public in place.	
	Locations of all Town-owned detention basins and other water quality structures identified.	DPW, Planning
	Schedule and procedures for long-term maintenance of all Town-owned basins/structures established.	DPW
	Continues to hold pre-application meetings with developers and referring them to education materials provided by the state. 0 net increase	Planning
2	Modifications to SW ordinances developed and introduced to Town Council and ordinance in place.	Planning
	All plans for development projects greater than one acre reviewed.	
	Procedures in place for post-construction inspection of all BMPs.	DPW
3	Continued compliance with ordinance.	Planning
4	Continued compliance with ordinance.	Planning

8.0 POLLUTION PREVENTION/GOOD HOUSEKEEPING

8.1 REGULATORY REQUIREMENTS

The intent of this control measure is to ensure that existing municipal operations are performed in ways that will minimize contamination of storm water discharges. To satisfy the requirements of this minimum control measure, the Town must:

- Develop and implement an operation and maintenance program with the goal of preventing or minimizing pollutant runoff from municipal operations into the storm sewer system;
- Train employees on incorporating pollution prevention/good housekeeping techniques into municipal operations such as vehicle and building maintenance, park and open space maintenance, and storm system maintenance; and
- Determine the appropriate BMPs and measurable goals for this minimum control measure.

8.2 CURRENT PRACTICES AND RECOMMENDED MODIFICATIONS

Information regarding the current practices of the Town were gathered by interviewing personnel from the public works, planning and building departments. The locations of all the Town facilities are shown on Figure 8-1.

8.2.1 Storm Drainage System Inspection and Maintenance

A majority of the Town's storm drainage system is open in nature, consisting of swales, roadside ditches and detention basins. Piped systems are located in a few limited areas within the Town including the Mishnock Lake and Bailey Pond neighborhoods and within the newer subdivisions. The Town's storm drainage system inspection and maintenance program consists of inspecting catch basins throughout these areas and cleaning them as required. The Town's Highway Superintendent keeps a spreadsheet of the streets in Town that contain catch basins and the dates the catch basins are cleaned. These records date back to 1997. Catch basins are cleaned by a private contractor using a dump truck equipped with a clam shell attachment. The trash and debris removed from the catch basins is sent to the Central Landfill in Johnston, RI. Sediment removed from catch basins is stockpiled and used for road fill. The swales and roadside ditches are maintained by cutting excess vegetation and cleaning as necessary.

There are numerous detention basins located throughout West Greenwich. Most of the basins are located on private property, and most are Town maintained. The Town has maintenance easements to ensure access to the structures located on private property. No written records are kept regarding detention basin cleaning.

Figure 8-1

Recommendations

It is recommended that the Town establish a written schedule for inspection and maintenance of the storm drainage system to ensure all portions of the drainage system including detention basins and drain pipes receive proper attention. The written schedule can be based on the spreadsheet developed for the catch basin cleaning which lists the streets in Town with catch basins and the number of catch basins located on each street. In addition to the date each catch basin is cleaned, a record should be kept of how much sediment and trash is removed. This information can be used to prioritize catch basins that may require more frequent cleaning in the future. Catch basins that collect unusually large amounts of sediment or trash should be further investigated to determine the source of pollutants.

The Town should develop an inspection and maintenance schedule for the detention basins within its responsibility. It should also keep a list of the privately owned detention basins. When doing other work in the vicinity of these basins, DPW staff should periodically check to ensure these basins are being properly maintained by their respective owners. Otherwise steps should be taken to ensure they are maintained.

8.2.2 Street Sweeping

Most streets in Town are swept annually, some are swept twice per year. Those that are swept twice per year include the streets within the Mishnock Lake neighborhood, which is one of the relatively densely populated areas in Town. The other densely populated area in Town is in the vicinity of Bailey Pond. The streets in this neighborhood are gravel and are privately owned. Street sweeping typically occurs in the spring or summer on all paved, public roads in Town. Streets are cleaned during the day and no parking restrictions are in effect when sweeping takes place. Streets are cleaned using the Town-owned street sweeper which is a 1993 mechanical brush and hopper type sweeper. Sand and grit collected by the street sweeper is utilized as road fill; trash is disposed of at the Central Landfill.

Recommendations

It is recommended that the Town establish a written schedule for street sweeping to ensure as much dirt and sediment is removed from the streets as possible. A written record should be kept of the streets that are swept, when and an approximate volume of sediment and trash removed. This information will be used to determine if more frequent sweeping should be conducted on certain streets. Streets that collect unusually large amounts of sediment or trash should be further investigated to determine the source of pollutants.

8.2.3 Fleet Vehicle Maintenance

The Town vehicles are maintained at the public works garage located at 280 Victory Highway adjacent to the Town hall and police station. The Town fleet contains approximately 14 vehicles. The Highway Superintendent attended EPA/DEM's Public Works Garage Outreach Workshop in 1999 and participated in an EPA voluntary audit of its highway garage in September 2000.

The Town sealed the floor drains in the public works garage in 1993 and removed a 1,000-gallon underground gasoline storage tank. The Town performed soil testing in the vicinity of the floor drains and in the area surrounding the gasoline tank and it was determined by DEM's UIC Program and the Underground Storage Program that no further action was required at either location. All Town fuel tanks are above-ground and are provided with fully-enclosed secondary spill containment.

New and used automotive fluids are stored inside the public works garage. Used motor oil from Town vehicles is stored onsite and picked up by a local recycler. Public collection of used motor oil, via an Oil Igloo, is available at the transfer station.

Recommendations

It is recommended that the Town conduct periodic audits of its vehicle maintenance activities to ensure that all materials and wastes at the facility are being managed properly. The Town should also ensure that adequate spill prevention and control measures are in place.

8.2.4 Sand/Salt Storage and Use

The sand and salt reserves for the Town are stored within a salt shed which was constructed in 1994. Salt and sand are now protected from precipitation. Prior to the construction of the salt shed, the Town experienced problems with elevated salt content in nearby wells. The Town applies a 5/1 mix of sand and salt to roads during winter storms which utilizes approximately 2,000 tons of sand and 720 tons of salt in an average year. There are no salt-restricted areas within the Town.

Recommendations

The Town should also consider ways to reduce the amount of sand and salt applied to roads such as ensuring proper calibration of spreading equipment and by investigating alternate methods of de-icing roads when/if they become available. Other methods potentially available in the future, could include the use of alternative deicing chemicals and/or the use of site specific forecasts in conjunction with pavement sensors and roadway temperature profiles to guide the efficient application of deicing agents.

8.2.5 Building and Landscaped Area Maintenance

The Town does not regularly apply pesticides, herbicides or fertilizers to Town-owned land. DPW staff indicated that occasionally the weed-killer Round-up is used on isolated problem areas.

8.2.6 Solid Waste Collection and Disposal

The Town transfer station and recycling facilities are located on Bates Trail. The Town does not provide regular municipal curbside collection of solid waste and recyclables. Residents bring their own trash and recyclables to the Town transfer station, or hire a private contractor to do it for them. Waste collected at the transfer station is disposed of at the Central Landfill in Johnston. There are no public trash receptacles located within the Town.

DPW staff indicated that there is one location in Town, in the vicinity of the transfer station, that has a propensity to collect trash and other discarded items. The Town plans to post signage at this site prohibiting illegal dumping, warning potential polluters of fines, and providing a telephone number for witnesses to report incidents.

The Town already has best management practices in place to promote recycling and it actively participates in earth day cleanup efforts with local environmental organizations. A resident noted during the public meeting on March 19th, that more capacity for recyclable materials should be made available at the transfer station and better signage distinguishing the recyclable receptacles should be provided.

Recommendations

The Town should continue to promote recycling and when purchasing Town supplies consider buying recycled materials over virgin materials. The Town should continue to encourage participation in local cleanup efforts and post “no dumping” signage in the vicinity of the transfer station. A “no dumping” sign would cost approximately \$100 to \$300 to purchase and install depending on design chosen. Cleanup

events and litter prevention information could be posted on the Town's website and distributed at the transfer station.

Based on comments from residents, the Town plans to work with the contractor that runs the transfer station to ensure that ample space for recyclable materials is available at all times the facility is open. The Town also plans to post additional recycling signs at the transfer station to encourage recycling and to clearly label the correct receptacles for recycled materials.

8.2.7 Hazardous Materials Handling and Storage

Household hazardous waste collection is provided by RI Resource Recovery at the Central Landfill. West Greenwich does not offer collection or disposal of such waste to its residents. If residents wish to properly dispose of hazardous waste, they must make an appointment to drop it off at the Eco Depot located at the landfill in Johnston. This year RI Resource Recovery is offering satellite collections of household hazardous waste at specific locations and dates throughout the state. A collection is scheduled for Exeter, RI (which is adjacent to West Greenwich) on November 15, 2004. The Town plans to actively advertise this opportunity to its residents and to encourage RI Resource Recovery to make satellite collections standard practice.

Recommendations

It is recommended that the Town make information about Eco Depot readily available at the transfer station and post information about handling household hazardous waste on its website. It is also recommended that the Town continue to periodically conduct a hazardous materials audit of all its facilities to ensure that hazardous materials and wastes are being properly handled, stored and disposed of. This audit may also provide the Town with recommendations for less hazardous alternatives to any of the hazardous materials it is currently using.

[THIS SPACE LEFT BLANK INTENTIONALLY]

8.3 MEASURABLE GOALS

Table 8-1
POLLUTION PREVENTION/GOOD HOUSEKEEPING MEASURABLE GOALS

TARGET YEAR	ACTIVITY	TOWN DEPARTMENT RESPONSIBLE
1	Pollution prevention measures identified.	DPW
	Employee pollution prevention training materials gathered.	
	Maintenance schedule for catch basins and street cleaning established.	
	Road shoulders and roadside ditches observed for signs of erosion. Remedial measures recommended if erosion problems found.	
	Ample space for recyclable materials consistently provided at Town transfer station.	
	Satellite household hazardous waste collection promoted through Town, sponsored by Rhode Island Resource Recovery.	DPW, Bldg/Zoning
	Inspection of all outfalls for visible signs of scouring. Remedial measures recommended if erosion problems found.	DWP, Planning
2	Pollution prevention training for appropriate employees completed.	DPW
	Additional recycling signage posted at Town transfer station.	
	Periodic hazardous materials audit of Town facilities performed.	
	Work with Rhode Island Resource Recovery to investigate increasing household hazardous waste collections in vicinity of West Greenwich.	
3	Pollution prevention training for appropriate employees continued.	DPW
	Satellite collection or Eco Depot collection of household hazardous waste advertised through Town.	
4	Pollution prevention BMP's incorporated into the Town's capital improvement and comprehensive plan	Planning
	Consider reinstituting the Youth Litter Corps Program.	

TARGET YEAR	ACTIVITY	TOWN DEPARTMENT RESPONSIBLE
	Pollution prevention training for appropriate employees continued.	DPW
	Periodic hazardous materials audit of Town facilities performed.	

9.0 EVALUATION AND ASSESSMENT REPORTING

9.1 EVALUATION/REPORTING REQUIREMENTS

The Town is required to comply with specific evaluation/assessment reporting requirements under the Phase II Storm Water Permit. These requirements include:

- The status of compliance with permit conditions, including an assessment of the appropriateness of selected BMPs and progress toward achieving the measurable goals for each minimum control measure;
- Results of any information collected and analyzed;
- A summary of activities planned for the next reporting cycle; and
- A change in any identified best management practices or measurable goals for any minimum control measure.

9.2 PLANNED REPORTING

The Town will comply with DEM's evaluation and reporting requirements by evaluating the progress and success of the storm water program annually. If any of the proposed target dates are not being met, the Town will provide an explanation as well as an amended target date. DEM's RIPDES Storm Water Program indicated in a meeting on November 6, 2002, that they were developing a report format that they want all the regulated MS4s to utilize. The Town of West Greenwich will utilize the RIDEM report format as requested and will submit timely annual reports as required.

10.0 STORM WATER ABATEMENT OPPORTUNITIES

The following is a description of storm water abatement opportunities the Town is planning or considering implementing. See Figure 10-1 for a map and tabular summary of the approximate locations of these projects (where applicable).

Town Landfill Closure – The existing Town transfer station is located on the site of a former Town dump. The Town plans to work with the state to investigate formally closing the old landfill located on Bates trail in the eastern portion of the Town near the East Greenwich line. The Town landfill is currently identified as a Comprehensive Environmental Resource Liability and Compensation Act (CERCLA) waste site, but it is expected to contain mainly municipal waste. Properly capping the landfill (if required) would prevent rain water and associated runoff from transporting pollutants from the landfill into local water bodies. The location of the Town Landfill is shown on Figure 10-1. The Town Planner is taking the lead on investigating the closure of this landfill. The extend of the capping/closure required at this site has not as yet been determined, therefore the cost to close the landfill cannot be estimated at this time.

Open Space Preservation - The Town makes successful use of the state’s Farm, Forest and Open Space Act that allows land owners with more than ten acres to apply for local tax assessment relief. According to the Comprehensive Plan, approximately 165 property owners have successfully utilized this state/local program to ensure that large tracts of land would remain open space. The Town’s Zoning Ordinance also mandates the provision of a special designation of all state, town and quasi-public open space to become part of the Open Space and Public Land zoning districts. This provision restricts the use of these areas to open space and recreation. The purpose of this zone is to insure all properties owned by a public agency will be protected as open space in the event of the transfer or sale of the property. The protection of open space has significant positive impacts on storm water quality. Land that is maintained in a vegetated state will not impact local water bodies with a net increase in storm water runoff or related pollutants associated with development of the land. The four largest areas of open land in West Greenwich include the Arcadia Management Area, the Big River Wildlife Management Area, the W. Alton Jones Campus and the Wickaboxet Wildlife Management Area.

Responsible Zoning – The Town’s current Zoning Ordinance (amended June 12, 2002) contains requirements that encourage environmentally responsible use of land. Such provisions include “Ecological Considerations” which require development to result in minimal degradation of unique or irreplaceable land types; minimal adverse impact upon the critical areas such as streams, wetlands, areas of aquifer recharge and discharge, steep slopes, highly erodible soils; areas with a high water table, mature stands of vegetation and extraordinary wildlife nesting, feeding or breeding grounds. The Zoning Ordinance also requires that any proposed development be designed so as to provide for proper surface water management through a system of controlled drainage that: 1-preserves existing natural drainage patterns and wetlands; 2-enhances groundwater recharge areas; and 3-protects other properties and existing natural and artificial drainage features from the adverse effects of flooding, erosion and the depositing of silt, gravel or stone. Zoning Board of Review is responsible for implementing the Zoning Ordinance. The requirements of the ordinance apply town-wide and there is no direct cost associated with its implementation.

ISDS Wastewater Management Plan – The entire Town, with the exception of a few companies within the Technology Park area located off 95, is unsewered. All of the unsewered areas throughout the Town rely on individual sewage disposal systems (ISDS or septic systems). The Town plans to develop an ISDS Wastewater Management Plan and potentially a Wastewater Management District to regulate timely maintenance and repair of systems especially in the densely populated sections of the Town including the Mishnock Lake and Bailey's Pond areas. Development of the ISDS Plan and related Wastewater Management District will be dependent on funding availability. The Town Planner is taking the lead on investigating the potential development of the ISDS Plan which is expected to cost approximately \$25,000 to \$30,000 to develop.

Storm Water Source Reduction and Advanced Management – In addition to the projects and practices outlined above and in previous sections of this report, the Town has implemented several other measures that address source reduction via appropriate land-use and other environmental management tools. For instance, the Town's Comprehensive Plan identifies goals and policies to protect natural resources within the Town. Some of the goals include: protecting the Town's natural resources to preserve the rural character unique to the community; the protection of ground and surface water resources from contamination from point and non-point sources; the conservation of prime farmland, open space, and other natural resources utilizing various growth management methodologies. Some of the proposed policies include: amending development regulations to encourage growth in areas of limited land constraints and discouraging development in environmentally-sensitive areas; and prohibiting direct discharges of storm water from all development into lakes, ponds, streams, or wetlands. The Town Council and the Planning Board are responsible for carrying out the Comprehensive Plan.

**Table 10-1
SUMMARY OF STORM WATER ABATEMENT OPPORTUNITIES**

ABATEMENT OPPORTUNITY	APPROX COST	FUNDING SOURCES	AFFECTED WATERBODY	ANTICIPATED IMPROVEMENTS	START DATE
Town Landfill Closure (Initial Investigation)	\$10,000	Priority Pollution	Frenchtown Brook	Properly closing landfill will prevent storm water runoff from transporting pollutants off site.	2005*
ISDS Wastewater Management Plan	\$25,000 to \$30,000	SRF	Lake Mishnock Bailey's Pond and others	Reduction in nutrients and bacteria from poorly functioning septic systems.	2005*
Open Space Preservation	varies	Land Trust Private Donations	Town wide	Reduced volume of runoff, improved quality of runoff	On going
Storm Water Reduction Advanced Mgmt.	varies	Operating Budget	Town wide	Reduced volume of runoff, improved quality of runoff	On going

* Depending on funding availability.

Figure 10-1 Abatement Opportunities

11.0 POTENTIAL FUNDING SOURCES

The following are descriptions of traditional funding sources that are available to finance storm water pollution prevention projects in Rhode Island. Additional non-traditional funding sources may also be available or become available throughout the duration of the permit. In the past, these sources have included state and open space land grants, and other private foundation grants.

Non Point Source Funding – Periodically DEM’s Non-Point Source Program makes funding available for projects that reduce non-point source pollutant loadings entering water resources so that beneficial uses of the water resources are maintained or restored. Funding is provided by the Rhode Island Clean Water Trust Fund and EPA Clean Water Act Section 319 monies. The grants are administered by Jim Riordan, DEM Non-Point Source Program manager, who can be reached at (401) 222-4700 or jriordan.dem.state.ri.us.

State Revolving Fund – The State Revolving Fund (SRF) co-managed by the RI Clean Water Finance Agency and DEM Office of Water Resources, provides below market rate loans (1/3 off prime) for the construction and upgrade of wastewater collection systems and treatment facilities and other water pollution abatement projects which contribute to the removal, curtailment or mitigation of pollution of the waters of the state. In order to receive SRF funding for a project, the Town must submit information on that project to DEM and have the project placed on the Project Priority List. For more information contact Jay Manning at DEM’s Office of Water Resources (401) 222-4700 or jmanning@dem.state.ri.us.

Aqua Fund – The Rhode Island Aqua Fund was established in 1988 to fund projects aimed at protecting and improving the water quality of Narragansett Bay and its tributaries. A 20-member Aqua Fund Council, comprised of scientists, state officials, EPA, the League of Cities and Towns, commercial fishermen, local industry representatives and the general public, advises the Director of DEM in granting funds. The fund categories include: planning, project implementation, wastewater treatment, and non-point source pollution prevention. For more information contact Lisa McGreavy at DEM’s Office of Water Resources (401) 222-4700 or lmcgeav@dem.state.ri.us.

12.0 PUBLIC PARTICIPATION

12.1 PUBLIC WORKSHOPS/PUBLIC HEARING

A public meeting was held on March 19, 2003 to educate residents on the causes and effects of storm water pollution. This meeting also afforded the residents with an opportunity to provide their input on the contents of the SWMP. The public meeting was advertised on March 13, 2003 in the Kent County Daily Times, and on March 17, 2003 in the Providence Journal. Notice of the meeting was also posted at Town Hall, on the local public access channel and at the Louttit Library. Residents were asked for their comments during the meeting and were informed that additional comments or questions could be provided to the Town Planner at their convenience. Several meetings with Town representatives and members of the steering committee were held during preparation of the draft SWMP.

The Town plans to hold a second public meeting/public hearing where the final draft SWMP will be presented to the Town council and to the public. The public hearing will be advertised in the Providence Journal, in the Kent County Daily Times, and on the local access channel. After a presentation by Berger on the contents of the plan, the public will be invited to voice comments before the Town Council. The draft SMWP will be revised to address the comments received by the Town, the Town Council, and RIDEM NonPoint Source Program. The Town Council will vote to approve the finalized SWMP and the finalized plan will be submitted to RIDEM.

12.2 PUBLIC COMMENTS

Public comments were received during the March 19, 2003 public meeting and these ideas and suggestions were incorporated into the draft SWMP. Additional public comments will be solicited during the public hearing. These comments will be addressed in the final SWMP.

12.3 AGENCY COMMENTS

To be completed once agency comments have been received.

12.4 RESPONSIVENESS SUMMARY

To be completed once all comments have been received

