

# **Village of Mamaroneck, New York**

## **Stormwater Management Program**



Mamaroneck Harbor

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May 2010  
Revised December 2012

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## **Village of Mamaroneck, New York Stormwater Management Program**

### 1.0 General Information

The Village of Mamaroneck, New York, in order to comply with the requirements of the United States Environmental Protection Agency, and the New York State Department of Environmental Conservation, has developed this Stormwater Management Plan for the purpose of documenting municipal efforts for the purpose of improving stormwater quality.

Each of the six (6) minimum control measures including; public education and outreach, public participation and involvement, illicit discharge detection and elimination, construction site stormwater runoff control, post construction and pollution prevention and good housekeeping is individually documented herein.

### 1.1 Agencies / Offices responsible for program implementation

The Table below shows the respective agencies and offices of the Village which are responsible for implementation of the individual Minimum Control Measures. In each case, the Department Head shall be the contact person.

Minimum Control Measure	Agency / Office	Telephone Number
Public Information and Outreach	Asst. Village Manager	914-777-7703
Public Participation and Involvement	Asst. Village Manager	914-777-7703
Illicit Discharge Detection and Elimination	Public Works Building Department	914-777-7745 914-777-7731
Construction Site Stormwater Runoff Control	Building Department	914-777-7731
Post Construction Stormwater Management	Building Department	914-777-7731
Pollution Prevention and Good Housekeeping	Public Works	914-777-7745

### 1.2 Municipal Demographics

The Village of Mamaroneck is located in the southeast area of Westchester County, New York with a population of 18,400 based on the year 2000 census.

The Village is bordered on the south and west by the Town of Mamaroneck, on the east by Long Island Sound, and on the north by the Town of Harrison and City of Rye. The highway network consists of approximately 46.2 miles of Village maintained streets and 4.3 miles of state touring



and county maintained highways. The Village is a diverse community made up of single and multi-family homes, a large business area and waterfront bordering on Long Island Sound.

The main water body to which stormwater flows is the Long Island Sound by way of the Sheldrake and Mamaroneck Rivers and the village stormwater conveyance system

<b>Item</b>	<b>Pollutant</b>	<b>Pollutant</b>	<b>Pollutant</b>	<b>Pollutant</b>
Long Island Sound	Nutrients	D/O and Oxygen Demand	Pathogens	
Mamaroneck River & Harbor	Silt & Sediment	D/O and Oxygen Demand	Pathogens	Floatables
Sheldrake River	Silt & Sediment	Phosphorus	Pesticides	Nutrients

Source: NYSDEC Atlantic Ocean / Long Island Sound PWL Inventory

The New Haven Branch of the Metro North Commuter Railroad has a station in the Village.

Municipal offices are located 123 Mamaroneck Avenue.

### 1.3 Stormwater Management Program Committee

The Committee consists of the following individuals:

Deputy Village Manager  
Building Inspector  
Public Works General Foreman

The committee meets twice annually and at other times as may be requested by any member of the committee. The purpose of the committee is to develop, implement, operate and monitor the Village's overall Stormwater Management Plan, insure that changes to the overall concept of Stormwater Management at the Federal or State levels are added to the Village's plan, develop an annual budget for stormwater management, develop and implement individual components of each of the six (6) minimum control measures, review previous years efforts to determine if the documented goals and objectives of the program are being met (and adjust municipal efforts as may be needed), prepare the annual report for review by the public, review by the Village Board and submission to the New York State Department of Environmental Conservation.

### 1.4 Annual Budget

A budget shall be prepared annually for implementation of the Village's Stormwater Management Program. The budget shall address each of the six (6) minimum control measures, specifying a dollar amount to be set aside for each. Where funds are set aside in other areas of the budget for stormwater related programs (i.e street sweeping and catch basin cleaning) the

section of the budget where those functions are listed shall be indicated along with the approximate dollar amount available.

### 1.5 Annual Review

The Stormwater Management Program Committee shall meet prior to the preparation of the Village's Annual Budget for the purpose of reviewing efforts being made to improve stormwater quality, determine if the established goals and objectives are being met, and determine what changes if any are needed to the Village's Stormwater Management Program and any associated budgetary needs.

### 1.6 Records

Records relating to all work associated with the Village's Stormwater Management Program shall be kept for a minimum of 5 years. Records may be kept either as an electronic or hard copy. Records shall be readily available to the public as well as Federal, State and Local agencies during the normal business hours of Village Hall. A copy of the Village's Annual Report to the New York State Department of Environmental Conservation will be posted on the Village's Website with annual updates. Records with respect to Construction Site Stormwater Runoff Control shall be kept as part of the individual building site file or other format as determined by the Building Official. Post Construction records with respect to Best Management Practices (BMP) for both public and private facilities shall be kept indefinitely.

### 1.7 Cooperative Efforts and 3<sup>rd</sup> Party Participation

The Village shall cooperate with the Stormwater Management efforts of surrounding municipalities as far as practical. Cooperation may take the form of meetings to determine items of work which can produce economies of scale for cooperating municipalities/agencies and the implementation of those work items. Where the Village utilized a 3<sup>rd</sup> party in any portion of its Stormwater Management Program, that party shall comply with the MS4 permit requirements applicable to the work being performed. Compliance shall be verified in the form of a Compliance Certification attached to and made part of this document in Section 12.

### 1.8 Exempt Non-Stormwater Discharges

The following Non-Stormwater Discharges are exempt from the need for SPDES permit coverage unless the New York State Department of Environmental Conservation determines them to be substantial contributors of pollutants to the Village. (See Permit No. GP-0-08-002), Part IA(2).

- water line flushing
- landscape irrigation
- diverted stream flows
- rising ground water

- uncontaminated ground water infiltration(as defined in 40 CFR35.2005(20))
- uncontaminated ground water
- discharges from potable water sources
- foundation drains
- air conditioning condensate
- irrigation water
- springs
- water from craw space and basement sump pumps
- footing drains
- lawn and landscape watering runoff provided that all pesticides and fertilizers have been applied in accordance with the manufacturers product label
- water from individual residential car washing
- flows from riparian habitats and wetlands
- de-chlorinated swimming pool discharges
- residual street wash water
- discharges or flows from fire fighting activities
- de-chlorinated water from reservoir discharges
- any SPDES permitted discharge

## **2.0 Public Education and Outreach**

### **2.1 Policies and Procedures**

It is the policy of the Village to conduct a program to educate the public on the problems associated with impaired stormwater quality, the conditions which contribute to impaired water quality, and the actions which can be taken by the community both individually and as a whole to improve the quality of stormwater runoff.

The Village will develop and operate a program to inform residents and businesses of the problems associated with impaired water quality through the distribution of literature, postings on the Village website, announcements when Stormwater related events are planned, articles in the Village Newsletter, postings on cable television, cable televised question and answer sessions, presentations before the general public, neighborhood groups, fraternal organizations, schools and targeted groups. Hard copies of the Village's Stormwater Management Program will be available at Village Hall and the Public Library and a copy of all Stormwater related information will be forwarded to the School District for their dissemination.

### **2.2 Goal (s)**

It is the goal of the Village to insure that sufficient information is made available to the public on impairments to stormwater quality and what needs to be done in order that individuals and businesses may make informed decisions on how best to contribute to the overall Stormwater Management Program effort.

### **2.3. Information To Be Distributed / Information Outlets**

Printed information to be distributed will take the form of single and multi-page information bulletins. These bulletins will be both generic in nature and target audience specific. Information such as lawn care and use of fertilizers is generic to all home and business owners with landscaped properties. Targeted audiences will have information available to them which focuses on their particular business or land use. The targeted audiences include ***service stations and vehicle repair shops, supermarkets / grocery stores / food outlets, sites containing large parking areas.*** Information on non-stormwater discharges will also be provided along with information on reducing pollution (where appropriate) from these type discharges. Illicit Discharge Detection and Elimination information is included in this Minimum Control Measure. All information will be placed on the Village's website.

The Village website will have a section dedicated to Stormwater Management. The website shall include a general welcome letter to the site by the Mayor followed by drop down screens with the information outlined above. The website will also include links to Federal, State, County, Organizational and Professional Stormwater websites as well as the name and contact information of the Stormwater Management Coordinator for the Village.

At least one informational session on Stormwater Management will be held annually at Village Hall and Stormwater Management staff will make themselves available for neighborhood and other civic events to inform residents of the Village's efforts. A cable television discussion on the Village's efforts and stormwater management in general will be prepared and programmed to run monthly. Text spots will also be prepared to run daily on cable television.

## 2.4 Activity Timetable

### Tentative Information Dissemination Calendar

Item / Month	J	F	M	A	M	J	J	A	S	O	N	D
Mailing *	X					X						
Internet Posting	X											
Newspaper / Newsletter Article (s)*												
Cable Television Spot (s)	X	X	X	X	X	X	X	X	X	X	X	X
Community Presentations*				X						X		
Annual Report Public Session				X	X							
Annual Program Budget Review**			X	X								

Subject to change based on need

\* As warranted by program activities and developments

\*\* The educational and outreach effort will be reviewed during the annual budget preparation period with funding provided accordingly.

## 2.5 Program Implementation Reporting

The following indicators will be utilized to represent the efforts used to inform the public of the Village's Stormwater Management Program:

- List of activities performed for general and target audiences including number of attendees, pieces of literature distributed, number of inquiries to Village Hall.
- Illicit Discharge Detection and Elimination training for employees including number of attendees and hours.
- Number of hits to the Village's Stormwater webpages (if possible)
- Construction site stormwater control training completed / attended
- Pollution Prevention Training for employees
- Report on program effectiveness and measurable goal assessments

### **3.0 Public Participation and Involvement**

#### **3.1 Policies and Procedures**

It is the policy of the Village to utilize the participation of the general public, businesses in order to maximize the Village's efforts to lessen the impact of pollutants on stormwater quality.

The Village will invite public participation, on an annual basis, through its educational and media outlets. Notification to residents, businesses and visitors will be accomplished through an open letter on the Village website. Contact information for the Village's Stormwater Coordinator will be on all literature distributed. Each year in April / May, Public Notice will be made utilizing Village Board meeting agendas or posting on the Village website to notify businesses and residents that they may review, comment, and where appropriate, receive a response to their inquiry on the Draft Annual Report prior to its presentation to the Village Board and subsequent transmittal to the New York State Department of Environmental Conservation. A summary will be made of all comments to the Draft Annual Report as well as the Village's response to questions about the information in the Draft Annual Report. Comments / inquiries as well as the Village's responses will be attached to the Final Annual Report. The Annual Stormwater Report once finalized and forwarded to the New York State Department of Environmental Conservation will be posted on the Village's website.

#### **3.2 Goal(s)**

It is the goal of the Village with respect to Public Participation and Involvement effort that all residences and businesses have an opportunity to better understand and "buy in" to the idea that water quality is the concern of each and every homeowner and business and that participating in the process of improving stormwater will have a positive impact on the overall quality of life in the Village.

#### **3.3 List of Activities for Participants**

The general public and businesses will be invited to participate in the Village's Stormwater Management efforts. Ways to participate may include, but will not be limited to:

- Roadside Cleanups
- Stream Walks
- Insuring contracted landscapers are utilizing proper methods of lawn fertilization and native plantings and yard waste disposal.
- Seeding or providing ground cover to areas on one's property where erosion may be occurring

The Village will provide guidance as to the implementation of such efforts and arrange for municipal collection of debris collected during roadside cleanups and stream walks.

### 3.4 Activity Timetable

#### Tentative Public Participation Calendar

Item / Month	J	F	M	A	M	J	J	A	S	O	N	D
Annual Report Comment Period				X	X							
Stream and Roadside Cleanups				X	X	X	X	X	X	X		
Proper Lawn Care Activities			X	X	X	X	X	X	X	X		

### 3.5 Program Implementation Reporting

The following indicators will be utilized to describe the level of participation in the Village's Stormwater Management Program:

- Annual Report Presentation /Availability to the public including how comments can be received by the Village and how responses are provided.
- List of public participation activities including the date, activity undertaken, number of participants and quantitative listing of activity results.
- Reporting methods / quantifying of stormwater quality concerns including reporting spills, illegal dumping, and construction site concerns.
- Report on program effectiveness and measurable goal assessments

#### **4.0 Illicit Discharge Detection and Elimination**

##### **4.1 Policies and Procedures**

It is the policy of the Village to inspect its stormwater outfalls on an annual basis and, where illicit discharges are found, determine their source and take action to terminate said discharge to the stormwater drainage system.

The Village has placed in its municipal code, legislation which outlines action which will be taken to detect and eliminate illicit discharges. Inspections shall be made by qualified staff on a schedule developed by the Village's Stormwater Management Coordinator. Inspections shall be made no sooner than 72 hours following a rain event. The basic inspection shall be visual in nature utilizing the information obtained and documented on the initial Outfall Reconnaissance Inventory (ORI). Should the existence of an illicit discharge be detected, staff will immediately seek out the source of the illicit discharge and take the necessary action to terminate same. The decision for containment of the illicit discharge and its sampling and testing as well as notification of higher authority, shall be made by the Building Official.

##### **4.2 Goal(s)**

The goal of the Village to inspect its stormwater conveyance system on both a scheduled and unscheduled basis and to remediate any illicit discharges detected.

##### **4.3 Legislation**

A copy of the Village's Legislation on Illicit Discharges may be found in Section 14.

##### **4.4 Mapping of Outfalls**

A copy of the Village's Stormwater Outfall Mapping may be found in Section 15

##### **4.5 Mapping of Conveyance Systems and Stormsheds**

Mapping of storm sheds shall be completed preliminarily by March 9, 2010.

##### **4.6 Timetable for Inspections**

Routine outfall inspections shall be made between April 1<sup>st</sup> and October 1<sup>st</sup> of each year. Inspections shall be made only after a period of 72 hours with no rainfall. A visual inspection shall be made initially utilizing the criteria on the Center for Watershed Protection Outfall Reconnaissance Inventory Form. Any illicit discharges detected shall be reported immediately



to the Building Official. Reports of illicit discharges shall be inspected immediately. The Building Official shall direct the steps to be taken to identify the source of the illicit discharge.

#### 4.7 Action and Remediation when Illicit Discharge is Detected

The Building Official (or Hazardous Materials Response Team) shall direct the actions to be taken in the event that an illicit discharge is detected. Immediate action shall be taken to trace the illicit discharge back to its origin. If the type of discharge can not be immediately identified, the Building Official may take / direct that samples be taken to determine the composition of the illicit discharge. Regulatory agencies such as the Westchester County Health Department and the New York State Department of Environmental Conservation shall be contacted to make them aware of the illicit discharge.

Once the source of the discharge is located, it shall be discontinued / mitigated immediately and further action against the polluter taken in accordance with the Village's Local Law on Illicit Discharges.

When performing Illicit Discharge Trackdowns, the Village will utilize The Center for Watershed Protection document titled, "Illicit Discharge Detection and Elimination" guidance manual dated October 2004.

#### 4.8 Media and In-House Information Outlets

Illicit Discharge Detection and Elimination public education and outreach is conducted under Minimum Control Measure # 1. The information distributed will include a definition of illicit discharges, some typical types of discharges as well as how homeowners and businesses should inspect their properties to insure that there are no illicit discharges emanating from the properties.

#### 4.9 Staff Training

Staff performing illicit discharge inspections shall receive training as to how to recognize them, characterize them and the proper reporting procedures for same. Records shall be kept with respect to employees who receive training and information about the actual training program conducted. Training shall be conducted annually and for all new employees prior to undertaking their assigned duties.

#### 4.10 Program Implementation Reporting

The following indicators will be utilized to describe the level of participation in the Village's Stormwater Management Program:

- Percent of Outfalls for which an Outfall Reconnaissance has been performed
- Status of system mapping
- Activities and results from informing employees, businesses and the general public of the hazards associated with illicit discharge and improper disposal of waste.
- Regulatory mechanism status, certification and equivalence
- Report on effectiveness of program, BMP and measurable goal assessment.

## **5.0 Construction Site Stormwater Runoff Control**

### **5.1 Policies and Procedures**

It is the policy of the Village to require all construction sites with one acre or more of disturbance to include in the site and design plans submitted, a stormwater pollution prevention plan (SWPPP). The Stormwater Pollution Prevention shall be prepared in accordance with the New York State Department of Environmental Conservation State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-10-001 and Permit No. GP-0-10-002, Municipally Separate Storm Sewer Systems. All SWPPP's shall be prepared in accordance with the most current version of the New York Standards and Specification for Erosion and Sediment Control.

#### **Project Review**

- The Building Inspector, prior to referral, shall require the builder/developer to submit the appropriate number of copies of the Project Plans, including the required Stormwater Pollution Prevention Plan, for Planning Board review.
- Each set of Project Plans provided shall include an original signature, date, and raised seal of the New York State Licensed Professional Engineer, Architect, or Landscape Architect who prepared the Plans. The Stormwater Pollution Prevention Plan Section of the Project Plan documents shall include a separate original signature, date, and raised seal of the New York State Licensed Professional Engineer. A Certified Professional Erosion and Sediment Control may also sign the Stormwater Pollution Prevention Plan if there are no permanent stormwater measures.
- The Building Inspector/ Planning Board shall have the SWPPP reviewed for the municipality by a New York State Licensed Professional Engineer, or Certified Professional Erosion and Sediment Control to insure compliance with the New York State Stormwater Design Manual (latest revision) and other technical standards.
- A public meeting shall be held as part of the Planning Board Review Process where individuals are allowed to comment either in writing or in person on the overall project as well as any specifics relating to the Stormwater Pollution Prevention Plan. Adequate public notice of the meeting shall be given in the local newspaper, posting on the municipal bulletin board and where available on the municipal website. Timeliness of the notice shall be in accordance with municipal code requirements. Plans and specifications for the project shall be available for review at the municipal offices during regular business hours.
- Public comments received both in writing and verbally with respect to the Stormwater Pollution Prevention Plan shall be documented by the Planning Board and included in the overall project file.
- The Planning Board may request the builder/developer to make changes to the Stormwater Pollution Prevention Plan as deemed appropriate and said changes shall be made to the Project Plans and resubmitted to the Planning Board prior to the Planning Board approval of the Project Plans.

- The Stormwater Pollution Prevention Plan shall include, in addition to a Table of Maintenance for Best Management Practices utilized during construction;
  1. A Table of Maintenance for permanently installed Best Management Practices including a schedule of inspections (once a year at a minimum), operating and maintenance procedures for structural Best Management Practices, Engineer's calculations with respect to any sizing of Best Management Practices, and operating, maintenance, planting and mowing practices for open space areas.
  2. Designation of the individuals, owners, homeowners association, or management agencies which shall be responsible for the operation and maintenance of permanently installed Best Management Practices.
  3. The designation of an annual date by which the individuals, owners, homeowners association, or management agencies shall certify, in a form acceptable to the Building Inspector that the installed Best Management Practices are being properly operated and maintained in accordance with the documented/industry standards.
  4. Documentation acceptable to the municipality allowing officials or their designated representatives access to the site for inspection of, or operation and maintenance of installed Best Management Practices should the owner default on said maintenance and operating procedures.
  5. A tabulation in a Microsoft Excel Format, (or other format designated by the Building Inspector) of all Construction and Post Construction Best Management Practices including inspection schedules as per New York State Department of Environmental Protection Stormwater Design Manual and other industry standards.

## 5.2 Goal(s)

To insure that all projects are completed with minimal or no impact on water quality. Where the final construction product is anticipated to have an impact on water quality, and that Best Management Practices have been constructed and are properly operated and maintained in perpetuity.

## 5.3 Legislation

A copy of the Village's Legislation on Construction Site Stormwater Runoff Control may be found in Section 14.

## 5.4 Media and In-Information Outlets

Construction Site Stormwater Runoff Control public education and outreach is conducted under Minimum Control Measure #1. Information on the submission of Stormwater Pollution Prevention Plans will be available in the office of the Building Official. In addition, a meeting between the owner/developer and the Building Official will be held prior to the submission of plans for consideration for construction to insure that all the requirements of the Village's

legislation on Construction Site Stormwater Runoff are understood. A mechanism is in place to allow the public to review construction proposals and comment on same (part of the Planning / Zoning Board Process), and for the public to receive a response to their inquiries prior to a final decision for construction to proceed.

#### 5.5 Staff Training

Village staff will take advantage of training opportunities related to Construction Site Inspection and Runoff, available through the New York State Department of Environmental Conservation, Soil and Water Conservation Districts, professional organizations and other training and education outlets. A record shall be kept of all training activities attended.

#### 5.6 Contractor Procedures Inspection and Reporting Requirements

Shall be as outlined in the New York State Department of Environmental Conservation State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-10-001 and as directed by the Building Official with respect to submission, formats and timeliness.

Shall be as outlined in the New York State Department of Environmental Conservation State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-10-001 and as directed by the Building Inspector/ Municipal Engineer with respect to submission formats and timeliness.

Municipal staff overseeing construction projects shall insure that owner/operator staff performing stormwater and SWPPP related inspections are qualified to perform such work and require the submission of documentation such as:

- Licensed Professional Engineer
- Certified Professional in Erosion and Sediment Control
- Registered Landscape Architect
- Someone working under the direct supervision of, and at the same company as, the licensed professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of NYSDEC endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC endorsed entity

Owner/operator staff performing SWPPP site inspections shall do so at a minimum interval of every seven (7) days or within 24 hours after every .25 inches of rainfall. Inspection reports must cover all aspects of the SWPPP and be signed and dated by the owner/operator designated site inspector. These reports shall be filed with the Building Inspector/Municipal Engineer within 48 hours of the completion of said inspections. A copy of all SWPPP site inspection reports shall remain on the site and be available to the Building Inspector/Municipal Engineer during working hours. Site inspections may be adjusted accordingly during site shutdowns during the winter months in accordance with documented requirements for such shutdowns. The

Building Inspector/Municipal Engineer shall visit the construction site periodically to verify owner/operator site inspection reports in order to insure both accuracy and compliance.

In the performance of his or her duties as the representative of the municipality having jurisdiction over the construction project, the Building Inspector or Engineer/Consultant on staff/retained by the municipality for such purpose shall utilize the New York State Department of Environmental, "Construction Stormwater Inspection Manual" and "New York State Standards and Specifications for Erosion and Sediment Control" latest revision when determining compliance with the Project Stormwater Pollution Prevention Plan.

Upon project completion, all SWPPP inspection reports shall be filed and kept with the Section/Block and Lot file or other storage mechanism/media utilized by the municipality.

#### 5.7 Program Implementation Reporting

The following indicators will be utilized to describe the level of participation in the Village's Stormwater Management Program:

- Number of SWPPP's reviewed annually
- Number and type of enforcement actions
- Percent of active construction sites inspected once
- Percent of active construction sites inspected more than once
- Number of construction sites authorized for disturbances of one acre or more
- Report on effectiveness of program, BMP and measurable goal assessment

## **6.0 Post Construction Stormwater Management**

### **6.1 Policies and Procedures**

It is the policy of the Village to insure that all constructed Best Management Practices (BMP's) are properly operated and maintained in accordance with the requirements of the New York State Department of Environmental Conservation State Pollution Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity Permit No. GP-0-10-001 and Permit No. GP-0-10-002, Municipally Separate Storm Sewer Systems.

### **6.2 Goal(s)**

The goal of the Village is to insure that all installed BMP(s) are properly operated and maintained in perpetuity

### **6.3 Legislation**

A copy of the Village's Legislation on Post Construction Stormwater Management may be found in Section 14.

### **6.4 Operation and Maintenance**

The operation and maintenance of all Best Management practices installed since March 2003 shall be documented as part of the approved Building / Planning and or Zoning Board Permit. The individual, association, public/private agency or other legal entity having responsibility for the installed BMP(s) shall be documented as part of the approved Building / Planning and or Zoning Board Permit. Prior to the approval of the BMP(s) to be installed, the owner / developer shall submit to the Building Official for approval, documentation as to why the particular BMP to be installed was chosen along with the analysis, its life expectancy, an inspection schedule and a maintenance schedule outlining in detail when individual maintenance efforts are to be undertaken. An easement for access to the installed BMP(s) shall be provided for municipal use in the event the owner of the BMP(s) defaults in the operation and maintenance of the structure(s). Owners of installed BMP(s) shall report to the Building Official at least annually, certifying that the BMP(s) is operating and being maintained properly.

### **6.5 Documentation of Best Management Practices**

The Building Official shall keep a record of all BMP(s) installed since March 2003. The record shall be kept in perpetuity and include:

- Name ,address and contact information of the owner of the BMP
- Operations and maintenance manual for the BMP if any
- Schedule as to when inspections and maintenance is to be performed
- Schedule as to written documentation receipt that inspections and maintenance were performed.

- Name of qualified stormwater management professional / firm providing verification as to proper operation and maintenance.
- Mechanism to insure that inspections performed are reported in a timely manner

In addition to Best Management Practices installed since March 2003, the Building Official shall make a determination as to all installed BMP(s) prior to March 2003. Documentation of BMP(s) to be provided by the owner of record shall be the same as that shown above. Should the BMP(s) not be being properly maintained or operated, the Building Official must reconcile said inactivity in accordance with local laws and the Village's SPDES Permit.

#### 6.6 Program Implementation Reporting

The following indicators will be utilized to describe the level of participation in the Village's Stormwater Management Program:

- Number of SWPPP's reviewed
- Number and type of enforcement actions
- Number and type of post-construction stormwater management practices inventoried
- Number and type of post-construction stormwater management practices inspected
- Number and type of post construction stormwater management practices maintained
- Regulatory mechanism status – certification that regulatory mechanism is equivalent to one of the "NYSDEC Sample Local Laws for Stormwater Management and erosion and sediment control" (if not already done)
- Report on effectiveness of program, BMP and measurable goal assessment



## **7. Pollution Prevention and Good Housekeeping**

### **Introduction**

As part of its efforts to improve water quality at its municipally owned and operated facilities, the Village has formalized and set down its policies and procedures with respect to Minimum Control Measure # 6, Pollution Prevention and Good Housekeeping, in its Stormwater Management Program. The eight (8) elements associated with Minimum Control Measure # 6 include; Street and Bridge Maintenance, Winter Road Maintenance, Stormwater Drainage Conveyance and Treatment System Maintenance, Vehicle and Fleet Maintenance, Parks and Open Space Maintenance, Municipal Building Maintenance, Solid Waste Management, Streambank Stabilization and Erosion and Sediment Control. Each of these eight (8) elements has Best Management Practices (BMP's) common to one or more of them as well as specific to each.

### **BMP Implementation**

Municipal employees perform numerous municipal activities that have the potential to discharge pollutants. Staff should consistently implement the procedures or BMPs applicable to these activities. Some municipal activities are contracted to other parties. For example, many municipalities contract out street sweeping or waste collection. Municipalities may lease their facilities to other parties, at which activities take place that have the potential to discharge pollutants. To ensure measures are taken to reduce pollutants while contractors or lessees perform such activities, contract and lease language should explicitly specify requirements to comply with all BMP specifications.

Successful implementation of a BMP is dependent on the following components:

- Effective training of municipal and contract employees working in both fixed facilities and field programs.
- Regular inspections of fixed facilities, field programs, and treatment controls.
- Maintenance of treatment controls as needed to ensure proper functioning.
- Periodic evaluation/monitoring of BMP performance consistent with NPDES permit requirements.
- Follow-up action to correct deficiencies in BMP implementation noted during inspections.
- Accurate record keeping to track training, inspections, monitoring, and BMP maintenance.

- Submittal of an annual report to the New York State Department of Environmental Conservation regarding the effectiveness of the municipal efforts to reduce pollutants from fixed facilities and field programs.

### Staff Training

Education and training is the key to the success of BMP implementation. The Village will provide annual training sessions. In addition to Village sponsored training, staff may also attend local, regional, statewide, or national training seminars or workshops related to stormwater management and water quality conducted by other organizations.

The Village will provide training both program specific, and where feasible and appropriate, cross train staff with respect to all pollution prevention and good housekeeping efforts in order to maximize monitoring and implementation of BMP's.

Education and training will include:

- Maintenance Procedure Implementation and Inspection - In this training effort, proper procedures for performing municipal activities that may adversely affect stormwater quality are addressed. Maintenance procedures cover a wide range of municipal activities and the training may address either all maintenance procedures applicable to the municipality or a specific procedure (e.g. fertilizer and pesticide use). This training can be conducted in either a formal or a tailgate-style format.
- Pollution Prevention/Spill Awareness - This training addresses the general techniques municipal staff may implement to prevent pollution, as well as to respond to spills once they have occurred. Training can be tailored to management and other municipal staff who oversee pollution prevention measures, to field staff conducting activities that may result in spills, or to field staff who may encounter spills or illicit discharges.
- Where contract personnel are utilized, certificates indicating stormwater related training relative to the element in which the contractor is working, shall be required with no certification older than 3 years.

### Site Inspections

Inspections of municipal fixed facilities and field programs shall be performed to verify that BMPs are being implemented, that they are appropriate for that facility or program, and that they continue to reduce the discharge of pollutants. Inspections shall generally consist of the following:

- Fixed Facilities - Inspections are typically performed by a combination of stormwater program staff and on-site fixed facility managers. The inspection of a fixed facility may include spot checks of the facility and activities being performed at the facility, and interviews with key line staff. Inspections shall be performed at least annually.

- **Field Programs-** Inspections are typically performed by a combination of stormwater program staff and field program supervisors. The inspection of a field program may include spot checks of activities being performed, and interviews with key staff.
- **Contracted Activities -** Inspections are typically performed by municipal staff to supplement and check on self-inspections and reporting by the management staff of the contract firm performing the activity. Performance should be checked against contract/lease language
- **Leased Facilities -** Inspections are typically performed by municipal staff to supplement and check on self-inspections and reporting by the management staff of the lessor.

### Inspection Frequencies

Fixed facility or field program inspection frequency depends on the nature of the facility or program. Annual inspection shall be made as a minimum, with a more frequent schedule for facilities/activities that pose a greater threat to discharge pollutants. In the event of an observed problem, such as ineffective maintenance procedures or detected non-stormwater discharges, the inspection frequency shall be increased as appropriate until the facility problem is mitigated.

### Inspection Documentation Procedures

Inspection forms shall be developed and used to properly document all inspections and gather the necessary information for record keeping and annual reporting. Forms shall include:

- **General Inspection Forms -** These primary forms provide for a general characterization of the fixed facility or field program being inspected, including the type of facility or program, the reason for inspection, activities that may take place, and BMPs applicable for the facility. A general form for all inspections and a single fixed facility specific form should be completed.
- **Activity Specific Inspection Forms -** These secondary forms include a series of questions or checklist items about specific activities taking place at a fixed facility or as part of a field program, as well as a list of suggested corrective action plans that can be implemented should a problem be found. All forms applicable to the activities being performed at a fixed facility or field program should be completed.

### Treatment Control BMP Maintenance

Maintenance of treatment controls and drainage conveyance systems (e.g. detention and retention basins, infiltration devices, catch basins etc.) shall be performed based on recommendations by a professional engineer at the time of design and installation.

Where municipal contractors are responsible for maintenance of treatment controls, specific directions for maintenance shall be provided.

### Analytical Monitoring

The Village shall perform analytical monitoring when needed in order to assist in identifying a potential polluter as well as determine the mitigation steps needed to bring closure to an event. Monitoring is a long term effort as per the SPDES Permit.

### Enforcement

To ensure proper BMP performance, enforcement procedures and mechanisms should be established for the municipal fixed facilities and field programs. Enforcement actions may occur as a result of a problem found during an inspection or in response to a complaint that is received. Several different types of enforcement mechanisms and penalties can be utilized to ensure compliance. The internal enforcement procedures, directed toward municipal staff, include initial verbal warnings, written warnings, and more serious disciplinary actions if verbal and written warnings do not result in appropriate action. External enforcement procedures which pertain to municipal contractors maybe undertaken primarily by the municipality's inspectors, managers, and supervisors who possess enforcement authority through established policies and procedures or ordinances. Depending on the severity of the violation, enforcement could range from the issuance of a notice of noncompliance to the loss of a contract or lease, or a fine.

### Recordkeeping

As applicable, the Village shall maintain records demonstrating successful implementation of BMP's. Recordkeeping shall include training, site inspection and maintenance and analytical monitoring.

### Training and Workshops

Records of all training sessions provided to staff shall be maintained and include:

- determining which staff requires which training;
- determining when training sessions must be conducted; and
- documenting training activities for enforcement and compliance purposes.

Municipal staff may attend training sessions or workshops sponsored by local, regional or national organizations. For these sessions, the following information shall be recorded:

- Name of Workshop/Training

- Sponsoring Organization
- General Description of the Subject Matter
- Location
- Date
- Inclusion of appropriate literature

#### Site Inspection and BMP Maintenance

Inspection reports shall be kept to track frequency and results of inspections, BMPs implemented, condition of BMPs inspected, and follow-up actions taken. It is also important to keep a record of maintenance activities or any other BMPs that are of an "action" nature. It is easy to demonstrate that a BMP that involves a physical change, such as berming or covering, has been accomplished. However, actions that relate to good housekeeping can only be demonstrated by recordkeeping. Besides demonstrating compliance, records can assist in BMP management. Keeping a record of catch basin cleaning, for example, also provides insight into how long it takes for the catch basin sump to refill.

#### Monitoring

Records of all stormwater monitoring information, inspections and visual observations, certifications, corrective actions and follow-up activities, and copies of all reports must be retained for a period of at least three years. These records shall include at a minimum, when applicable:

- Date, place, and time of sampling, visual observations, and/or measurements.
- Individual(s) who performed the sampling, visual observations, and or measurements.
- Visual observation records for events.
- Visual observations and inspections of non-stormwater discharges.
- Calibration and maintenance records of on-site instruments used.
- Visual observations and sample collection records,
- Date and approximate time of analyses.
- Individual who performed the analyses.
- Analytical results, method detection limits, and the analytical techniques or methods used.

- Quality assurance/quality control records and results. Sampling and analysis exemption and reduction certifications and supporting documentation.
- Record of any corrective actions and follow-up activities that resulted from observations

#### Reporting

An annual report, in a format as determined by the New York State Department of Environmental Conservation, and including all relevant information, shall be filed.

## **Pollution Prevention and Good Housekeeping**

### **7.2 Policies and Procedures**

#### **Street and Bridge Maintenance Policies and Procedures**

It is the **policy** of the Village to sweep its street and bridge infrastructure in accordance with the a schedule developed and implemented by the Department of Public Works.

The **procedure** used to implement this effort is to mechanically sweep streets, bridges and other facilities. Information will be provided to the general public with respect to the need for operation and maintenance of private parking facilities and sidewalks.

The Village utilizes motorized mechanical and other street sweeper equipment for implementation of its program. The sweepers are maintained by the Village's Public Works Facility and replaced based on an annual assessment of the equipments life expectancy, current condition and annual operation and maintenance costs. Manual sweeping will be performed on an as needed basis.

Municipally owned parking lots are swept on an "as needed" basis based on observations by municipal street sweeper operators and Department of Public Works supervisory personnel. The Village has an ordinance requiring adjoining property owners to maintain sidewalks.

The Village does not have any unpaved streets under its jurisdiction.

The Village shall provide an annual training review of its policy and procedures with respect to Street and Bridge Maintenance as it relates to Stormwater Management. Staff are required to sign in to the training session and a record of said training is kept with documentation relating to the Village's overall Stormwater Management Plan and Personnel Training Records.

#### **Street and Bridge Maintenance Implementation**

Records will be kept on a calendar year basis and reported at the Village's annual program review for the following work performed:

- **Tons or Cubic Yards** of debris cleaned from streets, sidewalks and parking lots (daily, monthly, cumulative for calendar year).
- **Number** of bridge repair / replacement projects with incorporated pollution prevention or streambank erosion control components.
- **Hours** of training, retraining or continuing education activities related to policies, procedures, implementation and stormwater management.

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*Stormwater Management Plan*

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- **Number** of street and bridge maintenance policies and procedures, or BMP updates or revisions.
- **Number** of erosion control and drainage measures implemented for roads.
- **Information** will be distributed to the public in both hard copy and electronic format as well as through presentations with the focus being on litter control and privately owned facilities such as parking lots and sidewalks.

**Implementation Calendar**

Item / Month	1	2	3	4	5	6	7	8	9	10	11	12
Street Sweeping			X	X	X	X	X	X	X	X	X	
Public Information Update and Distribution	X	X	X									X
Staff Training and Continuing Education (Dependent upon seasonal workload and availability of organizational sessions)	X	X	X	X	X	X	X	X	X	X	X	X

\*Implementation items not appearing on calendar may occur at any time of the year. All times subject to change.



### **Winter Road Maintenance**

It is the **policy** of the Village to utilize snow and ice control materials in a manner which creates maximum safety for vehicles and pedestrians and minimizes the impacts of snow and ice control products on the environment.

The **procedures** used to implement this effort includes:

The storage of road salts in a shed to eliminate the leaching of salt brine from stockpiles.

The storage of liquid deicing products in enclosed containers.

The utilizing of liquid deicing products as an alternative to increased quantities of road salt.

The use of ground speed control units where available on all large snow and ice control material application vehicles.

A reporting, inspection and maintenance program to insure that all snow and ice control application technology is in good working order.

Cleaning of vehicles on a wash pad includes any grit trap and oil/water separator.

The Village provides an annual training review of its policy and procedures with respect to Winter Maintenance as it relates to Stormwater Management. Staff are required to sign in to the training session and a record of said training is kept with documentation relating to the Village's overall Stormwater Management Plan and Personnel Training Records.

### **Winter Road Maintenance Implementation**

Records will be kept on a calendar year basis and reported at the Village's annual program review for the following work performed:

- **Tons or cubic yards** of materials reduction due to improved technology / procedures.
- **Tons or cubic yards** of rock salt utilized.
- **Gallons** of liquid materials utilized.
- **Hours** of training, retraining or continuing education activities related to policies, procedures, implementation and stormwater management.
- **Number** of street and winter maintenance policies and procedures, or BMP updates or revisions.

- **Information** distributed to the public in both hard copy and electronic format as well as through presentations.

### **Implementation Calendar**

<b>Item / Month</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
Public Information Update and Distribution										<b>X</b>	<b>X</b>	<b>X</b>
Staff Continuing Education (as available)	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>
Staff training /refresher prior to onset of winter									<b>X</b>	<b>X</b>	<b>X</b>	<b>X</b>

### **Stormwater Drainage, Conveyance and Treatment System Maintenance**

It is the **policy** of the Village to inspect, maintain, clean, and upgrade its stormwater conveyance and treatment system so as to discharge said water to the environment in the cleanest condition possible.

The **procedures** used to implement this effort includes:

Inspection, Cleaning and Maintenance of Stormwater Catch Basins on a Village wide multi-year program with more frequent cleaning in identified areas.

Flushing of Stormwater Conveyance piping based on need and observed at the time of Stormwater Catch Basin Cleaning.

Removal of debris and sediment buildup from outfall pits and open channel conveyances.

Maintenance and cleaning of detention/retention ponds.

Maintenance and cleaning of catch basin filter inserts.

Maintenance and cleaning of structural Best Management Practices.

The Village provides an annual training review of its policy and procedures with respect to Stormwater Drainage, Conveyance and Treatment System Maintenance as it relates to Stormwater Management. Staff are required to sign in to the training session and a record of said training is kept with documentation relating to the Village's overall Stormwater Management Plan and Personnel Training Records.

### **Stormwater Drainage, Conveyance and Treatment System Maintenance Implementation**

Records will be kept on a calendar year basis and reported at the Village's annual program review for the following work performed:

- **Cubic Yards or Tons** of materials cleaned from system components.
- **Linear Feet** of piped system cleaned.
- **Linear Feet** of open channel cleaned and maintained
- **Number** of Outfall Pits cleaned
- **Number** of upgrades and Technology improvements to system.

- **Hours** of training, retraining or continuing education activities related to policies, procedures, implementation and stormwater management.
- **Number** of maintenance policies and procedures, or BMP updates or revisions.
- **Information** distributed to the public in both hard copy and electronic format as well as through presentations.

### **Implementation Calendar**

Item / Month	1	2	3	4	5	6	7	8	9	10	11	12
Catch Basin Cleaning / Flushing Conveyance Piping*	X	X	X	X	X						X	X
All Other Procedures				X	X	X	X	X	X	X	X	
Public Information Update and Distribution	X	X	X									X

\*Cleaning subject to larvacide application in catch basins by Westchester County Health Department or on an emergency basis as necessary.  
Cleaning in winter months dependent on weather and temperature

### **Vehicle and Fleet Maintenance**

It is the **policy** of the Village to maintain its fleet of vehicles, as well as all Public Works Facilities in such a manner that pollutants are not discharged to the environment.

The **procedures** used to implement this policy include:

An inspection program undertaken on a regular basis to insure that fuel, oil and lubricating products do not leak from any vehicles

A vehicle washing program so that all oil, grit and other products washed from vehicles are directed toward a debris / oil / water separator before being discharged to the sanitary sewer system.

A written plan, reviewed and updated as needed annually for the operation of the Public Works Facility including fuel dispensing, spill procedures, storage of lubricants and hazardous materials, storage of road salt /de-icing materials.

Minimal annual cleaning of all stormwater drainage structures at the Public Works Garage.

Recycling of oil, antifreeze, tires, batteries, paper products, metals and glass

Proper storage of Hazardous Materials and availability on site of all MSDS documentation

The Village provides an annual training review of its policy and procedures with respect to Vehicle and Fleet Maintenance as it relates to Stormwater Management. Staff are required to sign in to the training session and a record of said training is kept with documentation relating to the Village's overall Stormwater Management Plan and Personnel Training Records.

### **Vehicle and Fleet Maintenance Implementation**

Records will be kept on a calendar year basis and reported at the Village's annual program review for the following work performed:

- **Cubic Yards or Tons** of material cleaned from system components including yard drains, floor drains and separators.
- **Volume** of oil and anti-freeze recycled
- **Tons** of tires recycled
- **Number** of batteries recycled

- **Hours** of training, retraining or continuing education activities related to policies, procedures, implementation and stormwater management.
- **Number** of maintenance policies and procedures, or BMP updates or revisions.

## Implementation Calendar

[illegible]

### **Parks and Open Space Maintenance**

It is the **policy** of the Village to operate its parks and open space facilities in a manner that limits the amount of pesticides, herbicides, insecticides and other chemicals utilized to enhance the appearance of such facilities and which also eliminates the potential impact of grass clippings, pruning waste, tree trimmings, weeds and litter on the Village's Stormwater Conveyance Systems.

The **procedures** used to implement this policy include:

Maintain an aggressive program for litter removal by providing sufficient disposal containers in parks and open space facilities along with a collection schedule sufficient to minimize overflowing containers.

Train personnel in the proper procedures for applying, handling and storage of landscape enhancement materials, mowing and related functions.

Insure that areas immediately surrounding stormwater drainage and conveyance infrastructure are properly maintained with no areas of erosion.

Reduce the use of high nitrogen fertilizers and those containing phosphorus that produce excessive growth requiring more frequent mowing and trimming.

Utilize mulching mowers where possible so that clippings are left in place. Collect grass clippings and recycle / dispose of where necessary.

Insure that all materials stored outside are secured in containers or covered sufficiently to eliminate migration.

Apply water commensurate with the infiltration rate of the soil.

Insure that the application of any products or materials is done by properly trained licensed / certified applicators.

Familiarize all staff with the hazards associated with products and chemicals utilized and maintain a copy of Material Safety Data Sheets (MSDS) on site where stored.

The Village provides an annual training review of its policy and procedures with respect to Parks and Open Space Maintenance as it relates to Stormwater Management. Staff are required to sign in to the training session and a record of said training is kept with documentation relating to the Village's overall Stormwater Management Plan and Personnel Training Records.

[illegible]



[illegible]

### **Solid Waste Management**

It is the **policy** of the Village to collect, store, process and dispose of solid waste, including materials recycling in a manner which minimizes the potential impact on water quality

The **procedures** used to implement this policy include:

Identifying illegal dumping sites and modifying \ posting to discourage the practice

Providing collection containers and schedules to handle litter in business areas, parks and other areas of the Village where a need is identified.

Providing ordinances requiring collection of pet waste.

Advertise Westchester County Household Hazardous Waste Collection Program.

Encourage greater utilization of Village Recycling Programs

The Village provides an annual training review of its policy and procedures with respect to Solid Waste Management as it relates to Stormwater Management. Staff are required to sign in to the training session and a record of said training is kept with documentation relating to the Village's overall Stormwater Management Plan and Personnel Training Records.

### **Solid Waste Management Implementation**

Records will be kept on a calendar year basis and reported at the Village's annual program review for the following work performed:

- **Tons** of Solid Waste Collected
- **Tons** of Glass Collected
- **Tons** of Paper Collected
- **Tons** of Metal Collected
- **Tons** of Plastic Collected
- **Tons** of Organics Collected
- **Tons** of Bulk Metal Collected
- **Tons** of Electronic Equipment Collected
  
- **Hours** of training, retraining or continuing education activities related to policies, procedures, implementation and stormwater management.
  
- **Number** of maintenance policies and procedures, or BMP updates or revisions.

### Implementation Calendar

Item / Month	1	2	3	4	5	6	7	8	9	10	11	12
Collection of Solid Waste and Recyclables*	X	X	X	X	X	X	X	X	X	X	X	X
Collection of Organic Yard Waste			X	X	X	X	X	X	X	X	X	X
Staff Training / Continuing Education	X	X	X	X	X	X	X	X	X	X	X	X
Number of policy / procedure updates	X	X	X	X	X	X	X	X	X	X	X	X

Household Hazardous Waste Collection provided by Westchester County Department of Environmental Facilities

### **Streambank Stabilization and Hydrologic Habitat Modification**

It is the **policy** of the Village to minimize the exposure of streambanks and waterbodies to the products of erosion.

The **procedures** used to implement this policy include:

Initial inspection of open ditch stormwater conveyance system for determining where erosion from public / private property may be depositing sediment.

Program for stabilization of stream banks within the Right-of-Way where needed.

Program for insuring maintenance of stream banks during construction activities

Public education for residents having stormwater conveyance systems within their property or waters which are tributary to.

The Village provides an annual training review of its policy and procedures with respect to Streambank Stabilization and Hydrologic Habitat Modification as it relates to Stormwater Management. Staff are required to sign in to the training session and a record of said training is kept with documentation relating to the City's overall Stormwater Management Plan and Personnel Training Records.

### **Implementation**

Records will be kept on a calendar year basis and reported at the Village's annual program review for the following work performed:

- **Linear Feet** stabilized utilizing:
  1. Hard Engineering for Streambanks (Rip Rap)
  2. Soft Engineering for Streambanks (Plantings)
  3. Hard Engineering Ponds and Lakes (Rip Rap)
  4. Soft Engineering for Ponds and Lakes (Plantings)
- **Each** ponds and lakes with Siltation Forebays
- **Cubic Yards** of material removed from siltation forebays
- **Linear Feet** of streambank walked including GPS
- **Number** of maintenance policies and procedures, or BMP updates or revisions.
- **Hours** of training, retraining or continuing education activities related to policies, procedures, implementation and stormwater management.

## Implementation Calendar

[illegible]

## Village of Mamaroneck Best Management Practices

### 7.3 Pollution Prevention / Good Housekeeping Element

Detailed Information Resource	Street and Bridge Maintenance	Winter Road Maintenance	Stormwater Drainage, Conveyance and Treatment System Maintenance	Vehicle and Fleet Maintenance	Parks and Open Space Maintenance	Municipal Building Maintenance	Solid Waste Management	Streambank Stabilization and Hydrologic Habitat Modification
SC - 10 Non-Stormwater Discharges	X	X	X	X	X	X		
SC - 11 Spill Prevention, Control, Cleanup	X	X	X	X	X	X	X	
SC - 20 Vehicle and Equipment Fueling				X	X			
SC - 21 Vehicle and Equipment Cleaning		X		X	X			
SC - 22 Vehicle and Equipment Repair				X				
SC - 30 Outdoor Loading and Unloading		X		X	X	X		
SC - 33 Outside Storage of Raw Materials		X		X	X	X	X	
SC - 34 Waste Handling and Disposal			X	X	X	X	X	
SC - 41 Buildings and Grounds Maintenance				X	X	X		
SC - 43 Parking / Storage Area Maintenance	X	X		X		X		
SC - 50 Open Water Activities	X	X	X	X	X	X		
SC - 61 Safer Alternative Products				X	X	X		
SC - 70 Road, Street and Bridge Maintenance	X	X						
SC - 71 Plaza and Sidewalk Cleaning	X							
SC - 72 Fountain and Pool Maintenance					X			
SC - 73 Landscape Maintenance					X	X		
SC - 74 Drainage System Maintenance			X				X	
SC - 75 Waste Handling and Disposal	X			X	X	X	X	
SC - 76 Water and Sewer Utility Maintenance			X			X		
Road Salt Application and Storage		X						
EC - 12 Streambank Stabilization								X

Storm Water Management Plan									
Pollution Prevention and Good Housekeeping									
Principal Categories of Municipal Operations									
Category and Status of Individual Elements									
Street and Bridge Maintenance									
Program Element									
Written Policy and Procedures in Place (Y/N)	Last Review (Date)	Sufficient Personnel to Sustain Program	Sufficient Equipment to Sustain Program	Annual Personnel Training Program In Place	Partnerships Established St/City/Lo/IV	Record Keeping In Place	(Meas. Goals) Quantitative Indicators		
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	N			
Y	6/1/2010	Y	Y	Y	N	N			
Y	6/1/2010	Y	Y	Y	N	N			
Program Implementation									
Y						Y	Tons / C.Y. Each		
Y						Y	No. Staff / Hours Each		
Y						Y			
Y						Y			
Training needs to be reduced to writing and formalized information provided by SWM Consultant									
As conditions arise, no inspection program in place									
Winter Road Maintenance									
Program Element									
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Y	6/1/2010	Y	Y	Y	N	Y			
Enclosed Off Site Facility (Fenimore Road)									
Cleanup after deliveries and Storms									
Ground Speed Controls on Spreaders									
Ground Speed Controls on Spreaders									
Records with Vehicle Maintenance files									
Long Island Sound									
Program Implementation									
Y						Y	Yes / No/ NA		
Y						Y	Yes / No/ NA		
Y						Y	Yes / No/ NA		
Y						Y	Tons/C.Y./Gal.		
N						N	No. Staff / Hours Each		
Y						Y			
Training needs to be reduced to writing and formalized									





Storm Water Management Plan															Page 3 of 4	
Pollution Prevention and Good Housekeeping																
Principal Categories of Municipal Operations																
Category and Status of Individual Elements																
	Written Policy and Procedures in Place (Y/N)	Last Review (Date)	Sufficient Personnel to Sustain Program	Sufficient Equipment to Sustain Program	Annual Personnel Training Program In Place	Partnerships Established St./City/Loc./V	Record Keeping In Place	Quantitative Indicators								
Parks and Open Space Maintenance																
Program Element																
1. Grounds Maintenance																
integrated pest management	Y	6/1/2010	NA	NA	NA	N	N									
use of pesticide alternatives	Y	6/1/2010	NA	NA	NA	N	N									
fertilizer use, alternatives and reductions	Y	6/1/2010	NA	NA	NA	N	N									
erosion control practices	Y	6/1/2010	NA	NA	NA	N	N									
solid waste: waste reduction, recycling and litter control	Y	6/1/2010	NA	NA	NA	N	N									
hazardous materials storage	Y	6/1/2010	NA	NA	NA	N	N									
pesticide and fertilizer usage records	Y	6/1/2010	NA	NA	NA	N	N									
4. Municipal Pool Maintenance																
hazardous materials storage	N	NA	N	N	N	N	N									
alternative discharge options for chlorinated water	N	NA	N	N	N	N	N									
6. Animal Waste Management																
pet waste control, education and enforcement	Y	NA	N	N	N	N	N									
bird waste control	N	NA	N	N	N	N	N									
domestic animals (fairgrounds, municipal farms)	N	NA	N	N	N	N	N									
wildlife	N	NA	N	N	N	N	N									
public education and communication	N	NA	N	N	N	N	N									
Program Implementation																
Grounds Maintenance																
Staff Certified as NYS Pesticide Applicators							Y	Each								
Reduction in Pesticide Usage or Alt. methods/products							Y	Lbs.								
Reduction in Fertilizer Usage							Y	Lbs.								
Municipal Pool Maintenance																
Procedures for proper drainage and discharge of pool water							NA	Yes/No/NA								
Hazardous materials properly stored and secured							NA	Yes/No/NA								
Animal Waste Management																
Ordinance in Place for Collection and Disposal (all sites)							Y	Yes/No/NA								
Program for control of concentrated animal sites							NA	Yes/No/NA								
Staff Training / Continuing Education							N	Yes/No/NA								
Best Management Practices, policies and updates							N	Yes/No/NA								
Municipal Building Maintenance																
Program Element																
1. Petroleum Bulk Storage spill prevention and response	Y	6/1/2010	Y	Y	N	N	N									
2. Hazardous material storage including pesticides	Y	6/1/2010	Y	Y	Y	N	N									
3. Onsite septic system inspection and maintenance	NA	NA	NA	NA	NA	N	N									
4. Grounds maintenance (pesticide, fertilizer, erosion control)	Y	6/1/2010	Y	Y	Y	N	N									
5. Erosion control new construction / other sites	Y	6/1/2010	NA	NA	NA	N	N									
6. Waste disposal and recycling	Y	6/1/2010	Y	Y	Y	WDEF	Y									
7. Alternative product usage	N	NA	NA	NA	NA	NA	N									
8. Building site drainage, roof drainage system, infiltration	N	NA	NA	NA	NA	NA	N									
Program Implementation																
Onsite septic inspections and pumpouts							NA	Each								
Alternative products adopted for use							Y	Each								
Reduction in fertilized usage							N	Yes/No/NA								
Pesticide Use changes (management/reduction/conversion)							Y	Yes/No/NA								
Volume of material recycled							Y	Cubic Yards/Tons								
System modifications to manage "clean water"							N	Yes/No/NA								
Staff Training / Continuing Education							N	hours								
Best Management Practices, policies and procedures							N	Each								
Updates																

Storm Water Management Plan									
Pollution Prevention and Good Housekeeping									
Principal Categories of Municipal Operations									
Category and Status of Individual Elements	Written Policy and Procedures in Place (Y/N)	Last Review (Date)	Sufficient Personnel to Sustain Program	Sufficient Equipment to Sustain Program	Annual Personnel Training Program In Place	Partnerships Established St./City./Lo./M	Record Keeping In Place	Quantitative Indicators	
<u>Solid Waste Management</u>									
Program Element									
1. Prevention of Illicit Dumping	Y	6/1/2010	Y	Y	N	N	Y		
2. Litter Control	Y	6/1/2010	Y	Y	N	N	N		
3. Animal Waste Control (pets, birds, wildlife, domestic)	Y	6/1/2010	Y	Y	N	WCDEF	Y		Part of Village Wide effort
4. Waste Reduction and Recycling	Y	6/1/2010	Y	Y	N	WCDEF	Y		Ordinance for pet owners
5. Household Hazardous Waste Collection	N		NA	NA	NA	WCDEF	N		Provided annually by WCDEF
							N		By WCDEF
Program Implementation									
Frequency of Hazardous Materials Collection Events							N	Each	Twice a year by WCDEF
Identification of Illegal Dumping Sites							N	Each	
Sites Modified to Discourage Illegal Dumping							Y	Each	Signage
Litter reduction events conducted (roadside/streambank/beach)							Y	Each	Village wide cleanup
Municipal Recycling Programs							Y	tons	
glass							Y	tons	Provided by WCDEF
paper							Y	tons	Provided by WCDEF
metal							Y	tons	Provided by WCDEF
plastic							Y	tons	Provided by WCDEF
organics							Y	tons	Provided by WCDEF
Bulk Metals							Y	tons	Provided by WCDEF
TV's and Computers							Y	tons	Provided by WCDEF
Staff Training / Continuing Education							N	No. of staff / hours	
Best Management Practices, policies and procedures Updates							Y	Each	
Streambank Stabilization / Hydrologic Habitat Modification									
Program Element									
1. Establish priorities for streambank stabilization, pond maint., hyd	Y	6/1/2010	Y	Y	N	N	N		
2. opportunities for alternative "soft engineering" approaches	N	NA	N	N	N	N	N		
3. Priority setting for sediment removal and maintenance	Y	6/1/2010	Y	Y	N	N	N		
4. opportunities for hydrologic habitat improvements	N	NA	N	N	N	N	N		
5. application of fluvial geomorphic assessments / erosion	N	NA	N	N	N	N	N		
6. Opportunities for sponsored volunteer stream walks	Y	6/1/2010	Y	Y	Y	N	N		
7. Initial staff training completed	N	NA	N	N	N	N	N		
Program Implementation									
Streambank Stabilized (Hard Engineering: rock/rip-rap)							N	Linear Feet	
Streambank Stabilized (Soft Engineering: planting, alt. materials)							N	Linear Feet	
Pond and Lake Shore Stabilized Hard Engineering							N	Linear Feet	
Pond and Lake Shore Stabilized Soft Engineering							N	Linear Feet	
Ponds and Lakes with siltation forebays							N	Each	
Materials removed from siltation/sediment forebays							N	CY/Tons	
Staff Training / Continuing Education							N	No. of Staff / Hours	
Best Management Practices, policies and procedures Updates							N	Each	
Linear distance of streams walked including GPS of problem areas							N	Linear Feet	
Information Provided by: Anthony Iacovelli, General Foreman									
May-10									
Reviewed December 2012									

**Village of Mamaroneck**  
**Stormwater Management Program**

**Contracted Entity Certification**

"I \_\_\_\_\_ certify under penalty of law that I understand  
(name of firm providing services)  
and agree to comply with the terms and conditions of the Village of Mamaroneck, NY  
(name of municipality)  
stormwater management program and agree to implement any corrective actions identified  
by the Village of Mamaroneck, NY or a representative. I also understand that the  
(name of municipality)

Village of Mamaroneck, NY must comply with the terms and conditions of the New  
(name of municipality)

York State Pollution Discharge Elimination System ("SPDES") general permit for stormwater  
discharges from the Municipal Separate Storm Sewer Systems (MS4's) and that it is unlawful  
for any person to directly or indirectly cause or contribute to a violation of water quality  
standards. I understand that any non-compliance by the Village of Mamaroneck, NY  
(name of municipality)  
will not diminish, eliminate or lessen my own liability"

Name of Firm: \_\_\_\_\_

Address of Firm: \_\_\_\_\_

Telephone No. of Firm: \_\_\_\_\_

Date of this Agreement: \_\_\_\_\_

Term of this Agreement: \_\_\_\_\_

Officer of Firm (Signature and Title) \_\_\_\_\_

Signature of Municipal Department Head: \_\_\_\_\_

Services to be provided (List by Minimum Control Measure)

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## Annual Plan Review and Signoff

This plan shall be reviewed and updated during the first 3 months of each calendar year.

[illegible]

**Municipal Stormwater Management Program**

**Annual Evaluation for Compliance**

**Date:** \_\_\_\_\_ **Evaluation Team:** \_\_\_\_\_

ITEM	MCM1	MCM2	MCM3	MCM4	MCM5	MCM6
Were all plan requirements for the year undertaken and completed						
What additions were made to the plan						
What items were deleted from the plan						
Was a NYSDEC or USEPA Audit performed						

MCM #	Comment
1	
2	
3	
4	
5	
6	

Reporting Period:

Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Total
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-------

o. Number of participants

**Village of Mamaroneck**

## Stormwater Management Program

## Program Implementation Reporting

**Reporting Period:**

[illegible]

### Minimum Measure # 2 Public Participation and Involvement

[illegible]

## Number of Reports Concerning

[illegible]

**b. Construction Site Concerns**

[illegible]

100

[illegible]

**Assessment (See separate report)**

(understand the need for, and importance of, the project)

[illegible][illegible][illegible]

## Percent of Outfalls Mapped

[illegible]

### Status of Conveyance System Mapping

Activities in and results from informing employees and the	Status of Conveyance System Wording (Percent Completed)

general public of the hazards associated with illicit discharges

and improper disposal of waste (Number)

and improper disposal of waste (Number)
<p><b>Status of Regulatory Mechanism, Certification and Equivalence</b></p>

(C=Completed P= Pending)

Report on Program Effectiveness  
(C=Completed, F=Pending)[illegible]

necessary (see separate report)

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[illegible][illegible][illegible][illegible][illegible]







**D R A F T**

Dear Village of Mamaroneck Business Owner:

On March 10, 2003, the Village began the development of its Stormwater Management Plan, mandated by the United States Department of Environmental Protection and administered by the New York State Department of Environmental Conservation. The plan requires that the Village make every effort to improve the water quality of its streams, lakes and rivers. The Village must implement six (6) minimum control measures including educating the public, soliciting participation and involvement of the public, detection and elimination of illicit discharges, control of construction site runoff, maintenance and operation of post construction structural Best Management Practices and pollution prevention and good housekeeping at municipal facilities.

Two of these measures have a direct impact on business owners who operate parking areas for there employees / patrons and visitors. Parking areas can collect dirt and floatable debris as well as hydrocarbons and heavy metals from parked / moving vehicles. Additionally, if your property / parking lot has had a Stormwater Best Management Practice installed such as median rain gardens, stormwater catch basin filter inserts, stone filter strips, retention or detention basins etc., it is the property owners responsibility to insure that these structures are properly operated and maintained.

Should you have any questions concerning property owner responsibilities with respect to the Village's Stormwater Management Program, please contact Stormwater Management Coordinator . Deputy Village Manager Dan Sarnoff at 914-777-7703

Very truly yours,

Village Manager

## ***Village of Mamaroneck, New York***

### ***Stormwater Management Program***

Dear Village Residents, Business Owners and Visitors:

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Recognizing the need for improving the quality of our surface waters, the Village passed legislation in the initial stages of its Stormwater Management Program, designed to control the quantity and quality of runoff from new development and redevelopment, and insure that stormwater runoff from a project, once completed, created minimal or no impact on water quality. Mamaroneck has been a proponent of maintaining and improving water quality and is part of a municipal consortium working to improve water quality in Long Island Sound.

Learn what you can about improving stormwater quality by visiting the following websites:

U.S. Environmental Protection Agency at <http://www.epa.gov/ebtpages/water.html>

NYS Dept of Environmental Conservation at <http://www.dec.ny.gov/chemical/8468.html>

Center for Watershed Protection at <http://www.cwp.org>

Village of Mamaroneck at

[http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY\\_Stormwater/index](http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY_Stormwater/index)

Sincerely,

Mayor

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#### **Mayor**

Honorable Norman S. Rosenblum

#### **Village Manager**

Richard Slingerland

#### **Board of Trustees**

Honorable Louis N. Santoro

Honorable Lissa Miller

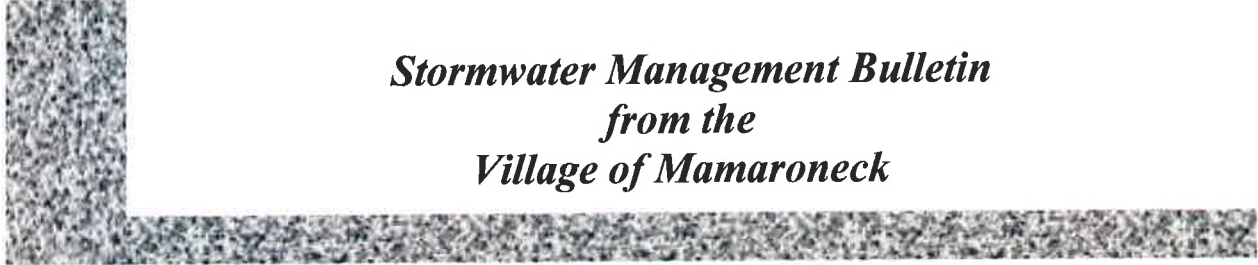
Honorable Leon Potok

Honorable Andres Bermudez Hallstrom

For further information on Village efforts, or to volunteer to assist the Village, contact

**Stormwater Management Coordinator**

Dan Sarnoff, Assistant Village Manager at  
914-777-7703



## **Stormwater Management Bulletin from the Village of Mamaroneck**

*In response to Federal and State water quality regulations and requirements, the Village has implemented a Stormwater Management Program.*

*The goal is to control discharges of pollutants to municipal storm drainage systems including, lakes, streams, and Long Island Sound. The Village encourages using BEST MANAGEMENT PRACTICES (BMP's) to effectively eliminate illegal discharges and connections*

*The Storm Drain System was built to collect and transport rain to prevent flooding in urban areas. Anything that flows or is discharged into the storm drain system goes into local lakes, streams and the Long Island Sound without any treatment.*

*The Sanitary Sewer System collects and transports sanitary wastes from interior building plumbing systems to the wastewater treatment plant where the waste is treated.*

*Best Management Practices (BMP's) are methods and practices such as good housekeeping, spill prevention or treatment measures to prevent or minimize pollutant discharges to municipal storm drain systems.*

***Illicit Discharges or Illicit Connections**  
Discharges non-storm water to municipal storm drain systems and contributes to water pollution.*

***Urban Runoff** is rain and other water that passes through and out of developed areas (streets, parking lots, roof tops etc.) into the storm drain system and eventually into local lakes, streams and the Long Island Sound.*

### **Pet Waste**

Pet waste left to decay on the sidewalk, or on grass near the street, may be washed into storm drains by rain and snow melt. Water entering storm drains does not receive treatment before it goes to our water resources. All stormwater in the Village eventually flows to the Long Island Sound. Many substances deposited on the land cause pollution of our waters including; pesticides, fertilizers, pet waste, household chemicals, oil and antifreeze. When pet waste is washed into storm drains, the waste decays, using up oxygen and sometimes releasing ammonia. Pet waste also contains nutrients that encourage weed and algae growth. Most importantly, pet waste may carry disease causing organisms, which make water unsafe. When pet waste is disposed of improperly, not only does water quality suffer, your health may be at risk to. Pets, children playing outside, and adults gardening are most at risk for infection from some of the bacteria found in pet waste.

**You can make a difference** by cleaning up after your pet using a plastic bag or pooper scooper. Double wrap the pet waste in a second plastic bag, securing it tightly and put it in either a street waste receptacle or your garbage can at home.

For further information, or to assist the Village in its efforts, contact **Stormwater Management Coordinator** Dan Sarnoff at 914-777-7703 or visit the following websites:

<http://www.epa.gov/ebtpages/water.html>  
<http://www.dec.ny.gov/chemical/8468.html>  
<http://www.cwp.org>  
[http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY\\_Stormwater/index](http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY_Stormwater/index)

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### **Retail Gas and Diesel Fuel Outlets**

Of any size are potential sources of stormwater pollution. Areas in retail fueling outlets for fuel dispensing, waste receptacles, vending machines and air / water supply areas can lead to the accumulation of automotive fluids, grease and other waste fluids on the ground. All owners and employees of retail fueling outlets can apply common sense practices to minimize or eliminate their contribution to stormwater pollution.

### **Best Management Practices**

#### **SPOT CLEAN ALL AREAS IMMEDIATELY**

*Use dry methods such as rags or absorbent materials to clean up leaks and drips. Leaks are not considered cleaned up until the absorbent is picked up and disposed of properly.*

**SPILL RESPONSE PLAN** *Maintain and update an acceptable Spill Response Plan.*

**TRAINING** *Regularly train all employees on proper methods of handling and disposing of waste. Ensure all employees are familiar with the Spill Response Plan. Educate employees on Best Management Practices (BMP's) and stormwater and wastewater discharge requirements and prohibitions.*

**LABELING** *Label all drains within the facility boundaries using paint or stencil, or indicate whether flow is to the storm drain, sewer or oil / water separator.*

**INSPECTION** *Annually inspect and clean storm drain inlets and catch basin.*

For further information, or to assist the City in its efforts, contact **Stormwater Management Coordinator** Dan Sarnoff at 914-777-7703 or visit any of the following webpages:

<http://www.epa.gov/ebtpages/water.html>

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## ***Stormwater Management Bulletin from the Village of Mamaroneck***

### **What is Stormwater Pollution:**

Stormwater pollution refers to many types of harmful materials that are carried by water (rain water, wash water or snow melt) through the storm drain system to our creeks and the Long Island Sound. These pollutants can include: sediments, nutrients, trash, metals, bacteria, oil and grease, phosphorus and organics.

### **Get Involved:**

Volunteers are needed to assist with waterway and roadside cleanup efforts, beautification projects, storm drain stenciling and neighborhood cleanups. Put together a group of friends, plan to meet over coffee and help keep trash and other pollutants out of our waters. Contact the Village's Stormwater Management Coordinator for details.

### **Dispose of Household Products Carefully:**

Many products under the sink or in the garage can harm water quality. Never pour paints, preservatives, brush cleaners and solvents down the drain. Sewers or septic tanks do not treat these materials and they can enter waterways untreated. Buy a product with the least amount of toxic materials. Read labels carefully for use and disposal instructions. Learn about Westchester County's Household Hazardous Waste Disposal Program. For information call 914-813-5425 or log onto the County website at <http://www.westchestergov.com>

### **Care for your lawn cautiously:**

Lawns with trees and shrubs prevent erosion, soak up nutrients before they run off into waterways, and improve soil by adding organic materials. Plant the right grass by testing the soil annually. Use the proper fertilizer, and do not over-fertilize. Improper fertilizing can lead to disease, poor root growth and weed problems. Water your lawn and shrubs only when it is dry by soaking the soil thoroughly. If you have a lawn service, make sure it is customized to your needs.

### **Illicit Discharge Detection and Elimination:**

Items which find their way into waterways and storm drains, either by accident or deliberately, decrease water quality and create unsightly conditions. Carelessly discarded trash, illegal connections of waste water and other products, household chemicals, oil, and nutrients from over fertilization of lawns can be washed into drains when it rains and eventually end up in our waterways. In 2007, the Village began a program to locate and identify discharges from illegal connections which decrease water quality and take enforcement action where appropriate. If you think your home or business may have an illegal connection to the storm drain, Contact the Village's Stormwater Management Coordinator to learn how to correct the condition.

For further information, or to assist the Village in its efforts, contact **Stormwater Management Coordinator** Dan Sarnoff, at 914-777-7745 or visit any of the following webpages:

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<http://www.dec.ny.gov/chemical/8468.html>

<http://www.cwp.org>

[http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY\\_Stormwater/index](http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY_Stormwater/index)



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### **Supermarkets, Restaurants, Fast Food Outlets and Grocery Stores**

Businesses selling food products can conduct common sense practices that require modest changes to routine operations or maintenance practices to reduce or eliminate their contribution to stormwater pollution. Follow these Best Management Practices (BMP's) to control pollutant discharges:

**PAVEMENT CLEANING:** Sweep parking lots and other paved areas periodically to remove debris. Dispose of debris in the garbage.

**EQUIPMENT CLEANING:** Discharge wash water to the sanitary sewer only.

**SPILL CLEANUP IN OUTDOOR AREAS:** Have commercial spill containment kits in convenient locations for immediate access.

**GREASE HANDLING AND DISPOSAL:** Store grease in separate covered containers. Recycle.

**WASTE DISPOSAL:** Inspect dumpsters periodically and replace broken or leaking units. Keep dumpsters covered to prevent stormwater from entering the container. Never dispose of food wastes or liquids associates with food wastes in storm drains.

**LITTER CONTROL:** Provide an adequate number of trash receptacles for customers and employees. Pick up litter and other wastes daily from outside areas.

**LANDSCAPING:** Minimize the use of pesticides and fertilizers.

**TRAINING:** Train all employees on what to do in the event of a spill. Designate a person to insure BMP's are followed.

For further information, or to assist the Village in its efforts, contact **Stormwater Management Coordinator** Dan Sarnoff at 914-777-7745 or visit the following webpages:

<http://www.epa.gov/ebtpages/water.html>

<http://www.dec.ny.gov/chemical/8468.html>

<http://www.cwp.org>

[http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY\\_Stormwater/index](http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY_Stormwater/index)



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### **Parking Lots**

**K**eeping pollutants out of our storm drain system protects our creeks, streams and the Long Island Sound. Materials swept, blown or washed into the storm drains end up in these open waters where they degrade water quality and harm aquatic life. In general, wastewater discharged to storm drains is illegal.

In addition to reviewing their own practices, the Village will institute a business education campaign. Information will be provided to businesses owners and large residential facilities in an effort to control potential discharge of pollutants to the storm drain system. *Property and business owners are responsible not only for their own activities, but the activities of their contractors as well.*

Stormwater runoff from parking lots and sidewalk areas can contribute significantly to urban runoff pollution. Automotive fluids, food wastes, grease pesticides, litter, exhaust residue and rubber generated from friction between tires and paved surfaces, as well as landscape wastes are some of the pollutants that can get into the stormwater conveyance system which ultimately flows to the Long Island Sound.

Owners and operators of parking lots can apply common sense practices to minimize or eliminate their contribution to stormwater pollution.

Whether your parking lot holds 5 cars or 1,000 cars, a scheduled maintenance program including repairs, sweeping, stormwater catch basin cleaning and debris removal is needed. Your efforts to maintain your parking lot in as clean a condition as possible, along with the efforts of your fellow business persons, will help in safeguarding our waters from pollutants and unsightly debris.



### **Best Management Practices (BMP's)**

Follow these BMP's to control pollutant discharges. The objectives are: 1) to keep pollutants from contacting rain, and 2) to keep pollutants from being dumped or poured into storm drains. The goal is "only rain in the drain"

- Sweep parking lots frequently, at least weekly, daily is preferable. Small areas can be swept with a broom, whereas larger areas may need a vacuum truck or mechanical sweeper. Dispose of sweepings properly.
- Post signs to control litter and prevent patrons from working with automobile fluids in your parking lot (changing oil, adding transmission fluid, etc.). You could be liable for the mess on your property!
- Use absorbent material to clean up automotive fluids on the parking lot. Dispose of the absorbent properly. Read the instructions on the container or Material Safety Data Sheet for disposal instructions.
- Pick up litter daily, dispose of debris in the garbage.
- Keep dumpster and trash cans covered and areas free of litter.
- Wash water from all cleaning operations must be discharged to the sanitary sewer.
- If cleaning with water and detergent is needed, use a mobile washing unit that is self contained; do not allow wash water (whether or not it is soapy) to discharge to the storm drain system.
- If using a self-contained mobile cleaner is not possible, collect the washwater and dispose in indoor sinks or drains for discharge to the sanitary sewer. Contact the Westchester County Department of Environmental Facilities for approval.
- Stencil any storm drains on the property with "No Dumping"
- If you do not have one, prepare a plan of your parking area indicating where stormwater catch basins are located and where they flow to.
- Clean storm drains at least once a year, preferably in the Spring. Dispose of materials properly.

### Event Record

[illegible]

Training shall be performed as directed by the Stormwater Management Coordinator . A record shall be made of attendees present at the training session.

[illegible]

## Chapter 13: Tracking Discharges To A Source

Once an illicit discharge is found, a combination of methods is used to isolate its specific source. This chapter describes the four investigation options that are introduced below.

### *Storm Drain Network Investigation*

Field crews strategically inspect manholes within the storm drain network system to measure chemical or physical indicators that can isolate discharges to a specific segment of the network. Once the pipe segment has been identified, on-site investigations are used to find the specific discharge or improper connection.

### *Drainage Area Investigation*

This method relies on an analysis of land use or other characteristics of the drainage area that is producing the illicit discharge. The investigation can be as simple as a “windshield” survey of the drainage area or a more complex mapping analysis of the storm drain network and potential generating sites. Drainage area investigations work best when prior indicator monitoring reveals strong clues as to the likely generating site producing the discharge.

### *On-site Investigation*

On-site methods are used to trace the source of an illicit discharge in a pipe segment, and may involve dye, video or smoke testing within isolated segments of the storm drain network.

### *Septic System Investigation*

Low-density residential watersheds may require special investigation methods if they are not served by sanitary sewers and/or

storm water is conveyed in ditches or swales. The major illicit discharges found in low-density development are failing septic systems and illegal dumping. Homeowner surveys, surface inspections and infrared photography have all been effectively used to find failing septic systems in low-density watersheds.

### 13.1 Storm Drain Network Investigations

This method involves progressive sampling at manholes in the storm drain network to narrow the discharge to an isolated pipe segment between two manholes. Field crews need to make two key decisions when conducting a storm drain network investigation—where to start sampling in the network and what indicators will be used to determine whether a manhole is considered clean or dirty.

#### *Where to Sample in the Storm Drain Network*

The field crew should decide how to attack the pipe network that contributes to a problem outfall. Three options can be used:

- Crews can work progressively up the trunk from the outfall and test manholes along the way.
- Crews can split the trunk into equal segments and test manholes at strategic junctions in the storm drain system.
- Crews can work progressively down from the upper parts of the storm drain network toward the problem outfall.

The decision to move up, split, or move down the trunk depends on the nature and land use of the contributing drainage area. Some guidance for making this decision is provided in Table 53. Each option requires different levels of advance preparation. Moving up the trunk can begin immediately when an illicit discharge is detected at the outfall, and only requires a map of the storm drain system. Splitting the trunk and moving down the system require a little more preparation to analyze the storm drain map to find the critical branches to strategically sample manholes. Accurate storm drain maps are needed for all three options. If good mapping is not available, dye tracing

can help identify manholes, pipes and junctions, and establish a new map of the storm drain network.

#### Option 1: Move up the Trunk

Moving up the trunk of the storm drain network is effective for illicit discharge problems in relatively small drainage areas. Field crews start with the manhole closest to the outfall, and progressively move up the network, inspecting manholes until indicators reveal that the discharge is no longer present (Figure 50). The goal is to isolate the discharge between two storm drain manholes.

Table 53: Methods to Attack the Storm Drain Network

Method	Nature of Investigation	Drainage System	Advance Prep Required
Follow the discharge up	Narrow source of an individual discharge	Small diameter outfall (< 36") Simple drainage network	No
Split into segments	Narrow source of a discharge identified at outfall	Large diameter outfall (> 36"), Complex drainage Logistical or traffic issues may make sampling difficult.	Yes
Move down the storm drain	Multiple types of pollution, many suspected problems – possibly due to old plumbing practices or number of NPDES permits	Very large drainage area (> one square mile).	Yes

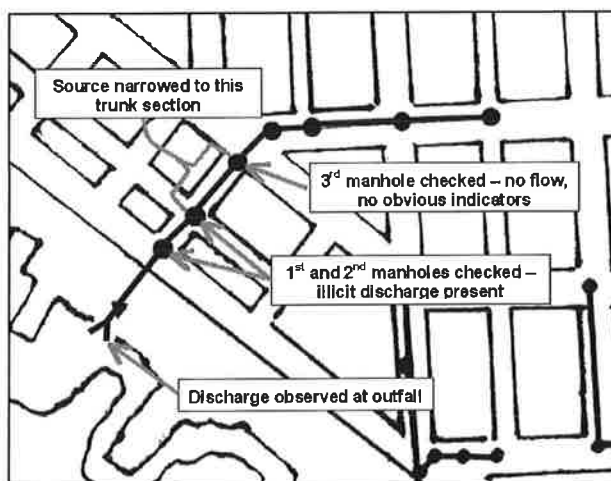


Figure 50: Example Investigation Following the Source up the Storm Drain System

Option 2: Split the storm drain network

When splitting the storm drain network, field crews select strategic manholes at junctions in the storm drain network to isolate discharges. This option is particularly suited in larger and more complex drainage areas since it can limit the total number of manholes to inspect, and it can avoid locations where access and traffic are problematic.

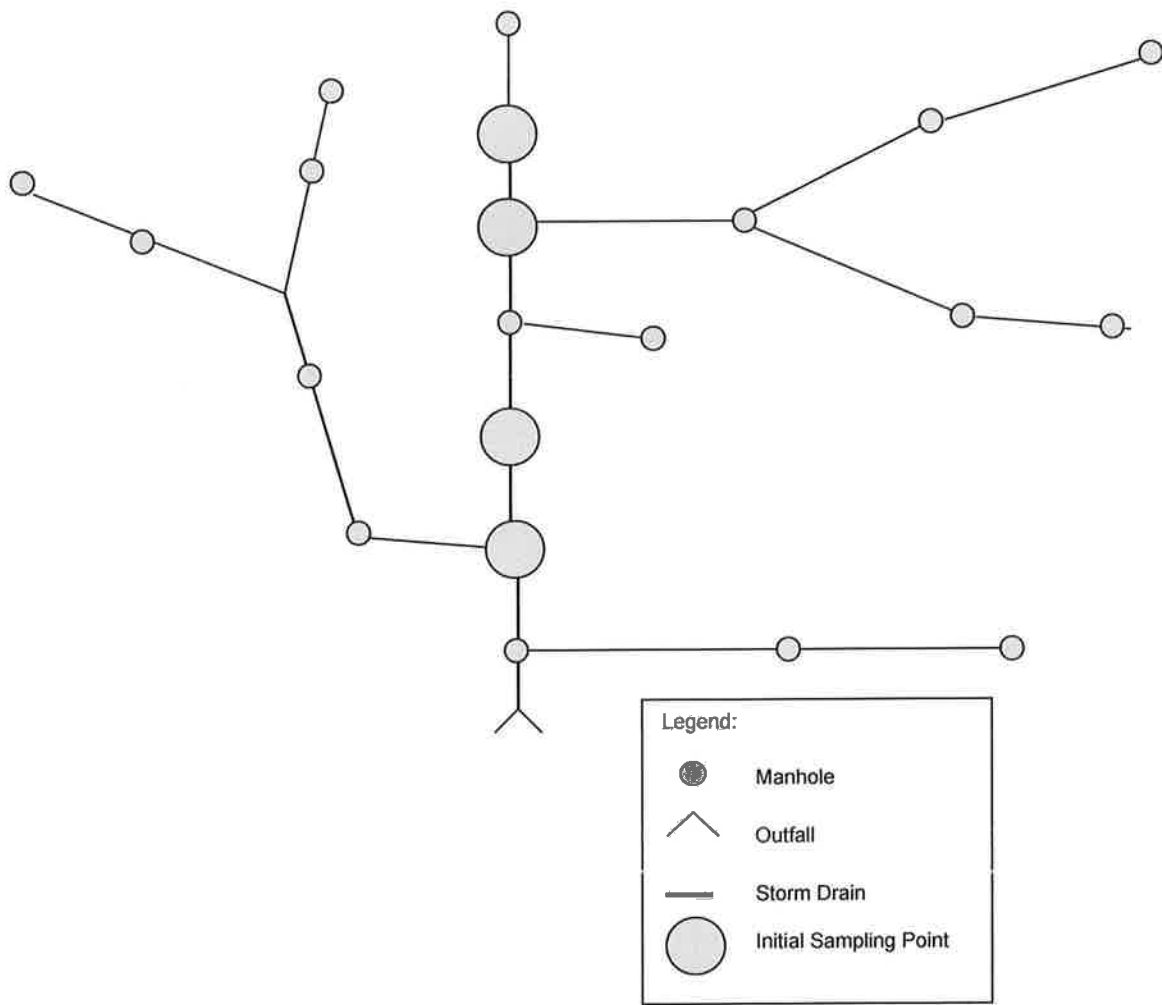
The method for splitting the trunk is as follows:

1. Review a map of the storm drain network leading to the suspect outfall.
2. Identify major contributing branches to the trunk. The trunk is defined as the largest diameter pipe in the storm drain network that leads directly to the outfall. The “branches” are networks of smaller pipes that contribute to the trunk.
3. Identify manholes to inspect at the farthest downstream node of each contributing branch and one immediately upstream (Figure 51).
4. Working up the network, investigate manholes on each contributing branch and trunk, until the source is narrowed to a specific section of the trunk or contributing branch.
5. Once the discharge is narrowed to a specific section of trunk, select the appropriate on-site investigation method to trace the exact source.

6. If narrowed to a contributing branch, move up or split the branch until a specific pipe segment is isolated, and commence the appropriate on-site investigation to determine the source.

Option 3: Move down the storm drain network

In this option, crews start by inspecting manholes at the “headwaters” of the storm drain network, and progressively move down pipe. This approach works best in very large drainage areas that have many potential continuous and/or intermittent discharges. The Boston Water and Sewer Commission has employed the headwater option to investigate intermittent discharges in complex drainage areas up to three square miles (Jewell, 2001). Field crews certify that each upstream branch of the storm drain network has no contributing discharges before moving down pipe to a “junction manhole” (Figure 52). If discharges are found, the crew performs dye testing to pinpoint the discharge. The crew then confirms that the discharge is removed before moving farther down the pipe network. Figure 53 presents a detailed flow chart that describes this option for analyzing the storm drain network.



**Figure 51: Key initial sampling points along the trunk of the storm drain**

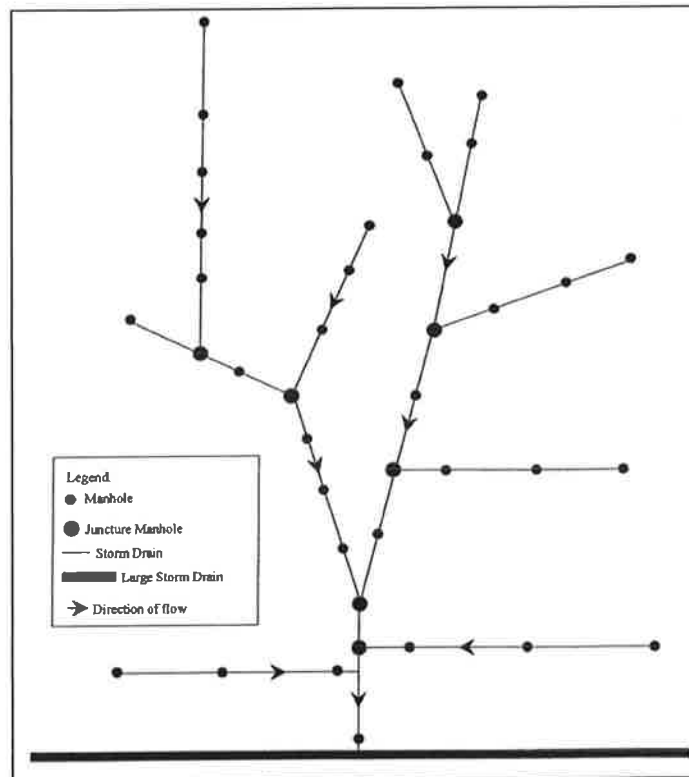


Figure 52: Storm Drain Schematic Identifying "Juncture Manholes" (Source: Jewell, 2001)

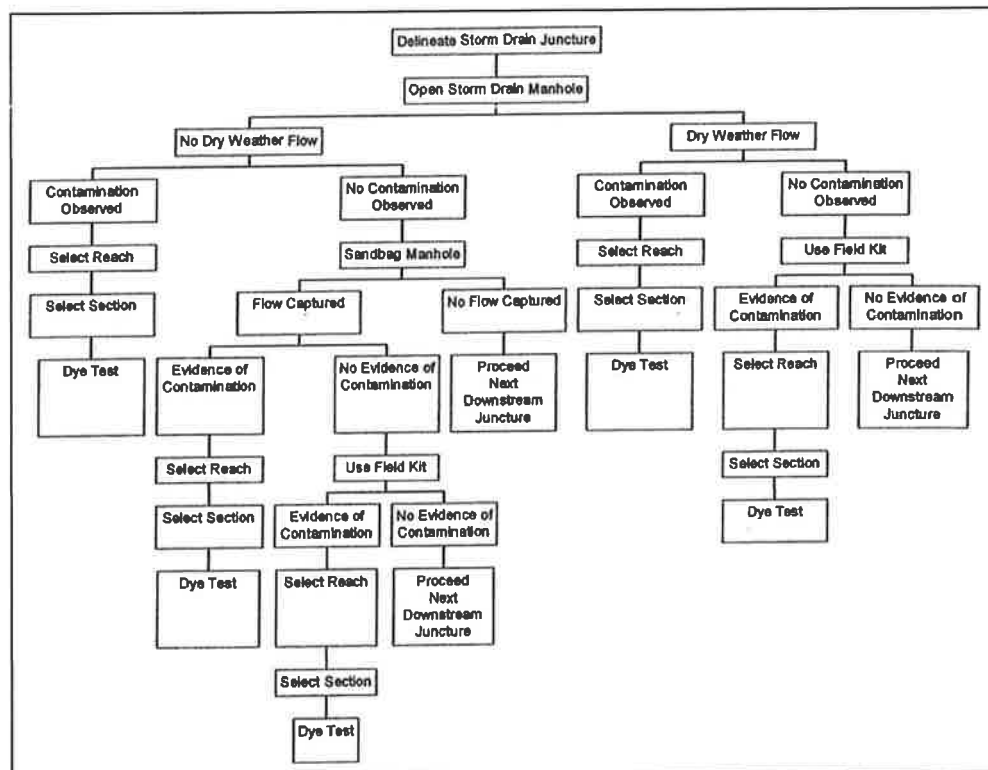


Figure 53: A Process for Following Discharges Down the Pipe (Source: Jewell, 2001)



### *Dye Testing to Create a Storm Drain Map*

As noted earlier, storm drain network investigations are extremely difficult to perform if accurate storm drain maps are not available. In these situations, field crews may need to resort to dye testing to determine the flowpath within the storm drain network. Fluorescent dye is introduced into the storm drain network and suspected manholes are then inspected to trace the path of flow through the network (U.S. EPA, 1990). Two or three member crews are needed for dye testing. One person drops the dye into the trunk while the other(s) looks for evidence of the dye down pipe.

To conduct the investigation, a point of interest or down pipe “stopping point” is identified. Dye is then introduced into manholes upstream of the stopping point to determine if they are connected. The process continues in a systematic manner until an upstream manhole can no longer be determined, whereby a branch or trunk of the system can be defined, updated or corrected. More information on dye testing methods is provided in Section 13.3.

### *Manhole Inspection: Visual Observations and Indicator Sampling*

Two primary methods are used to characterize discharges observed during manhole inspections—visual observations and indicator sampling. In both methods, field crews must first open the manhole to determine whether an illicit discharge is present. Manhole inspections require a crew of two and should be conducted during dry weather conditions.

Basic field equipment and safety procedures required for manhole inspections are outlined in Table 54. In particular, field

crews need to be careful about how they will safely divert traffic (Figure 54). Other safety considerations include proper lifting of manhole covers to reduce the potential for back injuries, and testing whether any toxic or flammable fumes exist within the manhole before the cover is removed. Wayne County, MI has developed some useful operational procedures for inspecting manholes, which are summarized in Table 55.

**Table 54: Basic Field Equipment Checklist**

• Camera and film or digital camera	• Storm drain, stream, and street maps
• Clipboards	• Reflective safety vests
• Field sheets	• Rubber / latex gloves
• Field vehicle	• Sledgehammer
• First aid kit	• Spray paint
• Flashlight or spotlight	• Tape measures
• Gas monitor and probe	• Traffic cones
• Manhole hook / crow bar	• Two-way radios
• Mirror	• Waterproof marker/pen
• Hand held global positioning satellite (GPS) system receiver (best resolution available within budget, at least 6' accuracy)	



**Figure 54: Traffic cones divert traffic from manhole inspection area**

**Table 55: Field Procedure for Removal of Manhole Covers**

*(Adapted from: Pomeroy et al., 1996)*

**Field Procedures:**

1. Locate the manhole cover to be removed.
2. Divert road and foot traffic away from the manhole using traffic cones.
3. Use the tip of a crowbar to lift the manhole cover up high enough to insert the gas monitor probe. Take care to avoid creating a spark that could ignite explosive gases that may have accumulated under the lid. Follow procedures outlined for the gas monitor to test for accumulated gases.
4. If the gas monitor alarm sounds, close the manhole immediately. Do not attempt to open the manhole until some time is allowed for gases to dissipate.
5. If the gas monitor indicates the area is clear of hazards, remove the monitor probe and position the manhole hook under the flange. Remove the crowbar. Pull the lid off with the hook.
6. When testing is completed and the manhole is no longer needed, use the manhole hook to pull the cover back in place. Make sure the lid is settled in the flange securely.
7. Check the area to ensure that all equipment is removed from the area prior to leaving.

**Safety Considerations:**

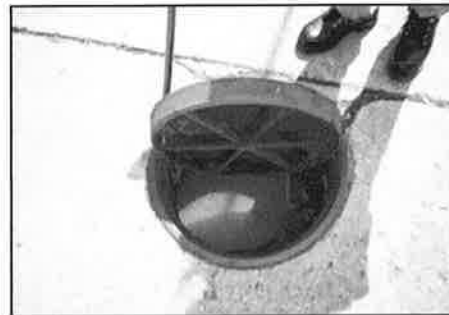
1. Do not lift the manhole cover with your back muscles.
2. Wear steel-toed boots or safety shoes to protect feet from possible crushing injuries that could occur while handling manhole covers.
3. Do not move manhole covers with hands or fingers.
4. Wear safety vests or reflective clothing so that the field crew will be visible to traffic.
5. Manholes may only be entered by properly trained and equipped personnel and when all OSHA and local rules are followed.

Visual Observations During Manhole Inspection

Visual observations are used to observe conditions in the manhole and look for any signs of sewage or dry weather flow. Visual observations work best for obvious illicit discharges that are not masked by groundwater or other “clean” discharges, as shown in Figure 55. Typically, crews progressively inspect manholes in the storm

drain network to look for contaminated flows. Key visual observations that are made during manhole inspections include:

- Presence of flow
- Colors
- Odors
- Floatable materials
- Deposits or stains (intermittent flows)

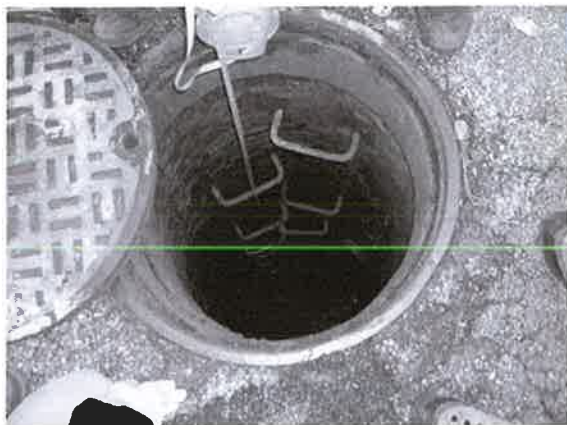


**Figure 55: Manhole observation (left) indicates a sewage discharge. Source is identified at an adjacent sewer manhole that overflowed into the storm drain system (right).**

### Indicator Sampling

If dry weather flow is observed in the manhole, the field crew can collect a sample by attaching a bucket or bottle to a tape measure/rope and lowering it into the manhole (Figure 56). The sample is then immediately analyzed in the field using probes or other tests to get fast results as to whether the flow is clean or dirty. The most common indicator parameter is ammonia, although other potential indicators are described in Chapter 12.

Manhole indicator data is analyzed by looking for “hits,” which are individual samples that exceed a benchmark concentration. In addition, trends in indicator concentrations are also examined throughout the storm drain network.



**Figure 56: Techniques to Sample from the Storm Drain**

Figure 57 profiles a storm drain network investigation that used ammonia as the indicator parameter and a benchmark concentration of 1.0 mg/L. At both the outfall and the first manhole up the trunk, field crews recorded finding “hits” for ammonia of 2.2 mg/L and 2.3 mg/L, respectively. Subsequent manhole inspections further up the network revealed one manhole with no flow, and a second with a hit for ammonia (2.4 mg/L). The crew then tracked the discharge upstream of the second manhole, and found a third manhole with a low ammonia reading (0.05 mg/L) and a fourth with a much higher reading (4.3 mg/L). The crew then redirected its effort to sample above the fourth manhole with the 4.3 mg/L concentration, only to find another low reading. Based on this pattern, the crew concluded the discharge source was located between these two manholes, as nothing else could explain this sudden increase in concentration over this length of pipe.

The results of storm drain network investigations should be systematically documented to guide future discharge investigations, and describe any infrastructure maintenance problems encountered. An example of a sample manhole inspection field log is displayed in Figure 58.

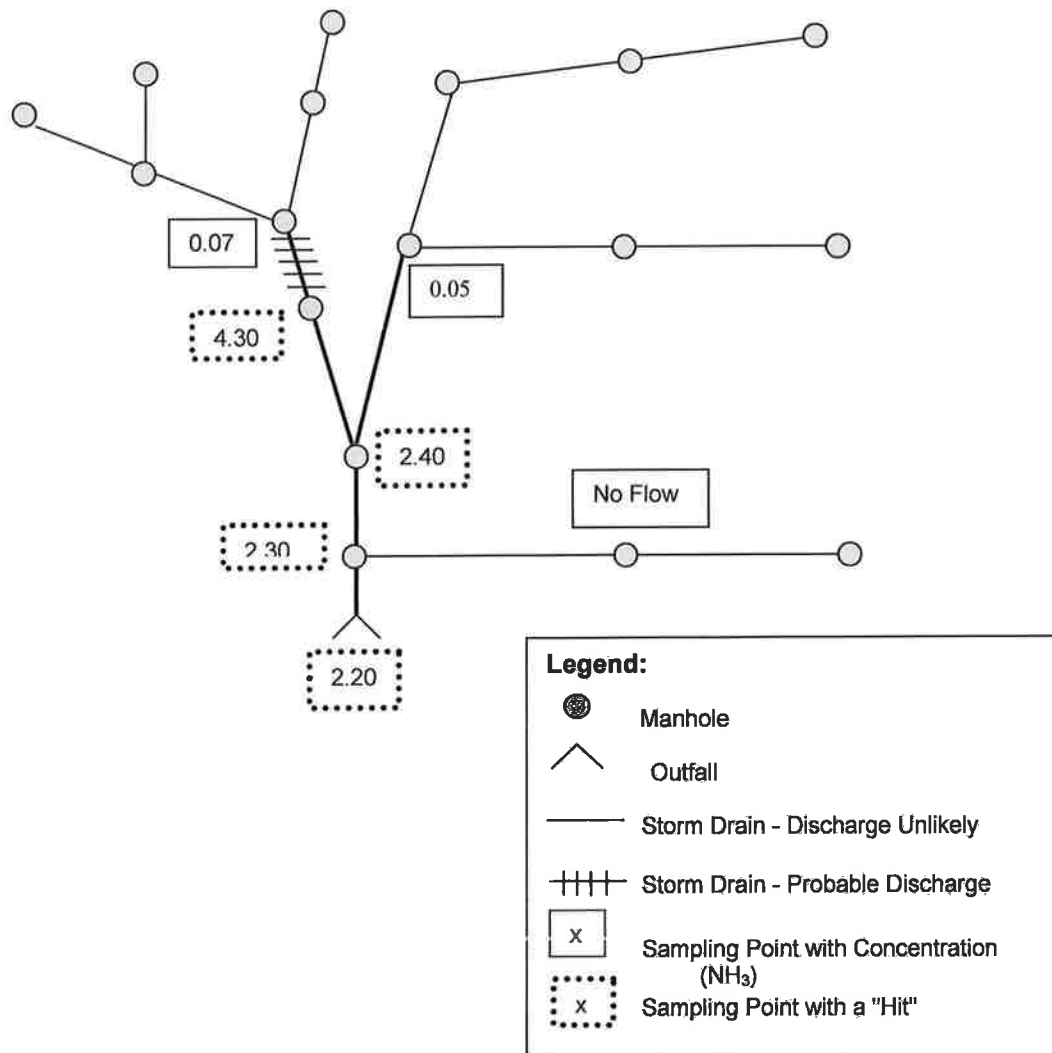


Figure 57: Use of Ammonia as a Trace Parameter to Identify an Illicit Discharge



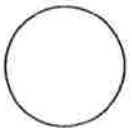
	<b>BOSTON WATER AND SEWER COMMISSION</b> <b>MANHOLE INSPECTION LOG</b>	<b>Manhole ID No.</b> <span style="border: 1px solid black; display: inline-block; width: 100px; height: 30px; vertical-align: middle;"></span>																																																												
Inspection Date: _____ Tributary Area: _____																																																														
Street: _____		Manhole Type:																																																												
Inspection: Not Found <input type="checkbox"/> Surface <input type="checkbox"/> Internal <input type="checkbox"/>		Sanitary Sewer <input type="checkbox"/> Storm Drain <input type="checkbox"/>																																																												
Follow Up Inspection <input type="checkbox"/>		High Outlet <input type="checkbox"/> Lovejoy <input type="checkbox"/>																																																												
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Inspector: _____ < 48 hours <input type="checkbox"/> 48 – 72 hours <input type="checkbox"/> > 72 hours <input type="checkbox"/>																																																														
<b>Observations:</b> Standing Water in Manhole: Yes <input type="checkbox"/> No <input type="checkbox"/> Color of Water: Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Other _____ Flow in Manhole: Yes <input type="checkbox"/> No <input type="checkbox"/> Velocity: Slow <input type="checkbox"/> Medium <input type="checkbox"/> Fast <input type="checkbox"/> Depth of Flow: _____ in. Color of Flow: No Flow: <input type="checkbox"/> Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Suspended Solids <input type="checkbox"/> Other _____ Blockages: Yes <input type="checkbox"/> No <input type="checkbox"/> Sediment in Manhole: Yes <input type="checkbox"/> No <input type="checkbox"/> If Yes: Percent of Pipe Filled: _____ % Floatables: None <input type="checkbox"/> Sewage <input type="checkbox"/> Oily Sheen <input type="checkbox"/> Foam <input type="checkbox"/> Other _____ Odor: None <input type="checkbox"/> Sewage <input type="checkbox"/> Oil <input type="checkbox"/> Soap <input type="checkbox"/> Other _____																																																														
<b>Field Testing:</b> pH _____ Temp _____ Spec. Cond. _____ Surfactants: Yes <input type="checkbox"/> No <input type="checkbox"/> Ammonia: Yes <input type="checkbox"/> No <input type="checkbox"/>																																																														
<b>Contamination:</b> Found During Inspection Yes <input type="checkbox"/> Check one: <input type="checkbox"/> Observation <input type="checkbox"/> Positive Test Kit Result No <input type="checkbox"/> Sandbagged Placed No <input type="checkbox"/> Yes <input type="checkbox"/> Give Date _____ Sandbag Checked (Date): _____ Flow was <input type="checkbox"/> Captured <input type="checkbox"/> Not Captured:																																																														
<table style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="4"><b>Condition of Manhole:</b></td> <td colspan="2"><b>Common Manholes:</b></td> </tr> <tr> <td>Grade: At _____ Above _____ Below _____</td> <td colspan="2">High Outlet: Blocked Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/></td> <td colspan="3"></td> </tr> <tr> <td></td> <td colspan="2">Lovejoy: Cover Plate in Place Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/></td> <td colspan="3"></td> </tr> <tr> <td></td> <td style="text-align: center;">Good</td> <td style="text-align: center;">Fair</td> <td style="text-align: center;">Poor</td> <td style="text-align: center;">Comments</td> <td></td> </tr> <tr> <td>Pavement</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td></td> </tr> <tr> <td>Cover</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td>Construction Material:</td> </tr> <tr> <td>Frame</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td>Brick Precast Other</td> </tr> <tr> <td>Corbel</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td></td> </tr> <tr> <td>Walls</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td></td> </tr> <tr> <td>Floor</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td style="text-align: center;">_____</td> <td></td> </tr> </table>			<b>Condition of Manhole:</b>				<b>Common Manholes:</b>		Grade: At _____ Above _____ Below _____	High Outlet: Blocked Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>						Lovejoy: Cover Plate in Place Yes <input type="checkbox"/> No <input type="checkbox"/> NA <input type="checkbox"/>						Good	Fair	Poor	Comments		Pavement	_____	_____	_____	_____		Cover	_____	_____	_____	_____	Construction Material:	Frame	_____	_____	_____	_____	Brick Precast Other	Corbel	_____	_____	_____	_____		Walls	_____	_____	_____	_____		Floor	_____	_____	_____	_____	
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Comments: Manhole Correct as Mapped Yes <input type="checkbox"/> No <input type="checkbox"/> <div style="text-align: right; margin-top: 20px;">  </div> <div style="text-align: center; margin-top: 50px;">  <p>Plan of Manhole</p> </div>																																																														

Figure 58: Boston Water and Sewer Commission Manhole Inspection Log (Source: Jewell, 2001)

### *Methods to isolate intermittent discharges in the storm drain network*

Intermittent discharges are often challenging to trace in the storm drain network, although four techniques have been used with some success.

#### Sandbags

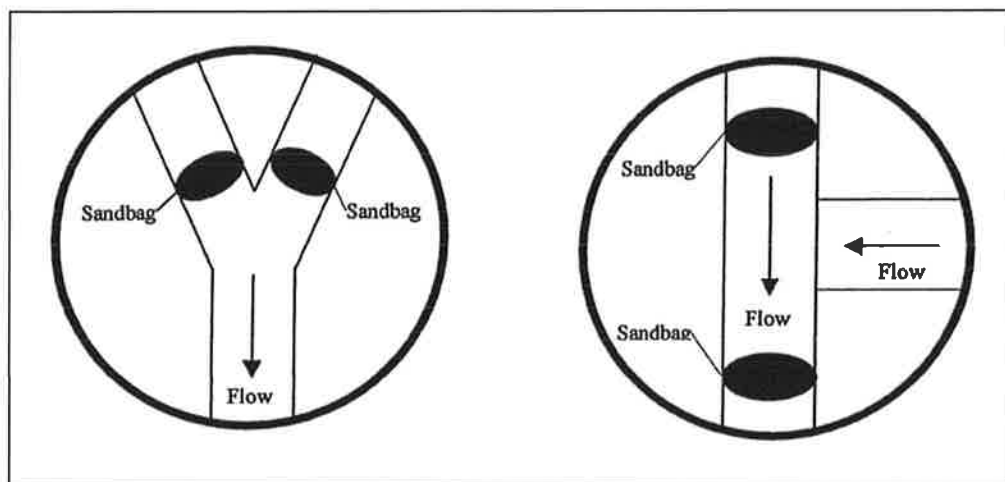
This technique involves placement of sandbags or similar barriers within strategic manholes in the storm drain network to form a temporary dam that collects any intermittent flows that may occur. Any flow collected behind the sandbag is then assessed using visual observations or by indicator sampling. Sandbags are lowered on a rope through the manhole to form a dam along the bottom of the storm drain, taking care not to fully block the pipe (in case it rains before the sandbag is retrieved).

Sandbags are typically installed at junctions in the network to eliminate contributing branches from further consideration (Figure 59). If no flow collects behind the sandbag, the upstream pipe network can be ruled out as a source of the intermittent discharge.

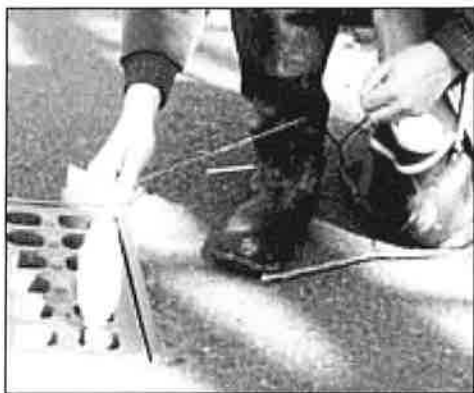
Sandbags are typically left in place for no more than 48 hours, and should only be installed when dry weather is forecast. Sandbags should not be left in place during a heavy rainstorm. They may cause a blockage in the storm drain, or, they may be washed downstream and lost. The biggest downside to sandbagging is that it requires at least two trips to each manhole.

#### Optical Brightener Monitoring (OBM) Traps

Optical brightener monitoring (OBM) traps, profiled in Chapter 12, can also be used to detect intermittent flows at manhole junctions. When these absorbent pads are anchored in the pipe to capture dry weather flows, they can be used to determine the presence of flow and/or detergents. These OBM traps are frequently installed by lowering them into an open-grate drop inlet or storm drain inlet, as shown in Figure 60. The pads are then retrieved after 48 hours and are observed under a fluorescent light (this method is most reliable for undiluted washwaters).



**Figure 59: Example Sandbag Placement (Source: Jewell, 2001)**



**Figure 60: Optical Brightener Placement in the Storm Drain**

(Source: Sargent and Castonguay, 1998)

#### Automatic Samplers

A few communities have installed automated samplers at strategic points within the storm drain network system that are triggered by small dry weather flows and collect water quality samples of intermittent discharges. Automated sampling can be extremely expensive, and is primarily used in very complex drainage areas that have severe intermittent discharge problems. Automated samplers can pinpoint the specific date and hours when discharges occur, and characterize its chemical composition, which can help crews fingerprint the generating source.

#### Observation of Deposits or Stains

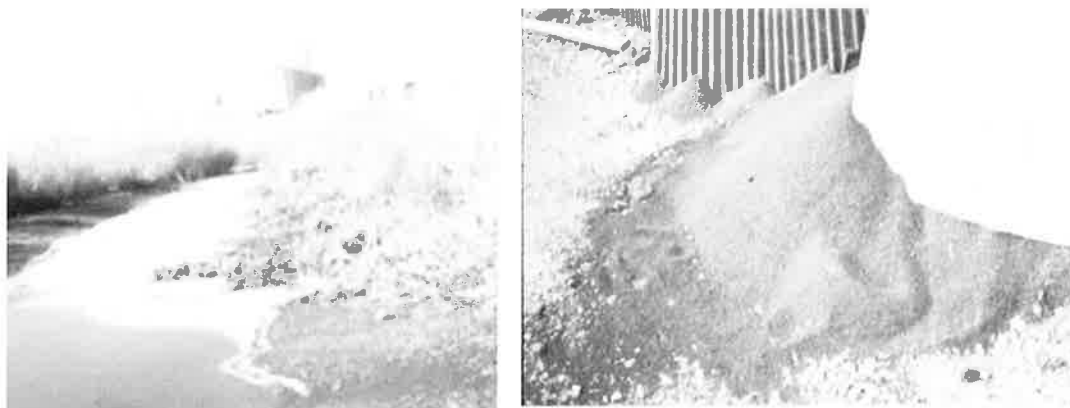
Intermittent discharges often leave deposits or stains within the storm drain pipe or manhole after they have passed. Thus, crews should note whether any deposits or stains are present in the manhole, even if no dry weather flow is observed. In some cases, the origin of the discharge can be surmised by collecting indicator samples in the water ponded within the manhole sump. Stains and deposits, however, are not always a conclusive way to trace intermittent discharges in the storm drain network.

## 13.2 Drainage Area Investigations

The source of some illicit discharges can be determined through a survey or analysis of the drainage area of the problem outfall. The simplest approach is a rapid windshield survey of the drainage area to find the potential discharger or generating sites. A more sophisticated approach relies on an analysis of available GIS data and permit databases to identify industrial or other generating sites. In both cases, drainage area investigations are only effective if the discharge observed at an outfall has distinct or unique characteristics that allow crews to quickly ascertain the probable operation or business that is generating it. Often, discharges with a unique color, smell, or off-the-chart indicator sample reading may point to a specific industrial or commercial source. Drainage area investigations are not helpful in tracing sewage discharges, since they are often not always related to specific land uses or generating sites.

#### *Rapid Windshield Survey*

A rapid drive-by survey works well in small drainage areas, particularly if field crews are already familiar with its business operations. Field crews try to match the characteristics of the discharge to the most likely type of generating site, and then inspect all of the sites of the same type within the drainage area until the culprit is found. For example, if fuel is observed at an outfall, crews might quickly check every business operation in the catchment that stores or dispenses fuel. Another example is illustrated in Figure 61 where extremely dense algal growth was observed in a small stream during the winter. Field crews were aware of a fertilizer storage site in the drainage area, and a quick inspection identified it as the culprit.



**Figure 61: Symptom (left): Extreme algal growth; Diagnosis (right): Cracked fertilizer storage is the phosphorus source**

A third example of the windshield survey approach is shown in Figure 62, where a very thick, sudsy and fragrant discharge was noted at a small outfall. The discharge appeared to consist of wash water, and the only commercial laundromat found upstream was confirmed to be the source. On-site testing may still be needed to identify the specific plumbing or connection generating the discharge.

#### *Detailed Drainage Area Investigations*

In larger or more complex drainage areas, GIS data can be analyzed to pinpoint the source of a discharge. If only general land use data exist, maps can at least highlight suspected industrial areas. If more detailed SIC code data are available digitally, the GIS can be used to pull up specific hotspot

operations or generating sites that could be potential dischargers. Some of the key discharge indicators that are associated with hotspots and specific industries are reviewed in Appendix K.

### 13.3 On-site Investigations

On-site investigations are used to pinpoint the exact source or connection producing a discharge within the storm drain network. The three basic approaches are dye, video and smoke testing. While each approach can determine the actual source of a discharge, each needs to be applied under the right conditions and test limitations (see Table 56). It should be noted that on-site investigations are not particularly effective in finding *indirect* discharges to the storm drain network.



**Figure 62: The sudsy, fragrant discharge (left) indicates that the laundromat is the more likely culprit than the florist (right).**



Table 56: Techniques to Locate the Discharge		
Technique	Best Applications	Limitations
Dye Testing	<ul style="list-style-type: none"> <li>Discharge limited to a very small drainage area (&lt;10 properties is ideal)</li> <li>Discharge probably caused by a connection from an individual property</li> <li>Commercial or industrial land use</li> </ul>	<ul style="list-style-type: none"> <li>May be difficult to gain access to some properties</li> </ul>
Video Testing	<ul style="list-style-type: none"> <li>Continuous discharges</li> <li>Discharge limited to a single pipe segment</li> <li>Communities who own equipment for other investigations</li> </ul>	<ul style="list-style-type: none"> <li>Relatively expensive equipment</li> <li>Cannot capture non-flowing discharges</li> <li>Often cannot capture discharges from pipes submerged in the storm drain</li> </ul>
Smoke Testing	<ul style="list-style-type: none"> <li>Cross-connection with the sanitary sewer</li> <li>Identifying other underground sources (e.g., leaking storage techniques) caused by damage to the storm drain</li> </ul>	<ul style="list-style-type: none"> <li>Poor notification to public can cause alarm</li> <li>Cannot detect all illicit discharges</li> </ul>

### TIP

The Wayne County Department of the Environment provides excellent training materials on on-site investigations, as well as other illicit discharge techniques. More information about this training can be accessed from their website:  
[Http://www.wcdoe.org/Watershed/Programs\\_Srvcs\\_IDEP/idep.htm](http://www.wcdoe.org/Watershed/Programs_Srvcs_IDEP/idep.htm).



Figure 63: Dye Testing Plumbing (NIWPC, 2003)

### Dye Testing

Dye testing is an excellent indicator of illicit connections and is conducted by introducing non-toxic dye into toilets, sinks, shop drains and other plumbing fixtures (see Figure 63). The discovery of dye in the storm drain, rather than the sanitary sewer, conclusively determines that the illicit connection exists.

Before commencing dye tests, crews should review storm drain and sewer maps to identify lateral sewer connections and how they can be accessed. In addition, property owners must be notified to obtain entry permission. For industrial or commercial properties, crews should carry a letter to

document their legal authority to gain access to the property. If time permits, the letter can be sent in advance of the dye testing. For residential properties, communication can be more challenging. Unlike commercial properties, crews are not guaranteed access to homes, and should call ahead to ensure that the owner will be home on the day of testing.

Communication with other local agencies is also important since any dye released to the storm drain could be mistaken for a spill or pollution episode. To avoid a costly and embarrassing response to a false alarm,

crews should contact key spill response agencies using a “quick fax” that describes when and where dye testing is occurring (Tuomari and Thomson, 2002). In addition, crews should carry a list of phone numbers to call spill response agencies in the event dye is released to a stream.

At least two staff are needed to conduct dye tests – one to flush dye down the plumbing fixtures and one to look for dye in the downstream manhole(s). In some cases,

three staff may be preferred, with two staff entering the private residence or building for both safety and liability purposes.

The basic equipment to conduct dye tests is listed in Table 57 and is not highly specialized. Often, the key choice is the type of dye to use for testing. Several options are profiled in Table 58. In most cases, liquid dye is used, although solid dye tablets can also be placed in a mesh bag and lowered into the manhole on a rope (Figure 64).

Table 57: Key Field Equipment for Dye Testing (Source: Wayne County, MI, 2000)	
<u>Maps, Documents</u>	
<ul style="list-style-type: none"> <li>• Sewer and storm drain maps (sufficient detail to locate manholes)</li> <li>• Site plan and building diagram</li> <li>• Letter describing the investigation</li> <li>• Identification (e.g., badge or ID card)</li> <li>• Educational materials (to supplement pollution prevention efforts)</li> <li>• List of agencies to contact if the dye discharges to a stream.</li> <li>• Name of contact at the facility</li> </ul>	
<u>Equipment to Find and Lift the Manhole Safely (small manhole often in a lawn)</u>	
<ul style="list-style-type: none"> <li>• Probe</li> <li>• Metal detector</li> <li>• Crow bar</li> <li>• Safety equipment (hard hats, eye protection, gloves, safety vests, steel-toed boots, traffic control equipment, protective clothing, gas monitor)</li> </ul>	
<u>Equipment for Actual Dye Testing and Communications</u>	
<ul style="list-style-type: none"> <li>• 2-way radio</li> <li>• Dye (liquid or “test strips”)</li> <li>• High powered lamps or flashlights</li> <li>• Water hoses</li> <li>• Camera</li> </ul>	

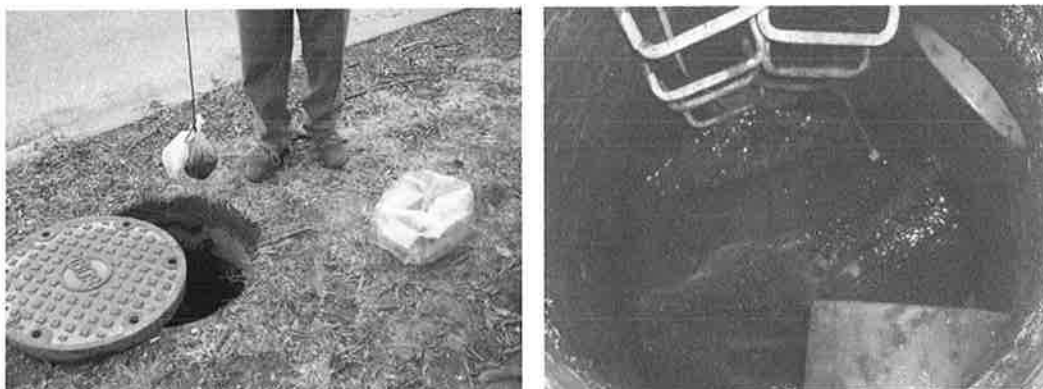


Figure 64: Dye in a mesh bag is placed into an upstream manhole (left); Dye observed at a downstream manhole traces the path of the storm drain (right)

If a longer pipe network is being tested, and dye is not expected to appear for several hours, charcoal packets can be used to detect the dye (GCHD, 2002). Charcoal packets can be secured and left in place for a week or two, and then analyzed for the presence of dye. Instructions for using charcoal packets in dye testing can be accessed at the following website:

<http://bayinfo.tamug.tamu.edu/gbeppubs/ms4.pdf>.

The basic drill for dye tests consists of three simple steps. First, flush or wash dye down the drain, fixture or manhole. Second, pop open downgradient sanitary sewer manholes and check to see if any dye appears. If none is detected in the sewer manhole after an hour or so, check downgradient storm drain manholes or outfalls for the presence of dye. Although dye testing is fairly straightforward, some tips to make testing go more smoothly are offered in Table 59.

Table 58: Dye Testing Options	
Product	Applications
Dye Tablets	<ul style="list-style-type: none"> <li>• Compressed powder, useful for releasing dye over time</li> <li>• Less messy than powder form</li> <li>• Easy to handle, no mess, quick dissolve</li> <li>• Flow mapping and tracing in storm and sewer drains</li> <li>• Plumbing system tracing</li> <li>• Septic system analysis</li> <li>• Leak detection</li> </ul>
Liquid Concentrate	<ul style="list-style-type: none"> <li>• Very concentrated, disperses quickly</li> <li>• Works well in all volumes of flow</li> <li>• Recommended when metering of input is required</li> <li>• Flow mapping and tracing in storm and sewer drains</li> <li>• Plumbing system tracing</li> <li>• Septic system analysis</li> <li>• Leak detection</li> </ul>
Dye Strips	<ul style="list-style-type: none"> <li>• Similar to liquid but less messy</li> </ul>
Powder	<ul style="list-style-type: none"> <li>• Can be very messy and must dissolve in liquid to reach full potential</li> <li>• Recommended for very small applications or for very large applications where liquid is undesirable</li> <li>• Leak detection</li> </ul>
Dye Wax Cakes	<ul style="list-style-type: none"> <li>• Recommended for moderate-sized bodies of water</li> <li>• Flow mapping and tracing in storm and sewer drains</li> </ul>
Dye Wax Donuts	<ul style="list-style-type: none"> <li>• Recommended for large sized bodies of water (lakes, rivers, ponds)</li> <li>• Flow mapping and tracing in storm and sewer drains</li> <li>• Leak detection</li> </ul>

**Table 59: Tips for Successful Dye Testing**

(Adapted from Tuomari and Thompson, 2002)

**Dye Selection**

- Green and liquid dyes are the easiest to see.
- Dye test strips can be a good alternative for residential or some commercial applications. (Liquid can leave a permanent stain).
- Check the sanitary sewer before using dyes to get a "base color." In some cases, (e.g., a print shop with a permitted discharge to the sanitary sewer), the sewage may have an existing color that would mask a dye.
- Choose two dye colors, and alternate between them when testing multiple fixtures.

**Selecting Fixtures to Test**

- Check the plumbing plan for the site to isolate fixtures that are separately connected.
- For industrial facilities, check most floor drains (these are often misdirected).
- For plumbing fixtures, test a representative fixture (e.g., a bathroom sink).
- Test some locations separately (e.g., washing machines and floor drains), which may be misdirected.
- If conducting dye investigations on multiple floors, start from the basement and work your way up.
- At all fixtures, make sure to flush with plenty of water to ensure that the dye moves through the system.

**Selecting a Sewer Manhole for Observations**

- Pick the closest manhole possible to make observations (typically a sewer lateral).
- If this is not possible, choose the nearest downstream manhole.

**Communications Between Crew Members**

- The individual conducting the dye testing calls in to the field person to report the color dye used, and when it is dropped into the system.
- The field person then calls back when dye is observed in the manhole.
- If dye is not observed (e.g., after two separate flushes have occurred), dye testing is halted until the dye appears.

**Locating Missing Dye**

- The investigation is not complete until the dye is found. Some reasons for dye not appearing include:
- The building is actually hooked up to a septic system.
- The sewer line is clogged.
- There is a leak in the sewer line or lateral pipe.

***Video Testing***

Video testing works by guiding a mobile video camera through the storm drain pipe to locate the actual connection producing an illicit discharge. Video testing shows flows and leaks within the pipe that may indicate an illicit discharge, and can show cracks and other pipe damage that enable sewage or contaminated water to flow into the storm drain pipe.

Video testing is useful when access to properties is constrained, such as residential neighborhoods. Video testing can also be expensive, unless the community already owns and uses the equipment for sewer inspections. This technique will not detect all types of discharges, particularly when the illicit connection is not flowing at the time of the video survey.

Different types of video camera equipment are used, depending on the diameter and condition of the storm sewer being tested.

Field crews should review storm drain maps, and preferably visit the site before selecting the video equipment for the test. A field visit helps determine the camera size needed to fit into the pipe, and if the storm drain has standing water.

In addition to standard safety equipment required for all manhole inspections, video testing requires a Closed-Circuit Television (CCTV) and supporting items. Many commercially available camera systems are specifically adapted to televise storm sewers, ranging from large truck or van-mounted systems to much smaller portable cameras. Cameras can be self-propelled or towed. Some specifications to look for include:

- The camera should be capable of radial view for inspection of the top, bottom, and sides of the pipe and for looking up lateral connections.
- The camera should be color.
- Lighting should be supplied by a lamp on the camera that can light the entire periphery of the pipe.

When inspecting the storm sewer, the CCTV is oriented to keep the lens as close as possible to the center of the pipe. The camera can be self-propelled through the pipe using a tractor or crawler unit or it may be towed through on a skid unit (see Figures 65



Figure 65: Camera being towed

and 66). If the storm drain has ponded water, the camera should be attached to a raft, which floats through the storm sewer from one manhole to the next. To see details of the sewer, the camera and lights should be able to swivel both horizontally and vertically. A video record of the inspection should be made for future reference and repairs (see Figure 67).

### Smoke Testing

Smoke testing is another “bottom up” approach to isolate illicit discharges. It works by introducing smoke into the storm drain system and observing where the smoke surfaces. The use of smoke testing to detect illicit discharges is a relatively new application, although many communities have used it to check for infiltration and inflow into their sanitary sewer network. Smoke testing can find improper connections, or damage to the storm drain

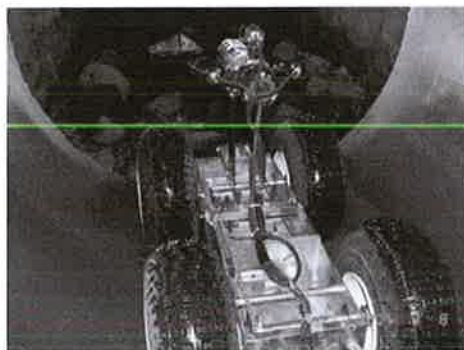


Figure 66: Tractor-mounted Camera



Figure 67: Review of an Inspection Video

system (Figure 68). This technique works best when the discharge is confined to the upper reaches of the storm drain network, where pipe diameters are too small for video testing and gaining access to multiple properties renders dye testing infeasible.

Notifying the public about the date and purpose of smoke testing before starting is critical. The smoke used is non-toxic, but can cause respiratory irritation, which can be a problem for some residents. Residents should be notified at least two weeks prior to testing, and should be provided the following information (Hurco Technologies, Inc., 2003):

- Date testing will occur
- Reason for smoke testing
- Precautions they can take to prevent smoke from entering their homes or businesses
- What they need to do if smoke enters their home or business, and any health concerns associated with the smoke
- A number residents can call to relay any particular health concerns (e.g., chronic respiratory problems)

Program managers should also notify local media to get the word out if extensive smoke testing is planned (e.g., television,

newspaper, and radio). On the actual day of testing, local fire, police departments and 911 call centers should be notified to handle any calls from the public (Hurco Technologies, Inc., 2003).

The basic equipment needed for smoke testing includes manhole safety equipment, a smoke source, smoke blower, and sewer plugs. Two smoke sources can be used for smoke testing. The first is a smoke “bomb,” or “candle” that burns at a controlled rate and releases very white smoke visible at relatively low concentrations (Figure 69). Smoke bombs are suspended beneath a blower in a manhole. Candles are available in 30 second to three minute sizes. Once opened, smoke bombs should be kept in a dry location and should be used within one year.

The second smoke source is liquid smoke, which is a petroleum-based product that is injected into the hot exhaust of a blower where it is heated and vaporized (Figure 70). The length of smoke production can vary depending on the length of the pipe being tested. In general, liquid smoke is not as consistently visible and does not travel as far as smoke from bombs (USA Blue Book).

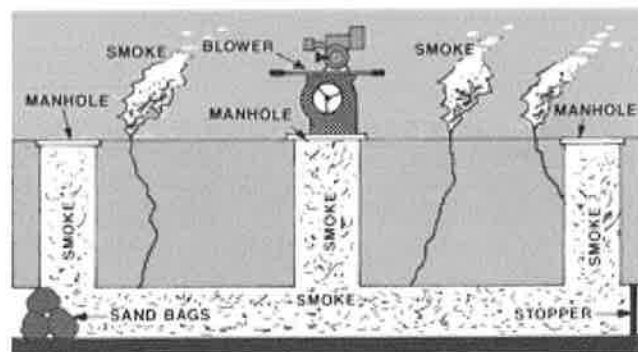


Figure 68: Smoke Testing System Schematic

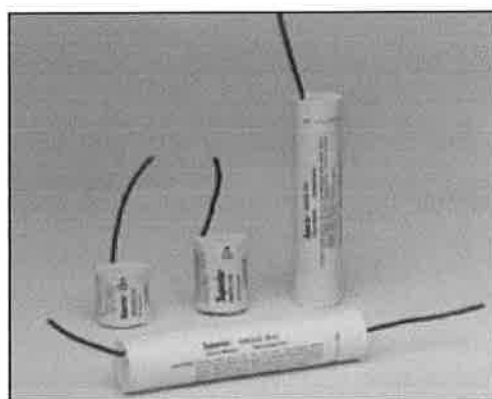


Figure 69: Smoke Candles



**Figure 70: Smoke Blower**

Smoke blowers provide a high volume of air that forces smoke through the storm drain pipe. Two types of blowers are commonly used: “squirrel cage” blowers and direct-drive propeller blowers. Squirrel cage blowers are large and may weigh more than 100 pounds, but allow the operator to generate more controlled smoke output. Direct-drive propeller blowers are considerably lighter and more compact, which allows for easier transport and positioning.

Three basic steps are involved in smoke testing. First, the storm drain is sealed off by plugging storm drain inlets. Next, the smoke is released and forced by the blower through the storm drain system. Lastly, the crew looks for any escape of smoke above-ground to find potential leaks.

One of three methods can be used to seal off the storm drain. Sandbags can be lowered into place with a rope from the street surface. Alternatively, beach balls that have a diameter slightly larger than the drain can be inserted into the pipe. The beach ball is then placed in a mesh bag with a rope attached to it so it can be secured and retrieved. If the beach ball gets stuck in the pipe, it can simply be punctured, deflated and removed. Finally, expandable plugs are

available, and may be inserted from the ground surface.

Blowers should be set up next to the open manhole after the smoke is started. Only one manhole is tested at a time. If smoke candles are used, crews simply light the candle, place it in a bucket, and lower it in the manhole. The crew then watches to see where smoke escapes from the pipe. The two most common situations that indicate an illicit discharge are when smoke is seen rising from internal plumbing fixtures (typically reported by residents) or from sewer vents (Figure 71). Sewer vents extend upward from the sewer lateral to release gas buildup, and are not supposed to be connected to the storm drain system.



**Figure 71: Smoke Rising from Sewer Vent**

### 13.4 Septic System Investigations

The techniques for tracing illicit discharges are different in rural or low-density residential watersheds. Often, these watersheds lack sanitary sewer service and storm water is conveyed through ditches or swales, rather than enclosed pipes. Consequently, many illicit discharges enter the stream as indirect discharges, through surface breakouts of septic fields or through

straight pipe discharges from bypassed septic systems.

The two broad techniques used to find individual septic systems -- on-site investigations and infrared imagery -- are described in this section.

### *On-Site Septic Investigations*

Three kinds of on-site investigations can be performed at individual properties to determine if the septic system is failing, including homeowner survey, surface condition analysis and a detailed system inspection. The first two investigations are rapid and relatively simple assessments typically conducted in targeted watershed areas. Detailed system inspections are a much more thorough investigation of the functioning of the septic system that is conducted by a certified professional. Detailed system inspections may occur at time of sale of a property, or be triggered by poor scores on the rapid homeowner survey or surface condition analysis.

#### Homeowner Survey

The homeowner survey consists of a brief interview with the property owner to determine the potential for current or future failure of the septic system, and is often done in conjunction with a surface condition analysis.

Table 60 highlights some common questions to ask in the survey, which inquire about resident behaviors, system performance and maintenance activity.

#### Surface Condition Analysis

The surface condition analysis is a rapid site assessment where field crews look for obvious indicators that point to current or potential production of illicit discharges by the septic system (Figure 72). Some of the key surface conditions to analyze have been described by Andrews *et al.*, (1997) and are described below:

- Foul odors in the yard
- Wet, spongy ground; lush plant growth; or burnt grass near the drain field
- Algal blooms or excessive weed growth in adjacent ditches, ponds and streams
- Shrubs or trees with root damage within 10 feet of the system
- Cars, boats, or other heavy objects located over the field that could crush lateral pipes
- Storm water flowing over the drain field
- Cave-ins or exposed system components
- Visible liquid on the surface of the drain field (e.g., surface breakouts)
- Obvious system bypasses (e.g., straight pipe discharges)

**Table 60: Septic System Homeowner Survey Questions**  
(Adapted from Andrews *et al.*, 1997 and Holmes Inspection Services)

<ul style="list-style-type: none"> <li>• How many people live in the house?<sup>1</sup></li> <li>• What is the septic tank capacity?<sup>2</sup></li> <li>• Do drains in the house empty slowly or not at all?</li> <li>• When was the last time the system was inspected or maintained?</li> <li>• Does sewage back up into the house through drain lines?</li> <li>• Are there any wet, smelly spots in the yard?</li> <li>• Is the septic tank effluent piped so it drains to a road ditch, a storm sewer, a stream, or is it connected to a farm drain tile?</li> </ul>
<p><sup>1</sup> Water usage ranges from 50 to 100 gallons per day per person. This information can be used to estimate the wastewater load from the house (Andrews <i>et al.</i>, 1997).</p> <p><sup>2</sup> The septic tank should be large enough to hold two days' worth of wastewater (Andrews <i>et al.</i>, 1997).</p>





**Figure 72: (a) Wet, spongy ground. Grass may be bright green or burnt due to high nutrient loading. (b) Straight pipe discharge to nearby stream. (c) Algal bloom in a nearby pond.**

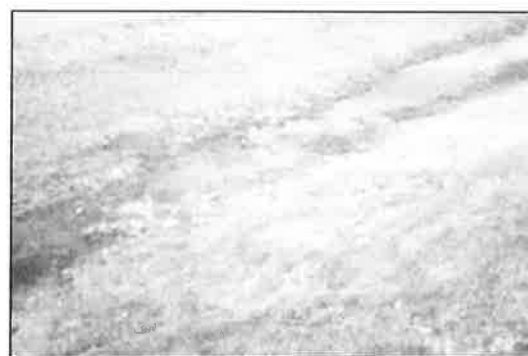
(Sources: a- Anish Jantrania; b- Snohomish County, WA c- King County, WA)

### *Detailed System Inspection*

The detailed system inspection is a much more thorough inspection of the performance and function of the septic system, and must be completed by a certified professional. The inspector certifies the structural integrity of all components of the system, and checks the depth of solids in the septic tank to determine if the system needs to be pumped out. The inspector also sketches the system, and estimates distance to groundwater, surface water, and drinking water sources. An example septic system inspection form from Massachusetts can be found at

<http://www.state.ma.us/dep/brp/www/soilsys.htm>.

Although not always incorporated into the inspection, dye testing can sometimes point to leaks from broken pipes, or direct discharges through straight pipes that might be missed during routine inspection. Dye can be introduced into plumbing fixtures in the home, and flushed with sufficient running water. The inspector then watches the septic field, nearby ditches, watercourses and manholes for any signs of the dye (Figure 73). The dye may take several hours to appear, so crews may want to place charcoal packets in adjacent waters to capture dye until they can return later to retrieve them.



**Figure 73: Dye surfacing in a septic field**

### *Infrared Imagery*

Infrared imagery is a special type of photography with gray or color scales that represent differences in temperature and emissivity of objects in the image ([www.stocktoninfrared.com](http://www.stocktoninfrared.com)), and can be used to locate sewage discharges. Several different infrared imagery techniques can be used to identify illicit discharges. The following discussion highlights two of these: aerial infrared thermography<sup>13</sup> and color infrared aerial photography.

### Infrared Thermography

Infrared thermography is increasingly being used to detect illicit discharges and failing septic systems. The technique uses the

<sup>13</sup> Infrared thermography is also being used by communities such as Mecklenburg County and the City of Charlotte in NC to detect illicit discharges at outfalls.

temperature difference of sewage as a marker to locate these illicit discharges. Figure 74 illustrates the thermal difference between an outfall discharge (with a higher temperature) and a stream.

The equipment needed to conduct aerial infrared thermography includes an aircraft (plane or helicopter); a high-resolution, large format, infrared camera with appropriate mount; a GPS unit; and digital recording equipment. If a plane is used, a higher resolution camera is required since it must operate at higher altitudes. Pilots should be experienced since flights take place at night, slowly, and at a low altitude. The camera may be handheld, but a mounted camera will provide significantly clearer results for a larger area. The GPS can be combined with a mobile mapping program and a video encoder-decoder that encodes and displays the coordinates, date, and time (Stockton, 2000). The infrared data are analyzed after the flight by trained analysts to locate suspected discharges, and field crews then inspect the ground-truthed sites to confirm the presence of a failing septic system.

Late fall, winter, and early spring are typically the best times of year to conduct these investigations in most regions of the country. This allows for a bigger difference



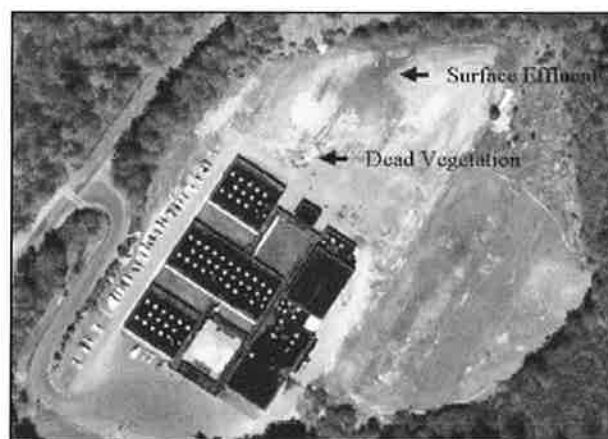
**Figure 74: Aerial Thermography Showing Sewage Leak**

between receiving water and discharge temperatures, and interference from vegetation is minimized (Stockton, 2004b). In addition, flights should take place at night to minimize reflected and direct daylight solar radiation that may adversely affect the imagery (Stockton, 2004b).

### Color Infrared Aerial Photography

Color infrared aerial photography looks for changes in plant growth, differences in soil moisture content, and the presence of standing water on the ground to primarily identify failing septic systems (Figure 75).

The Tennessee Valley Authority (TVA) uses color infrared aerial photography to detect failing septic systems in reservoir watersheds. Local health departments conduct follow-up ground-truthing surveys to determine if a system is actually failing (Sagona, 1986). Similar to thermography, it is recommended that flights take place at night, during leaf-off conditions, or when the water table is at a seasonal high (which is when most failures typically occur (U.S. EPA, 1999).



**Figure 75: Dead vegetation and surface effluent are evidence of a septic system surface failure.**  
(Source: U.S. EPA, 1999)

### 13.5 The Cost to Trace Illicit Discharge Sources

Tracing illicit discharges to their source can be an elusive and complex process, and precise staffing and budget data are difficult to estimate. Experience of Phase I NPDES communities that have done these investigations in the past can shed some light on cost estimates. Some details on unit costs for common illicit discharge investigations are provided below.

#### *Costs for Dye, Video, and Smoke Testing*

The cost of smoke, dye, and video testing can be substantial and staff intensive, and often depend on investigation specific factors, such as the complexity of the drainage network, density and age of buildings, and complexity of land use. Wayne County, MI, has estimated the cost of dye testing at \$900 per facility. Video testing costs range from \$1.50 to \$2.00 per foot, although this increases by \$1.00 per foot if pipe cleaning is needed prior to testing.

Table 61 summarizes the costs of start-up equipment for basic manhole entry and inspection, which is needed regardless of which type of test is performed. Tables 62 through 64 provide specific equipment costs for dye, video and smoke testing, respectively.

Table 61: Common Field Equipment Needed for Dye, Video, and Smoke Testing	
Item	Cost
1 Digital Camera	\$200
Clipboards, Pens, Batteries	\$25
1 Field vehicle	\$15,000 - \$35,000
1 First aid kit	\$30
1 Spotlight	\$40
1 Gas monitor and probe	\$900 - \$2,100
1 Hand-held GPS Unit	\$150
2 Two-way radios	\$250 - \$750
1 Manhole hook	\$80 - \$130
1 Mirror	\$70 - \$130
2 Reflective safety vests	\$40
Rubber/latex gloves (box of 100)	\$25
1 Can of Spray Paint	\$5
4 Traffic Cones	\$50

Table 62: Equipment Costs for Dye Testing

Product	Water Volume	Cost
Dye Strips	1 strip / 500 gallons	\$75 - \$94 per 100 strips
Dye Tablets	0 – 50,000 gallons	\$40 per 200 tablets
Liquid Concentrate (Rhodamine WT)	0 – 50,000 gallons	\$80 - \$90 per gallon \$15 - \$20 per pint
Powder	50,000 + gallons	\$77 per lb
Dye Wax Cakes	20,000 – 50,000 gallons	\$12 per one 1.25 ounce cake
Dye Wax Donuts	50,000 + gallons	\$104 - \$132 per 42 oz. donut
<i>Price Sources:</i> <i>Aquatic Eco-Systems <a href="http://www.aquaticeco.com/">http://www.aquaticeco.com/</a></i> <i>Cole Parmer <a href="http://www.coleparmer.com">http://www.coleparmer.com</a></i> <i>USA Blue Book <a href="http://www.usabluebook.com">http://www.usabluebook.com</a></i>		

Table 63: Equipment Costs for Video Testing

Equipment	Cost
GEN-EYE 2™ B&W Sewer Camera with VCR & 200' Push Cable	\$5,800
100' Push Rod and Reel Camera for 2" – 10" Pipes	\$5,300
200' Push Rod and Reel Camera for 8" – 24" Pipes	\$5,800
Custom Saturn III Inspection System 500' cable for 6-16" Lines	\$32,000 (\$33,000 with 1000 foot cable)
OUTPOST <ul style="list-style-type: none"> <li>Box with build-out</li> <li>Generator</li> <li>Washdown system</li> </ul>	\$6,000 \$2,000 \$1,000
Video Inspection Trailer <ul style="list-style-type: none"> <li>7'x10' trailer &amp; build-out</li> <li>Hardware and software package</li> <li>Incidentals</li> </ul>	\$18,500 \$15,000 \$5,000
Sprinter Chassis Inspection Vehicle <ul style="list-style-type: none"> <li>Van (with build-out for inspecting 6" – 24" pipes)</li> <li>Crawler (needed to inspect pipes &gt;24")</li> <li>Software upgrade (optional but helpful for extensive pipe systems)</li> </ul>	\$130,000 \$18,000 \$8,000
<i>Sources: USA Blue Book and Envirotech</i>	

Table 64: Equipment Costs for Smoke Testing

Equipment	Cost
Smoke Blower	\$1,000 to \$2,000 each
Liquid Smoke	\$38 to \$45 per gallon
Smoke Candles, 30 second (4,000 cubic feet)	\$27.50 per dozen
Smoke Candles, 60 Second (8,000 cubic feet)	\$30.50 per dozen
Smoke Candles, 3 Minute (40,000 cubic feet)	\$60.00 per dozen
<i>Sources: Hurco Tech, 2003 and Cherne Industries, 2003</i>	

### Costs for Septic System Investigations

Most septic system investigations are relatively low cost, but factors such as private property access, notification, and the total number of sites investigated can increase costs. Unit costs for the three major septic system investigations are described below.

#### Homeowner Survey and Surface Condition Analysis

Both the homeowner survey and the surface condition analysis are relatively low cost investigation techniques. Assuming that a staff person can investigate one home per hour, the average cost per inspection is approximately \$25. A substantial cost savings can be realized by using interns or volunteers to conduct these simple investigations.

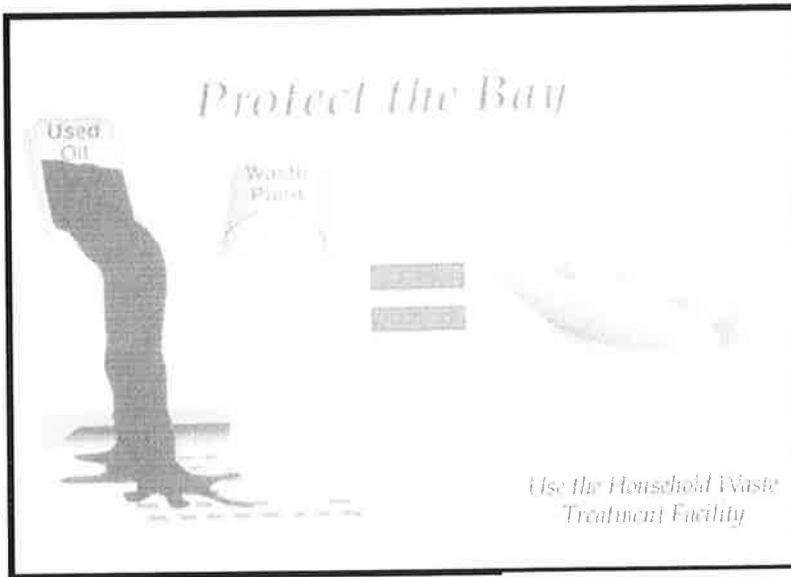
#### Detailed System Inspection

Septic system inspections are more expensive, but a typical unit cost is about \$250, and may also include an additional cost of pumping the system, at roughly \$150, if pumping is required to complete the inspection (Wayne County, 2003). This cost is typically charged to the homeowner as part of a home inspection.

### Aerial Infrared Thermography

The equipment needed to conduct aerial infrared thermography is expensive; cameras alone may range from \$250,000 to \$500,000 (Stockton, 2004a). However, private contractors provide this service. In general, the cost to contract an aerial infrared thermography investigation depends on the length of the flight (flights typically follow streams or rivers); how difficult it will be to fly the route; the number of heat anomalies expected to be encountered; the expected post-flight processing time (typically, four to five hours of analysis for every hour flown); and the distance of the site from the plane's "home" (Stockton, 2004a). The cost range is typically \$150 to \$400 per mile of stream or river flown, which includes the flight and post-flight analyses (Stockton, 2004a).

As an alternative, local police departments may already own an infrared imaging system that may be used. For instance, the Arkansas Department of Health used a state police helicopter with a Forward Looking Infrared (FLIR) imaging system, GPS, video equipment, and maps (Eddy, 2000). The disadvantage to this is that the equipment may not be available at optimal times to conduct the investigation. In addition, infrared imaging equipment used by police departments may not be sensitive enough to detect the narrow range of temperature difference (only a few degrees) often expected for sewage flows (Stockton, 2004a).



Graphic by: Margie Winter

## Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. For municipalities non-stormwater discharges present themselves in two situations. One is from fixed facilities owned and/or operated by the municipality. The other situation is non-stormwater discharges that are discovered during the normal operation of a field program. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, and surface cleaning. However, there are certain non-stormwater discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system. These discharges (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) can carry substances (such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants) into storm drains. The ultimate goal is to effectively eliminate non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges.

## Approach

The municipality must address non-stormwater discharges from its fixed facilities by assessing the types of non-stormwater discharges and implementing BMPs for the discharges determined to pose environmental concern. For field programs

## Objectives

- Contain
- Educate
- Reduce/Minimize

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>



the field staff must be trained to now what to look for regarding non-stormwater discharges and the procedures to follow in investigating the detected discharges.

***Suggested Protocols*****Fixed Facility***General*

- Post “No Dumping” signs with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Stencil storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as “Dump No Waste Drains to Stream” stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Landscaping and beautification efforts of hot spots might also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.

*Illicit Connections*

- Locate discharges from the fixed facility drainage system to the municipal storm drain system through review of “as-built” piping schematics.
- Use techniques such as smoke testing, dye testing and television camera inspection (as noted below) to verify physical connections.
- Isolate problem areas and plug illicit discharge points.

*Visual Inspection and Inventory*

- Inventory and inspect each discharge point during dry weather.
- Keep in mind that drainage from a storm event can continue for several days following the end of a storm and groundwater may infiltrate the underground stormwater collection system. Also, non-stormwater discharges are often intermittent and may require periodic inspections.

*Review Infield Piping*

- Review the “as-built” piping schematic as a way to determine if there are any connections to the stormwater collection system.
- Inspect the path of floor drains in older buildings.

*Smoke Testing*

- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.

- During dry weather the stormwater collection system is filled with smoke and then traced to sources. The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the stormwater system.

## *Dye Testing*

- A dye test can be performed by simply releasing a dye into either your sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

## *TV Inspection of Storm Sewer*

- TV Cameras can be employed to visually identify illicit connections to the fixed facility storm drain system.

## *Illegal Dumping*

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Clean up spills on paved surfaces with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.
- See fact sheet SC-11 Spill Prevention, Control, and Clean Up.

## **Field Program**

### *General*

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially ones that involve more than one jurisdiction and those that are not classified as hazardous, which are often not responded to as effectively as they need to be.
- Stencil storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- See SC-74 Stormwater Drainage System Maintenance for additional information.



*Field Inspection*

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- During routine field program maintenance field staff should look for evidence of illegal discharges or illicit connection:
  - Is there evidence of spills such as paints, discoloring, etc.
  - Are there any odors associated with the drainage system
  - Record locations of apparent illegal discharges/illicit connections and notify appropriate investigating agency.
- If trained, conduct field investigation of non-stormwater discharges to determine whether they pose a threat to water quality.

*Recommended Complaint Investigation Equipment*

- Field Screening Analysis
  - pH paper or meter
  - Commercial stormwater pollutant screening kit that can detect for reactive phosphorus, nitrate nitrogen, ammonium nitrogen, specific conductance, and turbidity
  - Sample jars
  - Sample collection pole
  - A tool to remove access hole covers
- Laboratory Analysis
  - Sample cooler
  - Ice
  - Sample jars and labels
  - Chain of custody forms.
- Documentation
  - Camera
  - Notebook
  - Pens
  - Notice of Violation forms

- Educational materials

## *Reporting*

- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any onsite drainage points observed.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

## *Enforcement*

- Educate the responsible party if identified on the impacts of their actions, explain the stormwater requirements, and provide information regarding Best Management Practices (BMP), as appropriate. Initiate follow-up and/or enforcement procedures.
- If an illegal discharge is traced to a commercial, residential or industrial source, conduct the following activities or coordinate the following activities with the appropriate agency:
  - Contact the responsible party to discuss methods of eliminating the non-stormwater discharge, including disposal options, recycling, and possible discharge to the sanitary sewer (if within POTW limits).
  - Provide information regarding BMPs to the responsible party, where appropriate.
  - Begin enforcement procedures, if appropriate.
  - Continue inspection and follow-up activities until the illicit discharge activity has ceased.
- If an illegal discharge is traced to a commercial or industrial activity, coordinate information on the discharge with the jurisdiction's commercial and industrial facility inspection program.

## *Training*

- Train technical staff to identify and document illegal dumping incidents.
- Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Train employees to identify non-stormwater discharges and report them to the appropriate departments.
- Train staff who have the authority to conduct surveillance and inspections, and write citations for those caught illegally dumping.

- Train municipal staff responsible for surveillance and inspection in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).
  - OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and federal OSHA 29 CFR 1910.146).
  - Procedural training (field screening, sampling, smoke/dye testing, TV inspection).
- Educate the identified responsible party on the impacts of his or her actions.

***Spill Response and Prevention***

- See SC-11 Spill Prevention Control and Clean Up

***Other Considerations***

- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The cost of fees for dumping at a proper waste disposal facility are often more than the fine for an illegal dumping offense, thereby discouraging people from complying with the law. The absence of routine or affordable pickup service for trash and recyclables in some communities also encourages illegal dumping. A lack of understanding regarding applicable laws or the inadequacy of existing laws may also contribute to the problem.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Many facilities do not have accurate, up-to-date schematic drawings.
- Can be difficult to locate illicit connections especially if there is groundwater infiltration.

**Requirements*****Costs***

- Eliminating illicit connections can be expensive especially if structural modifications are required such re-plumbing cross connections under an existing slab.
- Minor cost to train field crews regarding the identification of non-stormwater discharges. The primary cost is for a fully integrated program to identify and eliminate illicit connections and illegal dumping. However, by combining with other municipal programs (i.e. pretreatment program) cost may be lowered.
- Municipal cost for containment and disposal may be borne by the discharger.

***Maintenance***

Not applicable

## Supplemental Information

### *Further Detail of the BMP*

*What constitutes a "non-stormwater" discharge?*

- Non-stormwater discharges are discharges not made up entirely of stormwater and include water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, landscape irrigation, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

### *Permit Requirements*

- Current municipal NPDES permits require municipalities to effectively prohibit non-stormwater discharges unless authorized by a separate NPDES permit or allowed in accordance with the current NPDES permit conditions. Typically the current permits allow certain non-stormwater discharges in the storm drain system as long as the discharges are not significant sources of pollutants. In this context the following non-stormwater discharges are typically allowed:
  - Diverted stream flows;
  - Rising found waters;
  - Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20));
  - Uncontaminated pumped ground water;
  - Foundation drains;
  - Springs;
  - Water from crawl space pumps;
  - Footing drains;
  - Air conditioning condensation;
  - Flows from riparian habitats and wetlands;
  - Water line and hydrant flushing ;
  - Landscape irrigation;
  - Planned and unplanned discharges from potable water sources;
  - Irrigation water;
  - Individual residential car washing; and
  - Lawn watering.

Municipal facilities subject to industrial general permit requirements must include a certification that the stormwater collection system has been tested or evaluated for the presence of non-stormwater discharges. The state's General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility's SWPPP.

### *Illegal Dumping*

- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties

### *Outreach*

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people on the street who are aware of the problem and who have the tools to at least identify the incident, if not correct it. There are a number of ways of accomplishing this:

- Train municipal staff from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report the incidents.
- Deputize municipal staff who may come into contact with illegal dumping with the authority to write illegal dumping tickets for offenders caught in the act (see below).
- Educate the public. As many as 3 out of 4 people do not understand that in most communities the storm drain does not go to the wastewater treatment plant. Unfortunately, with the heavy emphasis in recent years on public education about solid waste management, including recycling and household hazardous waste, the sewer system (both storm and sanitary) has been the likely recipient of cross-media transfers of waste.
- Provide the public with a mechanism for reporting incidents such as a hot line and/or door hanger (see below).
- Help areas where incidents occur more frequently set up environmental watch programs (like crime watch programs).
- Train volunteers to notice and report the presence and suspected source of an observed pollutant to the appropriate public agency.

*What constitutes a "non-stormwater" discharge?*

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of non-stormwater discharges. The state's General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility's SWPPP.

#### *Storm Drain Stenciling*

- Stencil storm drain inlets with a message to prohibit illegal dumpings, especially in areas with waste handling facilities.
- Encourage public reporting of improper waste disposal by a HOTLINE number stenciled onto the storm drain inlet.
- See Supplemental Information section of this fact sheet for further detail on stenciling program approach.

#### *Oil Recycling*

- Contract collection and hauling of used oil to a private licensed used oil hauler/recycler.
- Comply with all applicable state and federal regulations regarding storage, handling, and transport of petroleum products.
- Create procedures for collection such as; collection locations and schedule, acceptable containers, and maximum amounts accepted.
- The California Integrated Waste Management Board has a Recycling Hotline, (800) 553-2962, that provides information and recycling locations for used oil.

#### ***Household Hazardous Waste***

- Provide household hazardous waste (HHW) collection facilities. Several types of collection approaches are available including permanent, periodic, or mobile centers, curbside collection, or a combination of these systems.

#### ***Training***

- Train municipal employees and contractors in proper and consistent methods for waste disposal.
- Train municipal employees to recognize and report illegal dumping.
- Train employees and subcontractors in proper hazardous waste management.

#### ***Spill Response and Prevention***

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

## ***Other Considerations***

- Federal Regulations (RCRA, SARA, CERCLA) and state regulations exist regarding the disposal of hazardous waste.
- Municipalities are required to have a used oil recycling element and a HHW element within their integrated waste management plan.
- Significant liability issues are involved with the collection, handling, and disposal of HHW.

## ***Examples***

The City of Palo Alto has developed a public participation program for reporting dumping violations. When a concerned citizen or public employee encounters evidence of illegal dumping, a door hanger (similar in format to hotel "Do Not Disturb" signs) is placed on the front doors in the neighborhood. The door hanger notes that a violation has occurred in the neighborhood, informs the reader why illegal dumping is a problem, and notes that illegal dumping carries a significant financial penalty. Information is also provided on what citizens can do as well as contact numbers for more information or to report a violation.

The Port of Long Beach has a state of the art database incorporating storm drain infrastructure, potential pollutant sources, facility management practices, and a pollutant tracking system.

The State Department of Fish and Game has a hotline for reporting violations called CalTIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).

The California Department of Toxic Substances Control's Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

## **References and Resources**

<http://www.stormwatercenter.net/>

California's Nonpoint Source Program Plan <http://www.co.clark.wa.us/pubworks/bmpman.pdf>

King County Stormwater Pollution Control Manual - <http://dnr.metrokc.gov/wlr/dss/spcm.htm>

Orange County Stormwater Program,  
[http://www.ocwatersheds.com/stormwater/swp\\_introduction.asp](http://www.ocwatersheds.com/stormwater/swp_introduction.asp)

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program  
(<http://www.projectcleanwater.org>)

Santa Clara Valley Urban Runoff Pollution Prevention Program  
[http://www.scvurppp-w2k.com/pdf%20documents/PS\\_ICID.PDF](http://www.scvurppp-w2k.com/pdf%20documents/PS_ICID.PDF)



# Spill Prevention, Control & Cleanup SC-11



## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Description

Spills and leaks, if not properly controlled, can adversely impact the storm drain system and receiving waters. Due to the type of work or the materials involved, many activities that occur either at a municipal facility or as a part of municipal field programs have the potential for accidental spills and leaks. Proper spill response planning and preparation can enable municipal employees to effectively respond to problems when they occur and minimize the discharge of pollutants to the environment.

## Approach

- An effective spill response and control plan should include:
  - Spill/leak prevention measures;
  - Spill response procedures;
  - Spill cleanup procedures;
  - Reporting; and
  - Training
- A well thought out and implemented plan can prevent pollutants from entering the storm drainage system and can be used as a tool for training personnel to prevent and control future spills as well.

## Pollution Prevention

- Develop and implement a Spill Prevention Control and Response Plan. The plan should include:

## Targeted Constituents

Sediment	
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑



# **SC-11 Spill Prevention, Control & Cleanup**

- A description of the facility, the address, activities and materials involved
- Identification of key spill response personnel
- Identification of the potential spill areas or operations prone to spills/leaks
- Identification of which areas should be or are bermed to contain spills/leaks
- Facility map identifying the key locations of areas, activities, materials, structural BMPs, etc.
- Material handling procedures
- Spill response procedures including:
  - Assessment of the site and potential impacts
  - Containment of the material
  - Notification of the proper personnel and evacuation procedures
  - Clean up of the site
  - Disposal of the waste material and
  - Proper record keeping
- Product substitution – use less toxic materials (i.e. use water based paints instead of oil based paints)
- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of materials that are brought into the facility or into the field.

## ***Suggested Protocols***

### ***Spill/Leak Prevention Measures***

- If possible, move material handling indoors, under cover, or away from storm drains or sensitive water bodies.
- Properly label all containers so that the contents are easily identifiable.
- Berm storage areas so that if a spill or leak occurs, the material is contained.
- Cover outside storage areas either with a permanent structure or with a seasonal one such as a tarp so that rain can not come into contact with the materials.
- Check containers (and any containment sumps) often for leaks and spills. Replace containers that are leaking, corroded, or otherwise deteriorating with containers in good condition. Collect all spilled liquids and properly dispose of them.

# **Spill Prevention, Control & Cleanup SC-11**

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- Store, contain and transfer liquid materials in such a manner that if the container is ruptured or the contents spilled, they will not discharge, flow or be washed into the storm drainage system, surface waters, or groundwater.
- Place drip pans or absorbent materials beneath all mounted taps and at all potential drip and spill locations during the filling and unloading of containers. Any collected liquids or soiled absorbent materials should be reused/recycled or properly disposed of.
- For field programs, only transport the minimum amount of material needed for the daily activities and transfer materials between containers at a municipal yard where leaks and spill are easier to control.
- If paved, sweep and clean storage areas monthly, do not use water to hose down the area unless all of the water will be collected and disposed of properly.
- Install a spill control device (such as a tee section) in any catch basins that collect runoff from any storage areas if the materials stored are oil, gas, or other materials that separate from and float on water. This will allow for easier cleanup if a spill occurs.
- If necessary, protect catch basins while conducting field activities so that if a spill occurs, the material will be contained.

## ***Training***

- Educate employees about spill prevention, spill response and cleanup on a routine basis.
- Well-trained employees can reduce human errors that lead to accidental releases or spills:
  - The employees should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.
  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan if one is available.
- Training of staff from all municipal departments should focus on recognizing and reporting potential or current spills/leaks and who they should contact.
- Employees responsible for aboveground storage tanks and liquid transfers for large bulk containers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

## ***Spill Response and Prevention***

- Identify key spill response personnel and train employees on who they are.
- Store and maintain appropriate spill cleanup materials in a clearly marked location near storage areas; and train employees to ensure familiarity with the site's spill control plan and/or proper spill cleanup procedures.
- Locate spill cleanup materials, such as absorbents, where they will be readily accessible (e.g. near storage and maintenance areas, on field trucks).

# **SC-11 Spill Prevention, Control & Cleanup**

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- Follow the Spill Prevention Control and Countermeasure Plan if one is available.
- If a spill occurs, notify the key spill response personnel immediately. If the material is unknown or hazardous, the local fire department may also need to be contacted.
- If safe to do so, attempt to contain the material and block the nearby storm drains so that the area impacted is minimized. If the material is unknown or hazardous wait for properly trained personnel to contain the materials.
- Perform an assessment of the area where the spill occurred and the downstream area that it could impact. Relay this information to the key spill response and clean up personnel.

## *Spill Cleanup Procedures*

- Small non-hazardous spills
  - Use a rag, damp cloth or absorbent materials for general clean up of liquids
  - Use brooms or shovels for the general clean up of dry materials
  - If water is used, it must be collected and properly disposed of. The wash water can not be allowed to enter the storm drain.
  - Dispose of any waste materials properly
  - Clean or dispose of any equipment used to clean up the spill properly
- Large non-hazardous spills
  - Use absorbent materials for general clean up of liquids
  - Use brooms, shovels or street sweepers for the general clean up of dry materials
  - If water is used, it must be collected and properly disposed of. The wash water can not be allowed to enter the storm drain.
  - Dispose of any waste materials properly
  - Clean or dispose of any equipment used to clean up the spill properly
- For hazardous or very large spills, a private cleanup company or Hazmat team may need to be contacted to assess the situation and conduct the cleanup and disposal of the materials.
- Chemical cleanups of material can be achieved with the use of absorbents, gels, and foams. Remove the adsorbent materials promptly and dispose of according to regulations.
- If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

## *Reporting*

- Report any spills immediately to the identified key municipal spill response personnel.

# Spill Prevention, Control & Cleanup SC-11

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- Report spills in accordance with applicable reporting laws. Spills that pose an immediate threat to human health or the environment must be reported immediately to the Office of Emergency Service (OES)
- Spills that pose an immediate threat to human health or the environment may also need to be reported within 24 hours to the Regional Water Quality Control Board.
- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour)
- After the spill has been contained and cleaned up, a detailed report about the incident should be generated and kept on file (see the section on Reporting below). The incident may also be used in briefing staff about proper procedures

## ***Other Considerations***

- A Spill Prevention Control and Countermeasure Plan (SPCC) is required for facilities that are subject to the oil pollution regulations specified in Part 112 of Title 40 of the Code of Federal Regulations or if they have a storage capacity of 10,000 gallons or more of petroleum. (Health and Safety Code 6.67)
- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.
- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, if permitted to do so, prohibiting any hard connections to the storm drain.

## **Requirements**

### ***Costs***

- Will vary depending on the size of the facility and the necessary controls.
- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of wastes, contaminated soil and water is very expensive

### ***Maintenance***

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs

## **Supplemental Information**

### ***Further Detail of the BMP***

#### ***Reporting***

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the response and containment of a spill. A good record keeping system helps the municipality minimize incident recurrence, correctly respond with appropriate containment and cleanup activities, and comply with legal requirements.

# **SC-11 Spill Prevention, Control & Cleanup**

A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm drain.

These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

## ***Examples***

The City of Palo Alto includes spill prevention and control as a major element of its highly effective program for municipal vehicle maintenance shops.

## **References and Resources**

King County Stormwater Pollution Control Manual - <http://dnr.metrokc.gov/wlr/dss/spcm.htm>

Orange County Stormwater Program

[http://www.ocwatersheds.com/stormwater/swp\\_introduction.asp](http://www.ocwatersheds.com/stormwater/swp_introduction.asp)

# **Spill Prevention, Control & Cleanup SC-11**

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program  
(URMP)

<http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf>



## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

## Targeted Constituents

Sediment	
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	

## Description

Spills and leaks that occur during vehicle and equipment fueling can contribute hydrocarbons, oil and grease, as well as heavy metals to stormwater runoff. Implementing the following management practices can help prevent fuel spills and leaks.

## Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

## Pollution Prevention

- Use properly maintained offsite fueling stations whenever possible. These businesses are better equipped to handle fuel and spills properly.
- Educate employees about pollution prevention measures and goals
- Focus pollution prevention activities on containment of spills and leaks, most of which may occur during liquid transfers.

## Suggested Protocols

### General

- "Spot clean" leaks and drips routinely. Leaks are not cleaned up until the absorbent is picked up and disposed of properly.





## **SC-20      Vehicle and Equipment Fueling**

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- Label drains within the facility boundary, by paint/stencil (or equivalent), to indicate whether they flow to an oil/water separator, directly to the sewer, or to a storm drain. Labels are not necessary for plumbing fixtures directly connected to the sanitary sewer but may be useful to help eliminate confusion about where the drain leads.
- Post signs to remind employees not to top off the fuel tank when filling and signs that ban employees from changing engine oil or other fluids at that location.
- Report leaking vehicles to fleet maintenance.
- Install inlet catch basin equipped with a small sedimentation basin or grit chamber to remove large particles from stormwater in highly impervious areas. Proper maintenance of these devices is necessary.
- Accumulated non-contaminated stormwater (e.g., in a secondary containment) should be released prior to next storm.
- Ensure the following safeguards are in place:
  - Overflow protection devices on tank systems to warn the operator to automatically shutdown transfer pumps when the tank reaches full capacity.
  - Protective guards around tanks and piping to prevent vehicle or forklift damage.
  - Clearly tagging or labeling all valves to reduce human error.
  - Automatic shut off for severed fuel hoses.

### *Fuel Dispensing Areas*

- Maintain clean fuel-dispensing areas using dry cleanup methods such as sweeping for removal of litter and debris, or use of rags and absorbents for leaks and spills. Do not wash down areas with water.
- Fit underground storage tanks with spill containment and overfill prevention systems meeting the requirements of Section 2635(b) of Title 23 of the California Code of Regulations.
- Fit fuel dispensing nozzles with "hold-open latches" (automatic shutoffs) except where prohibited by local fire departments.
- Post signs at the fuel dispenser or fuel island warning vehicle owners/operators against "topping off" of vehicle fuel tanks.
- Design fueling area to prevent stormwater runoff and spills.
- Cover fueling area with an overhanging roof structure or canopy so that precipitation cannot come in contact with the fueling area and if possible use a perimeter drain or slope pavement inward with drainage to a blind sump (must be properly maintained and water properly disposed of); pave area with concrete rather than asphalt.

- Apply a suitable sealant that protects the asphalt from spilled fuels in areas where covering is infeasible and the fuel island is surrounded by pavement.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Cover storm drains in the vicinity during transfer.

## *Outdoor Waste Receptacle Area*

- Spot clean leaks and drips routinely to prevent runoff of spillage.
- Minimize the possibility of stormwater pollution from outside waste receptacles by using an effective combination of the following:
  - use only watertight waste receptacle(s) and keep the lid(s) closed, or
  - grade and pave the waste receptacle area to prevent runoff of stormwater, or
  - install a roof over the waste receptacle area, or
  - install a low containment berm around the waste receptacle area, or
  - use and maintain drip pans under waste receptacles. Containment areas and drip pans must be properly maintained and collected water disposed of properly (e.g., to sanitary sewer). Several drip pans should be stored in a covered location near outdoor waste receptacle area so that they are always available, yet protected from precipitation when not in use.
- Post "no littering" signs.

## *Air/Water Supply Area*

- Minimize the possibility of stormwater pollution from air/water supply areas by implementing an effective combination of the following:
  - spot clean leaks and drips routinely to prevent runoff of spillage, or
  - grade and pave the air/water supply area to prevent runoff of stormwater, or
  - install a roof over the air/water supply area, or
  - install a low containment berm around the air/water supply area. Maintain containment areas and dispose of contaminated water properly (e.g., to sanitary sewer).

## *Inspection*

- Aboveground Tank Leak and Spill Control:
  - Check for external corrosion and structural failure.

- Check for spills and overfills due to operator error.
  - Check for failure of piping system.
  - Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.
  - Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
  - Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
  - Periodically, integrity testing should be conducted by a qualified professional.
- Inspect and clean, if necessary, storm drain inlets and catch basins within the facility boundary before October 1 each year.

***Training***

- Train all employees upon hiring and annually thereafter on proper methods for handling and disposing of waste. Make sure that all employees understand stormwater discharge prohibitions, wastewater discharge requirements, and these best management practices.
- Train employees on proper fueling and cleanup procedures.
- Use a training log or similar method to document training.
- Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.

***Spill Response and Prevention***

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place stockpiles of spill cleanup materials where they are readily accessible.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly and dispose properly.
- Store portable absorbent booms (long flexible shafts or barriers made of absorbent material) in unbermed fueling areas.
- Report spills promptly.
- Install an oil/water separator and connect to the sanitary sewer (if allowed), if a dead-end sump is not used to collect spills.

***Other Considerations***

- Carry out all federal and state requirements regarding underground storage tanks, or install above ground tanks.

## Requirements

### Costs

- The retrofitting of existing fueling areas to minimize stormwater exposure or spill runoff can be expensive. Good design must occur during the initial installation.
- Extruded curb along the "upstream" side of the fueling area to prevent stormwater runoff is of modest cost.

### Maintenance

- Clean oil/water separators at appropriate intervals.
- Keep ample supplies of spill cleanup materials onsite.
- Inspect fueling areas, storage tanks, catch basin inserts, containment areas, and drip pans on a regular schedule.

## Supplemental Information

### Design Considerations

#### *Designing New Installations*

The elements listed below should be included in the design and construction of new or substantially remodeled facilities.

#### Fuel Dispensing Areas

- Fuel dispensing areas must be paved with Portland cement concrete (or, equivalent smooth impervious surface), with a 2% to 4% slope to prevent ponding, and must be separated from the rest of the site by a grade break that prevents runoff of stormwater to the extent practicable. The fuel dispensing area is defined as extending 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus 1 foot, whichever is less. The paving around the fuel dispensing area may exceed the minimum dimensions of the "fuel dispensing area" stated above.
- The fuel dispensing area must be covered, and the cover's minimum dimensions must be equal to or greater than the area within the grade break or the fuel dispensing area, as defined above. The cover must not drain onto the fuel dispensing area.
- If necessary install and maintain an oil control device in the appropriate catch basin(s) to treat runoff from the fueling area.

#### Outdoor Waste Receptacle Area

- Grade and pave the outdoor waste receptacle area to prevent runoff of stormwater to the extent practicable.

#### Air/Water Supply Area

- Grade and pave the air/water supply area to prevent runoff of stormwater to the extent practicable.

# SC-20      Vehicle and Equipment Fueling

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## *Designated Fueling Area*

- If your facility has large numbers of mobile equipment working throughout the site and you currently fuel them with a mobile fuel truck, consider establishing a designated fueling area. With the exception of tracked equipment such as bulldozers and perhaps small forklifts, most vehicles should be able to travel to a designated area with little lost time. Place temporary “caps” over nearby catch basins or manhole covers so that if a spill occurs it is prevented from entering the storm drain.

## **Examples**

The Spill Prevention Control and Countermeasure (SPCC) Plan, which is required by law for some facilities, is an effective program to reduce the number of accidental spills and minimize contamination of stormwater runoff.

The City of Palo Alto has an effective program for commercial vehicle service facilities. Many of the program's elements, including specific BMP guidance and lists of equipment suppliers, are also applicable to industrial facilities.

## **References and Resources**

Best Management Practice Guide for Retail Gasoline Outlets, California Stormwater Quality Task Force. 1997.

King County Stormwater Pollution Control Manual –  
<http://www.dnr.metrokc.gov/wlr/dss/spcm.htm>

Orange County Stormwater Program  
[http://www.ocwatersheds.com/StormWater/swp\\_introduction.asp](http://www.ocwatersheds.com/StormWater/swp_introduction.asp)

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)

# Vehicle and Equipment Cleaning SC-21

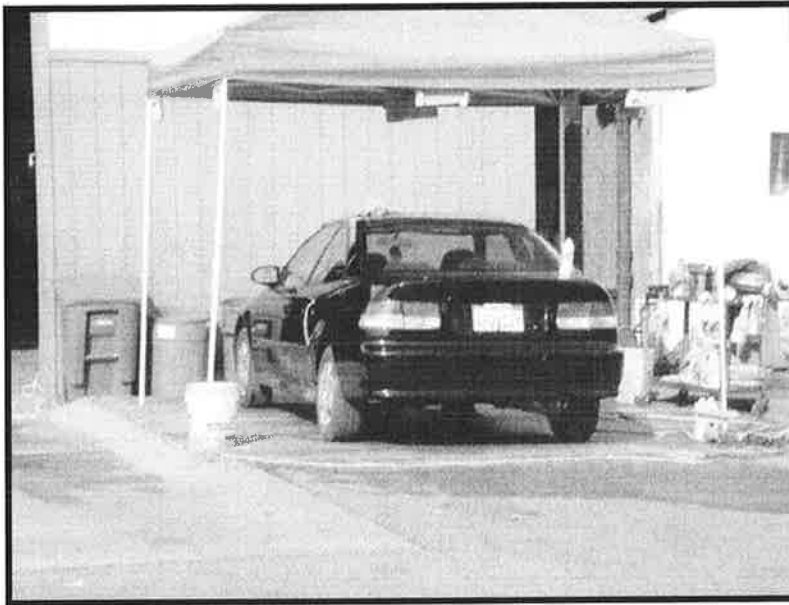


Photo Credit: Geoff Brosseau

## Description

Wash water from vehicle and equipment cleaning activities performed outdoors or in areas where wash water flows onto the ground can contribute toxic hydrocarbons and other organic compounds, oils and greases, nutrients, phosphates, heavy metals, and suspended solids to stormwater runoff. Use of the procedures outlined below can prevent or reduce the discharge of pollutants to stormwater during vehicle and equipment cleaning.

## Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives

## Pollution Prevention

- If possible, use properly maintained off-site commercial washing and steam cleaning businesses whenever possible. These businesses are better equipped to handle and properly dispose of the wash waters.
- Good housekeeping practices can minimize the risk of contamination from wash water discharges.

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	



# **SC-21      Vehicle and Equipment Cleaning**

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## ***Suggested Protocols***

### ***General***

- Use biodegradable, phosphate-free detergents for washing vehicles as appropriate.
- Mark the area clearly as a wash area.
- Post signs stating that only washing is allowed in wash area and that discharges to the storm drain are prohibited.
- Provide a trash container in wash area.
- Map on-site storm drain locations to avoid discharges to the storm drain system.
- Emphasize the connection between the storm drain system and runoff and help reinforce that car washing activities can have an affect on local water quality. This can be accomplished through storm drain stenciling programs.

### ***Vehicle and Equipment Cleaning***

- Design wash areas to properly collect and dispose of wash water when engine cleaning is conducted and when chemical additives, solvents, or degreasers are used. This may include installation of sumps or drain lines to collect wash water or construction of a berm around the designated area and grading of the area to collect wash water as well as prevent stormwater run-on.
- Consider washing vehicles and equipment inside the building if washing/cleaning must occur on-site. This will help to control the targeted constituents by directing them to the sanitary sewer.
- If washing must occur on-site and outdoor:
  - Use designated paved wash areas. Designated wash areas must be well marked with signs indicating where and how washing must be done. This area must be covered or bermed to collect the wash water and graded to direct the wash water to a treatment or disposal facility.
  - Oil changes and other engine maintenance cannot be conducted in the designated washing area. Perform these activities in a place designated for such activities.
  - Cover the wash area when not in use to prevent contact with rain water.
- Use hoses with nozzles that automatically turn off when left unattended.
- Perform pressure cleaning and steam cleaning off-site to avoid generating runoff with high pollutant concentrations. If done on-site, no pressure cleaning and steam cleaning should be done in areas designated as wellhead protection areas for public water supply.

### ***Disposal***

- Consider filtering and recycling wash water.

# Vehicle and Equipment Cleaning **SC-21**

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- Discharge equipment wash water to the sanitary sewer, a holding tank, or a process treatment system, regardless of the washing method used.
- Discharge vehicle wash water to (1) the sanitary sewer, a holding tank, or process treatment system or (2) an enclosed recycling system.
- Discharge wash water to sanitary sewer only after contacting the local sewer authority to find out if pretreatment is required.

## ***Training***

- Train employees on proper cleaning and wash water disposal procedures and conduct "refresher" courses on a regular basis.
- Train staff on proper maintenance measures for the wash area.
- Train employees and contractors on proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.

## ***Spill Response and Prevention***

- Refer to SC-11, Spill Prevention, Control and Cleanup.
- Keep your Spill Prevention Control and Counter Measure (SPCC) Plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Clean up spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

## ***Other Considerations (Limitations and Regulations)***

- Some municipalities may require pretreatment and monitoring of wash water discharges to the sanitary sewer.
- Steam cleaning can generate significant pollutant concentrations requiring that careful consideration be given to the environmental impacts and compliance issues related to steam cleaning.
- Most car washing best management practices are inexpensive, and rely more on good housekeeping practices (where vehicles are washed, planning for the collection of wash water) than on expensive technology. However, the construction of a specialized area for vehicle washing can be expensive for municipal facilities. Also, for facilities that cannot recycle their wash water the cost of pre-treating wash water through either structural practices or planning for collection and hauling of contaminated water to sewage treatment plants can represent a cost limitation.

## **Requirements**

### ***Costs***

- Capital costs vary depending on measures implemented



# **SC-21      Vehicle and Equipment Cleaning**

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- Low cost (\$500-1,000) for berm construction,
  - Medium cost (\$5,000-20,000) for plumbing modifications (including re-routing discharge to sanitary sewer and installing simple sump).
  - High cost (\$30,000-150,000) for on-site treatment and recycling.
- O&M costs increase with increasing capital investment.

## **Maintenance**

- Berm repair and patching.
- Sweep washing areas frequently to remove solid debris.
- Inspect and maintain sumps, oil/water separators, and on-site treatment/recycling units.

## **Supplemental Information**

### **Design Considerations**

#### *Designated Cleaning Areas*

- Washing operations outside should be conducted in a designated wash area having the following characteristics:
  - Paved with Portland cement concrete,
  - Covered and bermed to prevent contact with stormwater and contain wash water,
  - Sloped for wash water collection,
  - Equipped with an oil/water separator, if necessary.

## **Examples**

The City of Palo Alto has an effective program for commercial vehicle service facilities. Many of the program's elements, including specific BMP guidance and lists of equipment suppliers, are applicable to industrial vehicle service facilities.

The U.S. Postal Service in West Sacramento has a new vehicle wash system that collects, filters, and recycles the wash water.

## **References and Resources**

<http://www.stormwatercenter.net/>

King County - <ftp://dnr.metrokc.gov/wlr/dss/spcm/Chapter%203.PDF>

Orange County Stormwater Program

[http://www.ocwatersheds.com/StormWater/swp\\_introduction.asp](http://www.ocwatersheds.com/StormWater/swp_introduction.asp)

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)

<http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf>



Photo Credit: Geoff Brosseau

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Description

Vehicle or equipment maintenance and repair is potentially a significant source of stormwater pollution, due to the use of materials and wastes created that are harmful to humans and the environment. Engine repair and service (e.g. parts cleaning), replacement of fluids (e.g. oil change), and outdoor equipment storage and parking (dripping engines) can impact water quality if stormwater runoff from areas with these activities occurring on them becomes polluted by a variety of contaminants. Implementation of the following activities will prevent or reduce the discharge of pollutants to stormwater from vehicle and equipment maintenance and repair activities.

## Approach

### Pollution Prevention

- Keep accurate maintenance logs to evaluate materials use.
- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Minimize use of solvents. Clean parts without using solvents whenever possible.
- Keep an accurate, up-to-date inventory of materials.
- Recycle used motor oil, diesel oil, and other vehicle fluids and parts whenever possible.

## Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	

## Suggested Protocols



*General*

- Move maintenance and repair activities indoors whenever feasible.
- Store idle equipment containing fluids under cover.
- Use a vehicle maintenance area designed to prevent stormwater pollution - minimize contact of stormwater with outside operations through berming and appropriate drainage routing.
- Avoid hosing down your work areas. If work areas are washed, collect and direct wash water to sanitary sewer.
- Paint signs on storm drain inlets to indicate that they are not to receive liquid or solid wastes.
- Post signs at sinks to remind employees, not to pour hazardous wastes down drains.
- Clean yard storm drain inlets(s) regularly.
- Do not pour materials down drains or hose down work areas; use dry sweeping.
- Cover the work area so as to limit exposure to the rain
- Place curbs around the immediate boundaries of the process equipment.
- Build a shed or temporary roof over areas where you park cars awaiting repair or salvage, especially if you handle wrecked vehicles. Build a roof over vehicles you keep for parts.

*Material and Waste Handling*

- Store materials and wastes under cover whenever possible.
- Designate a special area to drain and replace motor oil, coolant, and other fluids. This area should not have any connections to the storm drain or the sanitary sewer and should allow for easy clean up of drips and spills.
- Drain all fluids from wrecked vehicles immediately. Ensure that the drain pan or drip pan is large enough to contain drained fluids (e.g. larger pans are needed to contain antifreeze, which may gush from some vehicles).
- Do not pour liquid waste to floor drains, sinks, outdoor storm drain inlets, or other storm drains or sewer connections.
- Do not dispose of used or leftover cleaning solutions, solvents, and automotive fluids and oil in the sanitary sewer.
- Dispose of all waste materials according to applicable laws and regulations.
- Collect leaking or dripping fluids in drip pans or containers. Fluids are easier to recycle if kept separate.

- Promptly transfer used fluids to the proper waste or recycling drums and store in an appropriately designed area that can contain spills. Don't leave drip pans or other open containers lying around.
- Do not dispose of oil filters in trash cans or dumpsters, which may leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Most municipalities prohibit or discourage disposal of these items in solid waste facilities. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.
- Store cracked and/or dead batteries in a non-leaking covered secondary container and dispose of properly at recycling or household hazardous waste facilities..

## *Maintenance and Repair Activities*

- Provide a designated area for vehicle maintenance.
- Keep equipment clean, don't allow excessive build-up of oil and grease.
- If temporary work is being conducted outside: Use a tarp, ground cloth, or drip pans beneath the vehicle or equipment to capture all spills and drips., The collected drips and spills must be disposed, reused, or recycled properly.
- If possible, perform all vehicle fluid removal or changing inside or under cover to prevent the runoff of stormwater and the runoff of spills:
  - Keep a drip pan under the vehicle while you unclip hoses, unscrew filters, or remove other parts. Use a drip pan under any vehicle that might leak while you work on it to keep splatters or drips off the shop floor.
  - Promptly transfer used fluids to the proper waste or recycling drums. Don't leave drip pans or other open containers lying around.
  - Keep drip pans or containers under vehicles or equipment that might drip during repairs.
  - Do not change motor oil or perform equipment maintenance in non-appropriate areas.
- If equipment (e.g., radiators, axles) is to be stored outdoors, oil and other fluids should be drained first. This is also applicable to vehicles being stored and not used on a regular basis.
- Monitor parked vehicles closely for leaks and place pans under any leaks to collect the fluids for proper disposal or recycling.

## *Parts Cleaning*

- Clean vehicle parts without using liquid cleaners wherever possible to reduce waste.
- Do all liquid cleaning at a centralized station so the solvents and residues stay in one area.

- Discharge wastewater generated from steam cleaning and pressure washing to an appropriate treatment control that is connected to a blind sump. Non-caustic detergents should be used instead of caustic cleaning agents, detergent-based or water-based cleaning systems in place of organic solvent degreasers, and non-chlorinated solvent in place of chlorinated organic solvents for parts cleaning. Refer to SC-21 for more information on steam cleaning.
- Locate drip pans, drain boards, and drying racks to direct drips back into a solvent sink or fluid holding tank for reuse.

### *Inspection*

- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- Make sure incoming vehicles are checked for leaking oil and fluids. Apply controls accordingly.

### *Training*

- Train employees and contractors in the proper handling and disposal of engine fluids and waste materials.
- Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures (You can use reusable cloth rags to clean up small drips and spills instead of disposables; these can be washed by a permitted industrial laundry. Do not clean them at home or at a coin-operated laundry business). The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.
- Use a training log or similar method to document training.

### *Spill Response and Prevention*

- Refer to SC-11 Spill Prevention, Control & Cleanup for more information.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date, and implement accordingly.
- Place adequate stockpiles of spill cleanup materials where they are readily accessible.
- Clean leaks, drips, and other spills with as little water as possible. Use rags for small spills, a damp mop for general cleanup, and dry absorbent material for larger spills. Use the following three-step method for cleaning floors:
  - Clean spills with rags or other absorbent materials
  - Sweep floor using dry absorbent material
  - Mop the floor. Mop water may be discharged to the sanitary sewer via a toilet or sink.
- Remove absorbent materials used for cleaning small spills promptly and properly.
- Do not saturate rags or absorbent material to eliminate need for disposal of spilled material as hazardous waste.

## ***Other Considerations***

- Space and time limitations may preclude all work being conducted indoors.
- It may not be possible to contain and clean up spills from vehicles/equipment brought onsite after working hours.
- Drain pans (usually 1 ft. x 1 ft.) are generally too small to contain antifreeze, so drip pans (3 ft. x 3 ft.) may have to be purchased or fabricated.
- Identification of engine leaks may require some use of solvents, which may require disposal as hazardous waste.
- Installation of structural treatment practices for pretreatment controls of wastewater discharges can be expensive.
- Prices for recycled materials and fluids may be higher than those of non-recycled materials.
- Some facilities can be limited by a lack of providers of recycled materials, and by the absence of businesses to provide services such as hazardous waste removal, structural treatment practice maintenance or solvent equipment and solvent recycling.

## **Requirements**

### ***Costs***

- Should be low, but will vary depending on the size of the facility.

### ***Maintenance***

- Sweep the maintenance area weekly, if it is paved, to collect loose particles, and wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

## **Supplemental Information**

### ***Further Detail of the BMP***

#### ***Recycling***

Separating wastes allows for easier recycling and may reduce treatment costs. Keep hazardous and non-hazardous wastes separate, do not mix used oil and solvents, and keep chlorinated solvents (e.g., 1,1,1-trichloroethane) separate from non-chlorinated solvents (e.g., kerosene and mineral spirits).

Many products made of recycled (i.e., refined or purified) materials are available. Engine oil, transmission fluid, antifreeze, and hydraulic fluid are available in recycled form. Buying recycled products supports the market for recycled materials.

- Recycling is always preferable to disposal of unwanted materials.
- Separate wastes for easier recycling. Keep hazardous and non-hazardous wastes separate, do not mix used oil and solvents, and keep chlorinated solvents separate from non-chlorinated solvents.
- Label and track the recycling of waste material (e.g. used oil, spent solvents, batteries).

- Purchase recycled products to support the market for recycled materials.

#### *Safer Alternatives*

If possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous material:

- Use non-caustic detergents instead of caustic cleaning for parts cleaning.
- Use detergent-based or water-based cleaning systems in place of organic solvent degreasers. Wash water may require treatment before it can be discharged to the sewer.
- Replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check list of active ingredients to see whether it contains chlorinated solvents.
- Choose cleaning agents that can be recycled.
- Refer to SC-61 Safer Alternative Products fact sheet for more information.

#### **References and Resources**

DTSC Doc. No. 619a Switching to Water Based Cleaners

DTSC Doc. No. 621 <http://www.stormwatercenter.net/>

King County - <ftp://dnr.metrokc.gov/wlr/dss/spcm/Chapter%203.PDF>

Model Urban Runoff Program: A How-To-Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July 1998 (Revised February 2002 by the California Coastal Commission).

Orange County Stormwater Program

[http://www.ocwatersheds.com/StormWater/swp\\_introduction.asp](http://www.ocwatersheds.com/StormWater/swp_introduction.asp)

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP) -

<http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf>



## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Description

The loading/unloading of materials usually takes place outside on docks or terminals; therefore, materials spilled, leaked, or lost during loading/unloading may collect in the soil or on other surfaces and have the potential to be carried away by stormwater runoff or when the area is cleaned. Additionally, rainfall may wash pollutants from machinery used to unload or move materials. Loading and unloading of material may include package products, barrels, and bulk products. Implementation of the following protocols will prevent or reduce the discharge of pollutants to stormwater from outdoor loading/unloading of materials.

## Approach

### Pollution Prevention

- Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Park tank trucks or delivery vehicles in designated areas so that spills or leaks can be contained.
- Limit exposure of materials with the potential to contaminate stormwater.
- Prevent stormwater runoff.
- Regularly check equipment for leaks.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>





***Suggested Protocols******Loading and Unloading – General Guidelines***

- Develop an operations plan that describes procedures for loading and/or unloading.
- Do not conduct loading and unloading during wet weather, whenever possible.
- Cover designated loading/unloading areas to reduce exposure of materials to rain.
- A seal or door skirt between delivery vehicles and building can reduce or prevent exposure to rain.
- Design loading/unloading area to prevent stormwater runoff which would include grading or berming the area, and positioning roof downspouts so they direct stormwater away from the loading/unloading areas.
- If feasible, load and unload all materials and equipment in covered areas such as building overhangs at loading docks.
- Load/unload only at designated loading areas.
- Use drip pans underneath hose and pipe connections and other leak-prone spots during liquid transfer operations, and when making and breaking connections. Several drip pans should be stored in a covered location near the liquid transfer area so that they are always available, yet protected from precipitation when not in use. Drip pans can be made specifically for railroad tracks. Drip pans must be cleaned periodically, and drip collected materials must be disposed of properly.
- Pave loading areas with concrete instead of asphalt.
- Avoid placing storm drains in the area.
- Grade and/or berm the loading/unloading area to a drain that is connected to a dead-end sump.

***Inspection***

- Check loading and unloading equipment regularly for leaks, including valves, pumps, flanges and connections.
- Look for dust or fumes during loading or unloading operations.

***Training***

- Train employees (e.g. fork lift operators) and contractors on proper spill containment and cleanup.
- Employees trained in spill containment and cleanup should be present during the loading/unloading.
- Train employees in proper handling techniques during liquid transfers to avoid spills.

- Make sure forklift operators are properly trained on loading and unloading procedures.

## ***Spill Response and Prevention***

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Keep your spill prevention Control and countermeasure (SPCC) Plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

## ***Other Considerations***

- Space, material characteristics and/or time limitations may preclude all transfers from being performed indoors or under cover.

## **Requirements**

### ***Costs***

- Should be low except when covering a large loading/unloading area.

### ***Maintenance***

- Conduct regular inspections and make repairs as necessary. The frequency of repairs will depend on the age of the facility.
- Check loading and unloading equipment regularly for leaks.
- Regular broom dry-sweeping of area.
- Conduct major clean-out of loading and unloading area and sump prior to October 1 of each year.

## **Supplemental Information**

### ***Further Detail of the BMP***

#### ***Special Circumstances for Indoor Loading/Unloading of Materials***

As appropriate loading or unloading of liquids should occur indoors so that any spills that are not completely retained can be discharged to the sanitary sewer, treatment plant, or treated in a manner consistent with local sewer authorities and permit requirements.

- For loading and unloading tank trucks to above and below ground storage tanks, the following procedures should be used:
  - The area where the transfer takes place should be paved. If the liquid is reactive with the asphalt, Portland cement should be used to pave the area.
  - Transfer area should be designed to prevent runoff of stormwater from adjacent areas. Sloping the pad and using a curb, like a speed bump, around the uphill side of the transfer area should reduce run-on.

- Transfer area should be designed to prevent runoff of spilled liquids from the area. Sloping the area to a drain should prevent runoff. The drain should be connected to a dead-end sump or to the sanitary sewer (if allowed). A positive control valve should be installed on the drain.
- For transfer from rail cars to storage tanks that must occur outside, use the following procedures:
  - Drip pans should be placed at locations where spillage may occur, such as hose connections, hose reels, and filler nozzles. Use drip pans when making and breaking connections.
  - Drip pan systems should be installed between the rails to collect spillage from tank cars.

**References and Resources**

<http://www.stormwatercenter.net/>

King County - <ftp://dnr.metrokc.gov/wlr/dss/spcm/Chapter%203.PDF>

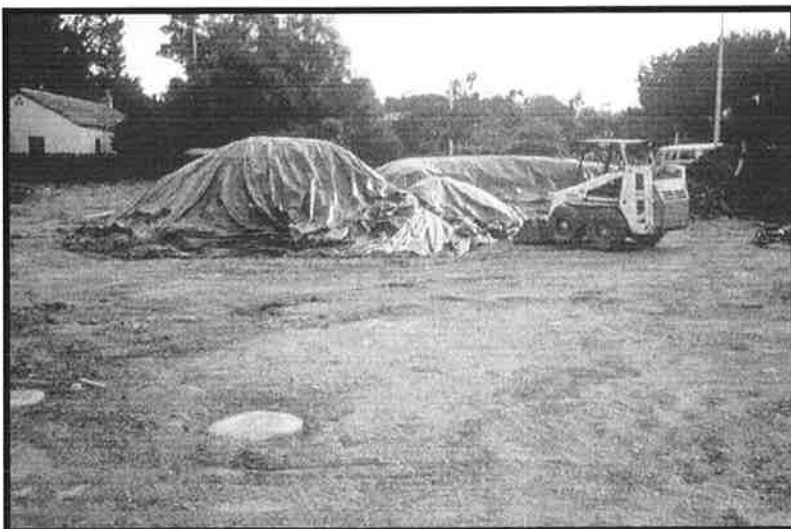
Orange County Stormwater Program

[http://www.ocwatersheds.com/StormWater/swp\\_introduction.asp](http://www.ocwatersheds.com/StormWater/swp_introduction.asp)

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP) -

<http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf>

# Outdoor Storage of Raw Materials SC-33



## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

## Description

Raw materials, by-products, finished products, containers, and material storage areas exposed to rain and/or runoff can pollute stormwater. Stormwater can become contaminated when materials wash off or dissolve into water or are added to runoff by spills and leaks. Improper storage of these materials can result in accidental spills and the release of materials. To prevent or reduce the discharge of pollutants to stormwater from material delivery and storage, pollution prevention and source control measures, such as minimizing the storage of hazardous materials on-site, enclosing or covering materials, storing materials in a designated area, installing secondary containment, conducting regular inspections, preventing stormwater runoff and runoff, and training employees and subcontractors must be implemented.

## Approach

### Pollution Prevention

- Employee education is paramount for successful BMP implementation.
- Minimize inventory of raw materials.
- Keep an accurate, up-to-date inventory of the materials delivered and stored on-site.
- Try to keep chemicals in their original containers, and keep them well labeled.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>



# SC-33 Outdoor Storage of Raw Materials

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## *Suggested Protocols*

### *General*

- Store all materials inside. If this is not feasible, then all outside storage areas should be covered with a roof, and bermed, or enclosed to prevent stormwater contact. At the very minimum, a temporary waterproof covering made of polyethylene, polypropylene or hypalon should be used over all materials stored outside.
- Cover and contain the stockpiles of raw materials to prevent stormwater from running into the covered piles. The covers must be in place at all times when work with the stockpiles is not occurring. (applicable to small stockpiles only).
- If the stockpiles are so large that they cannot feasibly be covered and contained, implement erosion control practices at the perimeter of your site and at any catch basins to prevent erosion of the stockpiled material off site,
- Keep liquids in a designated area on a paved impervious surface within a secondary containment.
- Keep outdoor storage containers in good condition.
- Keep storage areas clean and dry.
- Design paved areas to be sloped in a manner that minimizes the pooling of water on the site, particularly with materials that may leach pollutants into stormwater and/or groundwater, such as compost, logs, and wood chips. A minimum slope of 1.5 percent is recommended.
- Secure drums stored in an area where unauthorized persons may gain access to prevent accidental spillage, pilferage, or any unauthorized use.
- Cover wood products treated with chromated copper arsenate, ammonical copper zinc arsenate, creosote, or pentachlorophenol with tarps or store indoors.

### *Raw Material Containment*

- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items in secondary containers if applicable.
- Prevent the run-on of uncontaminated stormwater from adjacent areas as well as runoff of stormwater from the stockpile areas, by placing a curb along the perimeter of the area. The area inside the curb should slope to a drain. Liquids should be drained to the sanitary sewer if allowed. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Tanks should be bermed or surrounded by a secondary containment system.
- Release accumulated stormwater in petroleum storage areas prior to the next storm. At a minimum, water should pass through an oil/water separator and, if allowed, discharged to a sanitary sewer.

# Outdoor Storage of Raw Materials SC-33

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## *Inspection*

- Conduct regular inspections of storage areas so that leaks and spills are detected as soon as possible.
- Conduct routine inspections and check for external corrosion of material containers. Also check for structural failure, spills and overfills due to operator error, failure of piping system.
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.
- Visually inspect new tank or container installations for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.

## *Training*

- Employees should be well trained in proper material storage.
- Train employees and contractors in proper techniques for spill containment and cleanup.

## *Spill Response and Prevention*

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.
- Have employees trained in spill containment and cleanup present during loading/unloading of dangerous waste, liquid chemicals and other potentially hazardous materials.

## *Other Considerations*

- Storage sheds often must meet building and fire code requirements. Storage of reactive, ignitable, or flammable liquids must comply with the Uniform Fire Code and the National Electric Code.
- Space limitations may preclude storing some materials indoors.
- Some municipalities require that secondary containment areas (regardless of size) be connected to the sanitary sewer, prohibiting any hard connections to the storm drain. Storage sheds often must meet building and fire code requirements.
- The local fire district must be consulted for limitations on clearance of roof covers over containers used to store flammable materials.

# SC-33 Outdoor Storage of Raw Materials

## Requirements

### Costs

- Costs will vary depending on the size of the facility and the necessary controls. They should be low except where large areas may have to be covered.

### Maintenance

- Accurate and up-to-date inventories should be kept of all stored materials.
- Berms and curbs may require periodic repair and patching.
- Parking lots or other surfaces near bulk materials storage areas should be swept periodically to remove debris blown or washed from storage area.
- Sweep paved storage areas regularly for collection and disposal of loose solid materials, do not hose down the area to a storm drain or conveyance ditch.
- Keep outdoor storage areas in good condition (e.g. repair roofs, floors, etc. to limit releases to runoff).

## Supplemental Information

### Further Detail of the BMP

#### Raw Material Containment

Paved areas should be sloped in a manner that minimize the pooling of water on the site, particularly with materials that may leach pollutants into stormwater and/or groundwater, such as compost, logs, and wood chips. A minimum slope of 1.5 percent is recommended.

- Curbing should be placed along the perimeter of the area to prevent the runoff of uncontaminated stormwater from adjacent areas as well as runoff of stormwater from the stockpile areas.
- The storm drainage system should be designed to minimize the use of catch basins in the interior of the area as they tend to rapidly fill with manufacturing material.
- The area should be sloped to drain stormwater to the perimeter where it can be collected or to internal drainage alleyways where material is not stockpiled.
- If the raw material, by-product, or product is a liquid, more information for outside storage of liquids can be found under SC-31, Outdoor Container Storage.

### Examples

The "doghouse" design has been used to store small liquid containers. The roof and flooring design prevent contact with direct rain or runoff. The doghouse has two solid structural walls and two canvas covered walls. The flooring is wire mesh about secondary containment. The unit has been used successively at Lockheed Missile and Space Company in Sunnyvale.

## References and Resources

King County Stormwater Pollution Control Manual - <http://dnr.metrokc.gov/wlr/dss/spcm.htm>

# **Outdoor Storage of Raw Materials SC-33**

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Model Urban Runoff Program: A How-To-Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July 1998 (Revised February 2002 by the California Coastal Commission).

Orange County Stormwater Program

[http://www.ocwatersheds.com/StormWater/swp\\_introduction.asp](http://www.ocwatersheds.com/StormWater/swp_introduction.asp)

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)

<http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf>





## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>

## Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, and abnormal pH. Utilizing the following protocols will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

## Approach

### Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.
- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.



# **SC-41      Building & Grounds Maintenance**

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## ***Suggested Protocols***

### *Pressure Washing of Buildings, Rooftops, and Other Large Objects*

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a waste water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash water runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement. Ensure that this practice does not kill grass.

### *Landscaping Activities*

- Do not apply any chemicals (insecticide, herbicide, or fertilizer) directly to surface waters, unless the application is approved and permitted by the state.
- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.
- Check irrigation schedules so pesticides will not be washed away and to minimize non-stormwater discharge.

### *Building Repair, Remodeling, and Construction*

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paint brushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.

# Building & Grounds Maintenance SC-41

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- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.
- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. In which case you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover with secondary containment during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

## *Mowing, Trimming, and Planting*

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water; do not put it in the storm drain, pour over landscaped areas.
- Use hand or mechanical weeding where practical.

## *Fertilizer and Pesticide Management*

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Follow manufacturers' recommendations and label directions. Pesticides must never be applied if precipitation is occurring or predicted. Do not apply insecticides within 100 feet of surface waters such as lakes, ponds, wetlands, and streams.
- Use less toxic pesticides that will do the job, whenever possible. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.

## **SC-41      Building & Grounds Maintenance**

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- Apply pesticides only when wind speeds are low.
- Work fertilizers into the soil rather than dumping or broadcasting them onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.
- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

### *Inspection*

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.

### *Training*

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

### *Spill Response and Prevention*

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

### *Other Considerations*

- Alternative pest/weed controls may not be available, suitable, or effective in many cases.

## Requirements

### Costs

- Overall costs should be low in comparison to other BMPs.

### Maintenance

- Sweep paved areas regularly to collect loose particles, and wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

## Supplemental Information

### Further Detail of the BMP

#### *Fire Sprinkler Line Flushing*

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping but it is subject to rusting and results in lower quality water. Initially the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, polyphosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time, typically a year, between flushes and may accumulate iron, manganese, lead, copper, nickel and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

## References and Resources

California's Nonpoint Source Program Plan <http://www.swrcb.ca.gov/nps/index.html>

King County - <ftp://dnr.metrokc.gov/wlr/dss/spcm/Chapter%203.PDF>

Orange County Stormwater Program

[http://www.ocwatersheds.com/StormWater/swp\\_introduction.asp](http://www.ocwatersheds.com/StormWater/swp_introduction.asp)

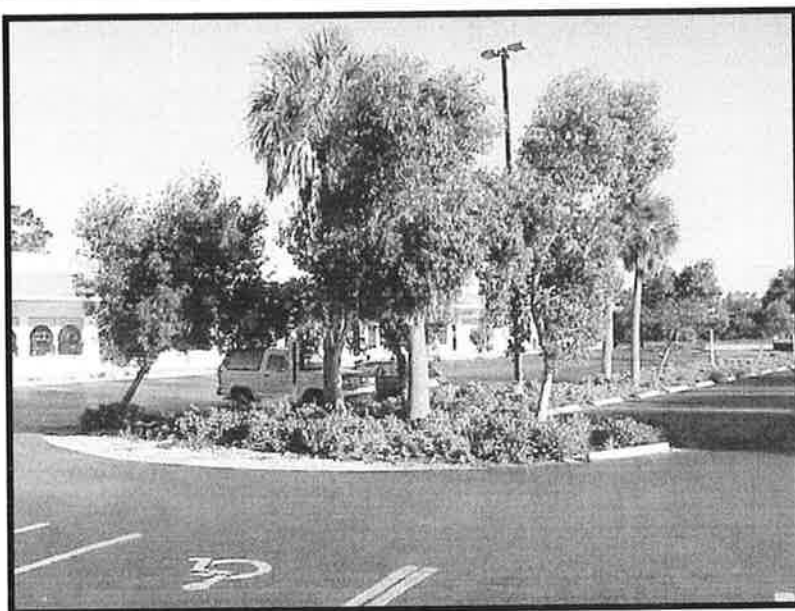
Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASSMA) <http://www.basmaa.org/>

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA) <http://www.basmaa.org/>

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP) -

<http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf>

# Parking/Storage Area Maintenance SC-43



## Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The following protocols are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

## Approach

### Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook).
- Keep accurate maintenance logs to evaluate BMP implementation.

### Suggested Protocols

#### General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>



## **SC-43 Parking/Storage Area Maintenance**

- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.

### *Controlling Litter*

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel and dispose of litter in the trash.

### *Surface cleaning*

- Use dry cleaning methods (e.g. sweeping or vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- If water is used follow the procedures below:
  - Block the storm drain or contain runoff.
  - Wash water should be collected and pumped to the sanitary sewer or discharged to a pervious surface, do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- When cleaning heavy oily deposits:
  - Use absorbent materials on oily spots prior to sweeping or washing.
  - Dispose of used absorbents appropriately.

### *Surface Repair*

- Pre-heat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc., where applicable. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.

# **Parking/Storage Area Maintenance SC-43**

- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

## ***Inspection***

- Have designated personnel conduct inspections of the parking facilities and stormwater conveyance systems associated with them on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

## ***Training***

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

## ***Spill Response and Prevention***

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

## ***Other Considerations***

- Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

## ***Requirements***

### ***Costs***

Cleaning/sweeping costs can be quite large, construction and maintenance of stormwater structural controls can be quite expensive as well.

### ***Maintenance***

- Sweep parking lot to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities on a regular basis to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.



# **SC-43 Parking/Storage Area Maintenance**

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## **Supplemental Information**

### ***Further Detail of the BMP***

#### ***Surface Repair***

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Use only as much water as necessary for dust control, to avoid runoff.

## **References and Resources**

<http://www.stormwatercenter.net/>

California's Nonpoint Source Program Plan <http://www.swrcb.ca.gov/nps/index.html>

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality control Board. July 1998 (Revised February 2002 by the California Coastal Commission).

Orange County Stormwater Program

[http://www.ocwatersheds.com/StormWater/swp\\_introduction.asp](http://www.ocwatersheds.com/StormWater/swp_introduction.asp)

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA) <http://www.basma.org>

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)

<http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf>

## Descriptions

Promote the use of less harmful products. Alternatives exist for most product classes including chemical fertilizers, pesticides, cleaning solutions, janitorial chemicals, automotive and paint products, and consumables (batteries, fluorescent lamps).

## Approach

Develop a comprehensive program based on:

- The "Precautionary Principle," which is an alternative to the "Risk Assessment" model that says it's acceptable to use a potentially harmful product until physical evidence of its harmful effects are established and deemed too costly from an environmental or public health perspective. For instance, a risk assessment approach might say it's acceptable to use a pesticide until there is direct proof of an environmental impact. The Precautionary Principle approach is used to evaluate whether a given product is safe, whether it is really necessary, and whether alternative products would perform just as well.
- Environmentally Preferable Purchasing Program to minimize the purchase of products containing hazardous ingredients used in the facility's custodial services, fleet maintenance, and facility maintenance in favor of using alternate products that pose less risk to employees and to the environment.
- Integrated Pest Management (IPM) or Less-Toxic Pesticide Program, which uses a pest management approach that minimizes the use of toxic chemicals and gets rid of pests by methods that pose a lower risk to employees, the public, and the environment.
- Energy Efficiency Program including no-cost and low-cost energy conservation and efficiency actions that can reduce both energy consumption and electricity bills, along with long-term energy efficiency investments.

Consider the following mechanisms for developing and implementing a comprehensive program:

- Policies
- Procedures
  - Standard operating procedures (SOPs)
  - Purchasing guidelines and procedures

## Objectives

- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

Sediment	
Nutrients	☑
Trash	
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑
Oxygen Demanding	



- Bid packages (services and supplies)
- Materials
  - Preferred or approved product and supplier lists
  - Product and supplier evaluation criteria
  - Training sessions and manuals
  - Fact sheets for employees

***Training***

- Employees who handle potentially harmful materials in the use of safer alternatives.
- Purchasing departments should be encouraged to procure less hazardous materials and products that contain little or no harmful substances or TMDL pollutants.

***Regulations***

This BMP has no regulatory requirements. Existing regulations already encourage facilities to reduce the use of hazardous materials through incentives such as reduced:

- Specialized equipment storage and handling requirements,
- Stormwater runoff sampling requirements,
- Training and licensing requirements, and
- Record keeping and reporting requirements.

***Equipment***

- There are no major equipment requirements to this BMP.

***Limitations***

- Alternative products may not be available, suitable, or effective in every case.

**Requirements*****Costs***

- The primary cost is for staff time to: 1) develop new policies and procedures and 2) educate purchasing departments and employees who handle potentially harmful materials about the availability, procurement, and use of safer alternatives.
- Some alternative products may be slightly more expensive than conventional products.

**Supplemental Information**

Employees and contractors / service providers can both be educated about safer alternatives by using information developed by a number of organizations including the references and resources listed below.

The following discussion provides some general information on safer alternatives. More specific information on particular hazardous materials and the available alternatives may be found in the references and resources listed below.

- Automotive products – Less toxic alternatives are not available for many automotive products, especially engine fluids. But there are alternatives to grease lubricants, car polishes, degreasers, and windshield washer solution. Refined motor oil is also available.
- Vehicle/Trailer lubrication – Fifth wheel bearings on trucks require routine lubrication. Adhesive lubricants are available to replace typical chassis grease.
- Cleaners – Vegetables-based or citrus-based soaps are available to replace petroleum-based soaps/detergents.
- Paint products – Water-based paints, wood preservatives, stains, and finishes are available.
- Pesticides – Specific alternative products or methods exist to control most insects, fungi, and weeds.
- Chemical Fertilizers – Compost and soil amendments are natural alternatives.
- Consumables – Manufacturers have either reduced or are in the process of reducing the amount of heavy metals in consumables such as batteries and fluorescent lamps. All fluorescent lamps contain mercury, however low-mercury containing lamps are now available from most hardware and lighting stores. Fluorescent lamps are also more energy efficient than the average incandescent lamp.
- Janitorial chemicals – Even biodegradable soap can harm fish and wildlife before it biodegrades. Biodegradable does not mean non-toxic. Safer products and procedures are available for floor stripping and cleaning, as well as carpet, glass, metal, and restroom cleaning and disinfecting.

## **Examples**

There are a number of business and trade associations, and communities with effective programs. Some of the more prominent are listed below in the references and resources section.

## **References and Resources**

Note: Many of these references provide alternative products for materials that typically are used inside and disposed to the sanitary sewer as well as alternatives to products that usually end up in the storm drain.

### ***General Sustainable Practices and Pollution Prevention Including Pollutant-Specific Information***

California Department of Toxic Substances Control ([www.dtsc.ca.gov](http://www.dtsc.ca.gov))

California Integrated Waste Management Board ([www.ciwmb.ca.gov](http://www.ciwmb.ca.gov))

City of Santa Monica ([www.santa-monica.org/environment](http://www.santa-monica.org/environment))

City of Palo Alto ([www.city.palo-alto.ca.us/cleanbay](http://www.city.palo-alto.ca.us/cleanbay))

City and County of San Francisco, Department of the Environment  
([www.ci.sf.ca.us/sfenvironment](http://www.ci.sf.ca.us/sfenvironment))

Earth 911 ([www.earth911.org/master.asp](http://www.earth911.org/master.asp))

Environmental Finance Center Region IX ([www.greenstart.org/efc9](http://www.greenstart.org/efc9))

Flex Your Power ([www.flexyourpower.ca.gov](http://www.flexyourpower.ca.gov))

GreenBiz.com ([www.greenbiz.com](http://www.greenbiz.com))

Green Business Program ([www.abag.org/bayarea/enviro/gbus/gb.html](http://www.abag.org/bayarea/enviro/gbus/gb.html))

Pacific Industrial and Business Association ([www.piba.org](http://www.piba.org))

Sacramento Clean Water Business Partners ([www.sacstormwater.org](http://www.sacstormwater.org))

USEPA BMP fact sheet – Alternative products  
([http://cfpub.epa.gov/npdes/stormwater/menuofbmps/poll\\_2.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/poll_2.cfm))

USEPA Region IX Pollution Prevention Program ([www.epa.gov/region09/p2](http://www.epa.gov/region09/p2))

Western Regional Pollution Prevention Network ([www.westp2net.org](http://www.westp2net.org))

***Metals (mercury, copper)***

National Electrical Manufacturers Association - Environment, Health and Safety  
([www.nema.org](http://www.nema.org))

Sustainable Conservation ([www.suscon.org](http://www.suscon.org))

Auto Recycling Project

Brake Pad Partnership

***Pesticides and Chemical Fertilizers***

Bio-Integral Resource Center ([www.birc.org](http://www.birc.org))

California Department of Pesticide Regulation ([www.cdpr.ca.gov](http://www.cdpr.ca.gov))

University of California Statewide IPM Program ([www.ipm.ucdavis.edu/default.html](http://www.ipm.ucdavis.edu/default.html))

***Dioxins***

Bay Area Dioxins Project (<http://dioxin.abag.ca.gov/>)



## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>

## Description

Streets, roads, and highways are significant sources of pollutants in stormwater discharges, and operation and maintenance (O&M) practices, if not conducted properly, can contribute to the problem. Stormwater pollution from roadway and bridge maintenance should be addressed on a site-specific basis. Use of the procedures outlined below, that address street sweeping and repair, bridge and structure maintenance, and unpaved roads will reduce pollutants in stormwater.

## Approach

### Pollution Prevention

- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal)
- Recycle paint and other materials whenever possible.
- Enlist the help of citizens to keep yard waste, used oil, and other wastes out of the gutter.

### Suggested Protocols

#### Street Sweeping and Cleaning

- Maintain a consistent sweeping schedule. Provide minimum monthly sweeping of curbed streets.
- Perform street cleaning during dry weather if possible.



- Avoid wet cleaning or flushing of street, and utilize dry methods where possible.
- Consider increasing sweeping frequency based on factors such as traffic volume, land use, field observations of sediment and trash accumulation, proximity to water courses, etc. For example:
  - Increase the sweeping frequency for streets with high pollutant loadings, especially in high traffic and industrial areas.
  - Increase the sweeping frequency just before the wet season to remove sediments accumulated during the summer.
  - Increase the sweeping frequency for streets in special problem areas such as special events, high litter or erosion zones.
- Maintain cleaning equipment in good working condition and purchase replacement equipment as needed. Old sweepers should be replaced with new technologically advanced sweepers (preferably regenerative air sweepers) that maximize pollutant removal.
- Operate sweepers at manufacturer requested optimal speed levels to increase effectiveness.
- To increase sweeping effectiveness consider the following:
  - Institute a parking policy to restrict parking in problematic areas during periods of street sweeping.
  - Post permanent street sweeping signs in problematic areas; use temporary signs if installation of permanent signs is not possible.
  - Develop and distribute flyers notifying residents of street sweeping schedules.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- If available use vacuum or regenerative air sweepers in the high sediment and trash areas (typically industrial/commercial).
- Keep accurate logs of the number of curb-miles swept and the amount of waste collected.
- Dispose of street sweeping debris and dirt at a landfill.
- Do not store swept material along the side of the street or near a storm drain inlet.
- Keep debris storage to a minimum during the wet season or make sure debris piles are contained (e.g. by berming the area) or covered (e.g. with tarps or permanent covers).

#### *Street Repair and Maintenance*

##### *Pavement marking*

- Schedule pavement marking activities for dry weather.

- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.
- Provide drop cloths and drip pans in paint mixing areas.
- Properly maintain application equipment.
- Street sweep thermoplastic grindings. Yellow thermoplastic grindings may require special handling as they may contain lead.
- Paints containing lead or tributyltin are considered a hazardous waste and must be disposed of properly.
- Use water based paints whenever possible. If using water based paints, clean the application equipment in a sink that is connected to the sanitary sewer.
- Properly store leftover paints if they are to be kept for the next job, or dispose of properly.

## *Concrete installation and repair*

- Schedule asphalt and concrete activities for dry weather.
- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place sand bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- When making saw cuts in pavement, use as little water as possible and perform during dry weather. Cover each storm drain inlet completely with filter fabric or plastic during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site. Alternatively, a small onsite vacuum may be used to pick up the slurry as this will prohibit slurry from reaching storm drain inlets.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.



*Patching, resurfacing, and surface sealing*

- Schedule patching, resurfacing and surface sealing for dry weather.
- Stockpile materials away from streets, gutter areas, storm drain inlets or watercourses. During wet weather, cover stockpiles with plastic tarps or berm around them if necessary to prevent transport of materials in runoff.
- Pre-heat, transfer or load hot bituminous material away from drainage systems or watercourses.
- Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and maintenance holes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from covered maintenance holes and storm drain inlets when the job is complete.
- Prevent excess material from exposed aggregate concrete or similar treatments from entering streets or storm drain inlets. Designate an area for clean up and proper disposal of excess materials.
- Use only as much water as necessary for dust control, to avoid runoff.
- Sweep, never hose down streets to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

*Equipment cleaning maintenance and storage*

- Inspect equipment daily and repair any leaks. Place drip pans or absorbent materials under heavy equipment when not in use.
- Perform major equipment repairs at the corporation yard, when practical.
- If refueling or repairing vehicles and equipment must be done onsite, use a location away from storm drain inlets and watercourses.
- Clean equipment including sprayers, sprayer paint supply lines, patch and paving equipment, and mud jacking equipment at the end of each day. Clean in a sink or other area (e.g. vehicle wash area) that is connected to the sanitary sewer.

*Bridge and Structure Maintenance**Paint and Paint Removal*

- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Do not transfer or load paint near storm drain inlets or watercourses.

- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint container.
- Plug nearby storm drain inlets prior to starting painting where there is significant risk of a spill reaching storm drains. Remove plugs when job is completed.
- If sand blasting is used to remove paint, cover nearby storm drain inlets prior to starting work.
- Perform work on a maintenance traveler or platform, or use suspended netting or tarps to capture paint, rust, paint removing agents, or other materials, to prevent discharge of materials to surface waters if the bridge crosses a watercourse. If sanding, use a sander with a vacuum filter bag.
- Capture all clean-up water, and dispose of properly.
- Recycle paint when possible (e.g. paint may be used for graffiti removal activities). Dispose of unused paint at an appropriate household hazardous waste facility.

## *Graffiti Removal*

- Schedule graffiti removal activities for dry weather.
- Protect nearby storm drain inlets prior to removing graffiti from walls, signs, sidewalks, or other structures needing graffiti abatement. Clean up afterwards by sweeping or vacuuming thoroughly, and/or by using absorbent and properly disposing of the absorbent.
- When graffiti is removed by painting over, implement the procedures under Painting and Paint Removal above.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a landscaped or dirt area. If such an area is not available, filter runoff through an appropriate filtering device (e.g. filter fabric) to keep sand, particles, and debris out of storm drains.
- If a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound), plug nearby storm drains and vacuum/pump wash water to the sanitary sewer.
- Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).

## *Repair Work*

- Prevent concrete, steel, wood, metal parts, tools, or other work materials from entering storm drains or watercourses.
- Thoroughly clean up the job site when the repair work is completed.
- When cleaning guardrails or fences follow the appropriate surface cleaning methods (depending on the type of surface) outlined in SC-71 Plaza & Sidewalk Cleaning fact sheet.

- If painting is conducted, follow the painting and paint removal procedures above.
- If graffiti removal is conducted, follow the graffiti removal procedures above.
- If construction takes place, see the Construction Activity BMP Handbook.
- Recycle materials whenever possible.

#### *Unpaved Roads and Trails*

- Stabilize exposed soil areas to prevent soil from eroding during rain events. This is particularly important on steep slopes.
- For roadside areas with exposed soils, the most cost-effective choice is to vegetate the area, preferably with a mulch or binder that will hold the soils in place while the vegetation is establishing. Native vegetation should be used if possible.
- If vegetation cannot be established immediately, apply temporary erosion control mats/blankets; a comma straw, or gravel as appropriate.
- If sediment is already eroded and mobilized in roadside areas, temporary controls should be installed. These may include: sediment control fences, fabric-covered triangular dikes, gravel-filled burlap bags, biobags, or hay bales staked in place.

#### *Non-Stormwater Discharges*

Field crews should be aware of non-stormwater discharges as part of their ongoing street maintenance efforts.

- Refer to SC-10 Non-Stormwater Discharges
- Identify location, time and estimated quantity of discharges.
- Notify appropriate personnel.

#### ***Training***

- Train employees regarding proper street sweeping operation and street repair and maintenance.
- Instruct employees and subcontractors to ensure that measures to reduce the stormwater impacts of roadway/bridge maintenance are being followed.
- Require engineering staff and/or consulting A/E firms to address stormwater quality in new bridge designs or existing bridge retrofits.
- Use a training log or similar method to document training.
- Train employees on proper spill containment and clean up, and in identifying non-stormwater discharges.

## ***Spill Response and Prevention***

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

## ***Other Considerations***

- Densely populated areas or heavily used streets may require parking regulations to clear streets for cleaning.
- No currently available conventional sweeper is effective at removing oil and grease. Mechanical sweepers are not effective at removing finer sediments.
- Limitations may arise in the location of new bridges. The availability and cost of land and other economic and political factors may dictate where the placement of a new bridge will occur. Better design of the bridge to control runoff is required if it is being placed near sensitive waters.

## **Requirements**

### ***Costs***

- The maintenance of local roads and bridges is already a consideration of most community public works or transportation departments. Therefore, the cost of pollutant reducing management practices will involve the training and equipment required to implement these new practices.
- The largest expenditures for street sweeping programs are in staffing and equipment. The capital cost for a conventional street sweeper is between \$60,000 and \$120,000. Newer technologies might have prices approaching \$180,000. The average useful life of a conventional sweeper is about four years, and programs must budget for equipment replacement. Sweeping frequencies will determine equipment life, so programs that sweep more often should expect to have a higher cost of replacement.
- A street sweeping program may require the following.
  - Sweeper operators, maintenance, supervisory, and administrative personnel are required.
  - Traffic control officers may be required to enforce parking restrictions.
  - Skillful design of cleaning routes is required for program to be productive.
  - Arrangements must be made for disposal of collected wastes.

- If investing in newer technologies, training for operators must be included in operation and maintenance budgets. Costs for public education are small, and mostly deal with the need to obey parking restrictions and litter control. Parking tickets are an effective reminder to obey parking rules, as well as being a source of revenue.

**Maintenance**

- Not applicable

**Supplemental Information****Further Detail of the BMP***Street sweeping*

There are advantages and disadvantages to the two common types of sweepers. The best choice depends on your specific conditions. Many communities find it useful to have a compliment of both types in their fleet.

**Mechanical Broom Sweepers** - More effective at picking up large debris and cleaning wet streets. Less costly to purchase and operate. Create more airborne dust.

**Vacuum Sweepers** - More effective at removing fine particles and associated heavy metals. Ineffective at cleaning wet streets. Noisier than mechanical broom sweepers which may restrict areas or times of operation. May require an advance vehicle to remove large debris.

**Street Flushers** - Not affected by biggest interference to cleaning, parked cars. May remove finer sediments, moving them toward the gutter and stormwater inlets. For this reason, flushing fell out of favor and is now used primarily after sweeping. Flushing may be effective for combined sewer systems. Presently street flushing is not allowed under most NPDES permits.

*Cross-Media Transfer of Pollutants*

The California Air Resources Board (ARB) has established state ambient air quality standards including a standard for respirable particulate matter (less than or equal to 10 microns in diameter, symbolized as PM<sub>10</sub>). In the effort to sweep up finer sediments to remove attached heavy metals, municipalities should be aware that fine dust, that cannot be captured by the sweeping equipment and becomes airborne, could lead to issues of worker and public safety.

*Bridges*

Bridges that carry vehicular traffic generate some of the more direct discharges of runoff to surface waters. Bridge scupper drains cause a direct discharge of stormwater into receiving waters and have been shown to carry relatively high concentrations of pollutants. Bridge maintenance also generates wastes that may be either directly deposited to the water below or carried to the receiving water by stormwater. The following steps will help reduce the stormwater impacts of bridge maintenance:

- Site new bridges so that significant adverse impacts to wetlands, sensitive areas, critical habitat, and riparian vegetation are minimized.

- Design new bridges to avoid the use of scupper drains and route runoff to land for treatment control. Existing scupper drains should be cleaned on a regular basis to avoid sediment/debris accumulation.
- Reduce the discharge of pollutants to surface waters during maintenance by using suspended traps, vacuums, or booms in the water to capture paint, rust, and paint removing agents. Many of these wastes may be hazardous. Properly dispose of this waste by referring to CA21 (Hazardous Waste Management) in the Construction Handbook.
- Train employees and subcontractors to reduce the discharge of wastes during bridge maintenance.

## *De-icing*

- Do not over-apply deicing salt and sand, and routinely calibrate spreaders.
- Near reservoirs, restrict the application of deicing salt and redirect any runoff away from reservoirs.
- Consider using alternative deicing agents (less toxic, biodegradable, etc.).

## **References and Resources**

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July 1998.

Orange County Stormwater Program

[http://www.ocwatersheds.com/stormwater/swp\\_introduction.asp](http://www.ocwatersheds.com/stormwater/swp_introduction.asp)

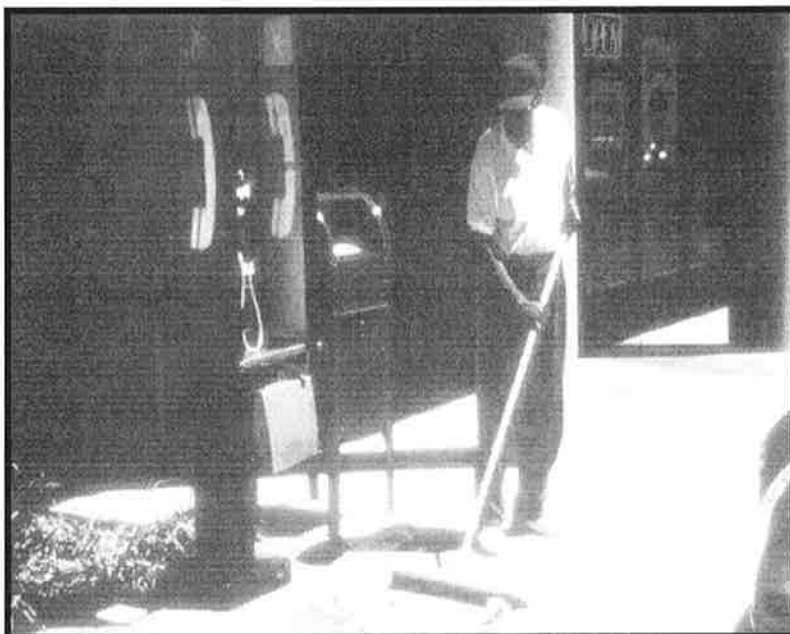
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Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2001. Fresh Concrete and Mortar Application Best Management Practices for the Construction Industry. June.

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United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Roadway and Bridge Maintenance. On-line  
[http://www.epa.gov/npdes/menuofbmpps/poll\\_13.htm](http://www.epa.gov/npdes/menuofbmpps/poll_13.htm)



## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>

## Description

Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. This fact sheet describes good housekeeping practices that can be incorporated into the municipality's existing cleaning and maintenance program.

## Approach

### Pollution Prevention

- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g. water based paints, gels or sprays for graffiti removal).

## Suggested Protocols

### Surface Cleaning

- Regularly broom (dry) sweep sidewalk, plaza and parking lot areas to minimize cleaning with water.
- Dry cleanup first (sweep, collect, and dispose of debris and trash) when cleaning sidewalks or plazas, then wash with or without soap.
- Block the storm drain or contain runoff when cleaning with water. Discharge wash water to landscaping or collect water and pump to a tank or discharge to sanitary sewer if allowed. (Permission may be required from local sanitation district.)



- Block the storm drain or contain runoff when washing parking areas, driveways or drive-throughs. Use absorbents to pick up oil; then dry sweep. Clean with or without soap. Collect water and pump to a tank or discharge to sanitary sewer if allowed. Street Repair and Maintenance.

#### *Graffiti Removal*

- Avoid graffiti abatement activities during rain events.
- Implement the procedures under Painting and Paint Removal in SC-70 Roads, Streets, and Highway Operation and Maintenance fact sheet when graffiti is removed by painting over.
- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a dirt or landscaped area after treating with an appropriate filtering device.
- Plug nearby storm drain inlets and vacuum/pump wash water to the sanitary sewer if authorized to do so if a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound). Ensure that a non-hazardous cleaning compound is used or dispose as hazardous waste, as appropriate.

#### *Surface Removal and Repair*

- Schedule surface removal activities for dry weather if possible.
- Avoid creating excess dust when breaking asphalt or concrete.
- Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up as much material as possible.
- Designate an area for clean up and proper disposal of excess materials.
- Remove and recycle as much of the broken pavement as possible to avoid contact with rainfall and stormwater runoff.
- When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet completely with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site.
- Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Wash water should be directed to landscaping or collected and pumped to the sanitary sewer if allowed.

#### *Concrete Installation and Repair*

- Schedule asphalt and concrete activities for dry weather.



- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place sand bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- Protect applications of fresh concrete from rainfall and runoff until the material has dried.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

## *Controlling Litter*

- Post "No Littering" signs and enforce anti-litter laws.
- Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.
- Clean parking lots on a regular basis with a street sweeper.

## *Training*

- Provide regular training to field employees and/or contractors regarding surface cleaning and proper operation of equipment.
- Train employee and contractors in proper techniques for spill containment and cleanup.
- Use a training log or similar method to document training.

## *Spill Response and Prevention*

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

**Other Considerations**

- Limitations related to sweeping activities at large parking facilities may include current sweeper technology to remove oil and grease.
- Surface cleaning activities that require discharges to the local sewerage agency will require coordination with the agency.
- Arrangements for disposal of the swept material collected must be made, as well as accurate tracking of the areas swept and the frequency of sweeping.

**Requirements****Costs**

- The largest expenditures for sweeping and cleaning of sidewalks, plazas, and parking lots are in staffing and equipment. Sweeping of these areas should be incorporated into street sweeping programs to reduce costs.

**Maintenance**

Not applicable

**Supplemental Information****Further Detail of the BMP**

Community education, such as informing residents about their options for recycling and waste disposal, as well as the consequences of littering, can instill a sense of citizen responsibility and potentially reduce the amount of maintenance required by the municipality.

Additional BMPs that should be considered for parking lot areas include:

- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Structural BMPs such as storm drain inlet filters can be very effective in reducing the amount of pollutants discharged from parking facilities during periods of rain.

**References and Resources**

Bay Area Stormwater Management Agencies Association (BASMAA). 1996. Pollution From Surface Cleaning Folder <http://www.basmaa.org>

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July. 1998.

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

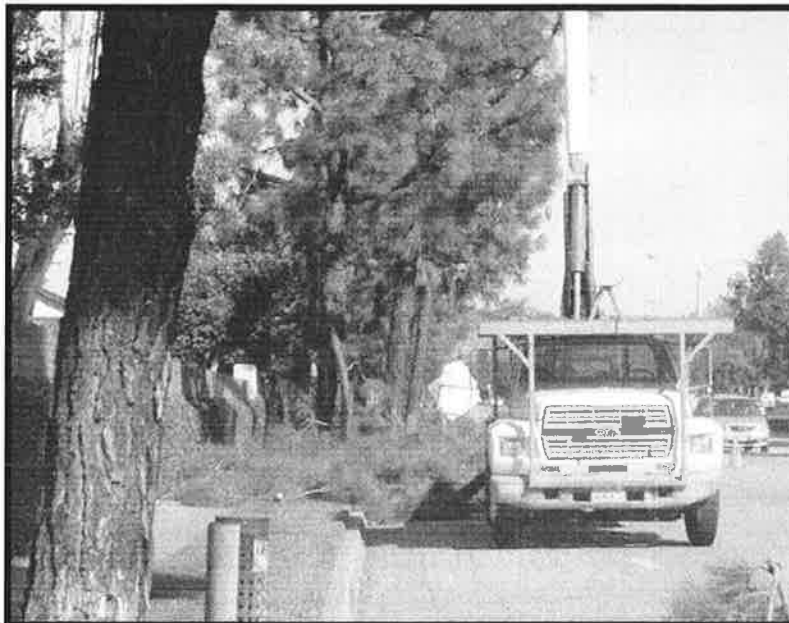
Orange County Stormwater Program

[http://www.ocwatersheds.com/stormwater/swp\\_introduction.asp](http://www.ocwatersheds.com/stormwater/swp_introduction.asp)

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. Maintenance Best Management Practices for the Construction Industry. Brochures: Landscaping, Gardening, and Pool; Roadwork and Paving; and Fresh Concrete and Mortar Application. June 2001.

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Plan. 2001. Municipal Activities Model Program Guidance. November.



## Objectives

- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	
Bacteria	
Oil and Grease	
Organics	
Oxygen Demanding	<input checked="" type="checkbox"/>

## Description

Landscape maintenance activities include vegetation removal; herbicide and insecticide application; fertilizer application; watering; and other gardening and lawn care practices. Vegetation control typically involves a combination of chemical (herbicide) application and mechanical methods. All of these maintenance practices have the potential to contribute pollutants to the storm drain system. The major objectives of this BMP are to minimize the discharge of pesticides, herbicides and fertilizers to the storm drain system and receiving waters; prevent the disposal of landscape waste into the storm drain system by collecting and properly disposing of clippings and cuttings, and educating employees and the public.

## Approach

### Pollution Prevention

- Implement an integrated pest management (IPM) program. IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools.
- Choose low water using flowers, trees, shrubs, and groundcover.
- Consider alternative landscaping techniques such as naturescaping and xeriscaping.
- Conduct appropriate maintenance (i.e. properly timed fertilizing, weeding, pest control, and pruning) to help preserve the landscapes water efficiency.



- Consider grass cycling (grass cycling is the natural recycling of grass by leaving the clippings on the lawn when mowing. Grass clippings decompose quickly and release valuable nutrients back into the lawn).

***Suggested Protocols******Mowing, Trimming, and Weeding***

- Whenever possible use mechanical methods of vegetation removal (e.g. mowing with tractor-type or push mowers, hand cutting with gas or electric powered weed trimmers) rather than applying herbicides. Use hand weeding where practical.
- Avoid loosening the soil when conducting mechanical or manual weed control, this could lead to erosion. Use mulch or other erosion control measures when soils are exposed.
- Performing mowing at optimal times. Mowing should not be performed if significant rain events are predicted.
- Mulching mowers may be recommended for certain flat areas. Other techniques may be employed to minimize mowing such as selective vegetative planting using low maintenance grasses and shrubs.
- Collect lawn and garden clippings, pruning waste, tree trimmings, and weeds. Chip if necessary, and compost or dispose of at a landfill (see waste management section of this fact sheet).
- Place temporarily stockpiled material away from watercourses, and berm or cover stockpiles to prevent material releases to storm drains.

***Planting***

- Determine existing native vegetation features (location, species, size, function, importance) and consider the feasibility of protecting them. Consider elements such as their effect on drainage and erosion, hardiness, maintenance requirements, and possible conflicts between preserving vegetation and the resulting maintenance needs.
- Retain and/or plant selected native vegetation whose features are determined to be beneficial, where feasible. Native vegetation usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.
- Consider using low water use groundcovers when planting or replanting.

***Waste Management***

- Compost leaves, sticks, or other collected vegetation or dispose of at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Reduce the use of high nitrogen fertilizers that produce excess growth requiring more frequent mowing or trimming.

- Avoid landscape wastes in and around storm drain inlets by either using bagging equipment or by manually picking up the material.

## ***Irrigation***

- Where practical, use automatic timers to minimize runoff.
- Use popup sprinkler heads in areas with a lot of activity or where there is a chance the pipes may be broken. Consider the use of mechanisms that reduce water flow to sprinkler heads if broken.
- Ensure that there is no runoff from the landscaped area(s) if re-claimed water is used for irrigation.
- If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
- Irrigate slowly or pulse irrigate to prevent runoff and then only irrigate as much as is needed.
- Apply water at rates that do not exceed the infiltration rate of the soil.

## ***Fertilizer and Pesticide Management***

- Utilize a comprehensive management system that incorporates integrated pest management (IPM) techniques. There are many methods and types of IPM, including the following:
  - Mulching can be used to prevent weeds where turf is absent, fencing installed to keep rodents out, and netting used to keep birds and insects away from leaves and fruit.
  - Visible insects can be removed by hand (with gloves or tweezers) and placed in soapy water or vegetable oil. Alternatively, insects can be sprayed off the plant with water or in some cases vacuumed off of larger plants.
  - Store-bought traps, such as species-specific, pheromone-based traps or colored sticky cards, can be used.
  - Slugs can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.
  - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).
  - Small mammals and birds can be excluded using fences, netting, tree trunk guards.
  - Beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seed head weevils, and spiders that prey on detrimental pest species can be promoted.
- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use pesticides only if there is an actual pest problem (not on a regular preventative schedule).
- Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).
- Do not mix or prepare pesticides for application near storm drains.
- Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the pest.
- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Calibrate fertilizer and pesticide application equipment to avoid excessive application.
- Periodically test soils for determining proper fertilizer use.
- Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Purchase only the amount of pesticide that you can reasonably use in a given time period (month or year depending on the product).
- Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Dispose of empty pesticide containers according to the instructions on the container label.

### *Inspection*

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.
- Inspect pesticide/fertilizer equipment and transportation vehicles daily.

### *Training*

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution. Pesticide application must be under the supervision of a California qualified pesticide applicator.
- Train/encourage municipal maintenance crews to use IPM techniques for managing public green areas.
- Annually train employees within departments responsible for pesticide application on the appropriate portions of the agency's IPM Policy, SOPs, and BMPs, and the latest IPM techniques.

- Employees who are not authorized and trained to apply pesticides should be periodically (at least annually) informed that they cannot use over-the-counter pesticides in or around the workplace.
- Use a training log or similar method to document training.

## ***Spill Response and Prevention***

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a known location
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

## ***Other Considerations***

- The Federal Pesticide, Fungicide, and Rodenticide Act and California Title 3, Division 6, Pesticides and Pest Control Operations place strict controls over pesticide application and handling and specify training, annual refresher, and testing requirements. The regulations generally cover: a list of approved pesticides and selected uses, updated regularly; general application information; equipment use and maintenance procedures; and record keeping. The California Department of Pesticide Regulations and the County Agricultural Commission coordinate and maintain the licensing and certification programs. All public agency employees who apply pesticides and herbicides in "agricultural use" areas such as parks, golf courses, rights-of-way and recreation areas should be properly certified in accordance with state regulations. Contracts for landscape maintenance should include similar requirements.
- All employees who handle pesticides should be familiar with the most recent material safety data sheet (MSDS) files.
- Municipalities do not have the authority to regulate the use of pesticides by school districts, however the California Healthy Schools Act of 2000 (AB 2260) has imposed requirements on California school districts regarding pesticide use in schools. Posting of notification prior to the application of pesticides is now required, and IPM is stated as the preferred approach to pest management in schools.

## **Requirements**

### ***Costs***

Additional training of municipal employees will be required to address IPM techniques and BMPs. IPM methods will likely increase labor cost for pest control which may be offset by lower chemical costs.

### ***Maintenance***

Not applicable



**Supplemental Information*****Further Detail of the BMP******Waste Management***

Composting is one of the better disposal alternatives if locally available. Most municipalities either have or are planning yard waste composting facilities as a means of reducing the amount of waste going to the landfill. Lawn clippings from municipal maintenance programs as well as private sources would probably be compatible with most composting facilities

***Contractors and Other Pesticide Users***

Municipal agencies should develop and implement a process to ensure that any contractor employed to conduct pest control and pesticide application on municipal property engages in pest control methods consistent with the IPM Policy adopted by the agency. Specifically, municipalities should require contractors to follow the agency's IPM policy, SOPs, and BMPs; provide evidence to the agency of having received training on current IPM techniques when feasible; provide documentation of pesticide use on agency property to the agency in a timely manner.

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Photo Credit: Geoff Brosseau

## Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff that may contain certain pollutants. Maintaining catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis will remove pollutants, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

## Approach

### Suggested Protocols

#### Catch Basins/Inlet Structures

- Municipal staff should regularly inspect facilities to ensure the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC-75 Waste Handling and Disposal).
- Clean catch basins, storm drain inlets, and other conveyance structures in high pollutant load areas just before the wet season to remove sediments and debris accumulated during the summer.

## Objectives

- Contain
- Educate
- Reduce/Minimize

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>



# SC-74      Drainage System Maintenance

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- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Record the amount of waste collected.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream.
- Except for small communities with relatively few catch basins that may be cleaned manually, most municipalities will require mechanical cleaners such as eductors, vacuums, or bucket loaders.

## *Storm Drain Conveyance System*

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect flushed effluent and pump to the sanitary sewer for treatment.

## *Pump Stations*

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge from cleaning a storm drain pump station or other facility to reach the storm drain system.
- Conduct quarterly routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.
- Sample collected sediments to determine if landfill disposal is possible, or illegal discharges in the watershed are occurring.

## *Open Channel*

- Consider modification of storm channel characteristics to improve channel hydraulics, to increase pollutant removals, and to enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a stream or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies

(SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS

## *Illicit Connections and Discharges*

- During routine maintenance of conveyance system and drainage structures field staff should look for evidence of illegal discharges or illicit connections:
  - Is there evidence of spills such as paints, discoloring, etc.
  - Are there any odors associated with the drainage system
  - Record locations of apparent illegal discharges/illicit connections
  - Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of up gradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
  - Once the origin of flow is established, require illicit discharger to eliminate the discharge.
- Stencil storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

## *Illegal Dumping*

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

- The State Department of Fish and Game has a hotline for reporting violations called Cal TIP (1-800-952-5400). The phone number may be used to report any violation of a Fish and Game code (illegal dumping, poaching, etc.).
- The California Department of Toxic Substances Control's Waste Alert Hotline, 1-800-69TOXIC, can be used to report hazardous waste violations.

***Training***

- Train crews in proper maintenance activities, including record keeping and disposal.
- Only properly trained individuals are allowed to handle hazardous materials/wastes.
- Train municipal employees from all departments (public works, utilities, street cleaning, parks and recreation, industrial waste inspection, hazardous waste inspection, sewer maintenance) to recognize and report illegal dumping.
- Train municipal employees and educate businesses, contractors, and the general public in proper and consistent methods for disposal.
- Train municipal staff regarding non-stormwater discharges (See SC-10 Non-Stormwater Discharges).

***Spill Response and Prevention***

- Refer to SC-11, Prevention, Control & Cleanup
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

***Other Considerations***

- Cleanup activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and disposal of flushed effluent to sanitary sewer may be prohibited in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Municipal codes should include sections prohibiting the discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.
- Private property access rights may be needed to track illegal discharges up gradient.

- Requirements of municipal ordinance authority for suspected source verification testing for illicit connections necessary for guaranteed rights of entry.

## Requirements

### Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget. A careful study of cleaning effectiveness should be undertaken before increased cleaning is implemented. Catch basin cleaning costs are less expensive if vacuum street sweepers are available; cleaning catch basins manually can cost approximately twice as much as cleaning the basins with a vacuum attached to a sweeper.
- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary. Encouraging reporting of illicit discharges by employees can offset costs by saving expense on inspectors and directing resources more efficiently. Some programs have used funds available from "environmental fees" or special assessment districts to fund their illicit connection elimination programs.

## Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Identifying illicit discharges requires teams of at least two people (volunteers can be used), plus administrative personnel, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Requires technical staff to detect and investigate illegal dumping violations, and to coordinate public education.

## Supplemental Information

### Further Detail of the BMP

#### *Storm Drain flushing*

Sanitary sewer flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in sanitary sewer systems. The same principles that make sanitary sewer flushing effective can be used to flush storm drains. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as to an open channel, to another point where flushing will be initiated, or over to the sanitary sewer and on to the treatment facilities, thus preventing re-suspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. The deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to

cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce the impacts of stormwater pollution, a second inflatable device, placed well downstream, may be used to re-collect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to re-collect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75 percent for organics and 55-65 percent for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm drain flushing.

#### *Flow Management*

Flow management has been one of the principal motivations for designing urban stream corridors in the past. Such needs may or may not be compatible with the stormwater quality goals in the stream corridor.

Downstream flood peaks can be suppressed by reducing through flow velocity. This can be accomplished by reducing gradient with grade control structures or increasing roughness with boulders, dense vegetation, or complex banks forms. Reducing velocity correspondingly increases flood height, so all such measures have a natural association with floodplain open space. Flood elevations laterally adjacent to the stream can be lowered by increasing through flow velocity.

However, increasing velocity increases flooding downstream and inherently conflicts with channel stability and human safety. Where topography permits, another way to lower flood elevation is to lower the level of the floodway with drop structures into a large but subtly excavated bowl where flood flows we allowed to spread out.

#### *Stream Corridor Planning*

Urban streams receive and convey stormwater flows from developed or developing watersheds. Planning of stream corridors thus interacts with urban stormwater management programs. If local programs are intended to control or protect downstream environments by managing flows delivered to the channels, then it is logical that such programs should be supplemented by management of the materials, forms, and uses of the downstream riparian corridor. Any proposal for stream alteration or management should be investigated for its potential flow and stability effects on upstream, downstream, and laterally adjacent areas. The timing and rate of flow from various tributaries can combine in complex ways to alter flood hazards. Each section of channel is unique, influenced by its own distribution of roughness elements, management activities, and stream responses.

Flexibility to adapt to stream features and behaviors as they evolve must be included in stream reclamation planning. The amenity and ecology of streams may be enhanced through the landscape design options of 1) corridor reservation, 2) bank treatment, 3) geomorphic restoration, and 4) grade control.

Corridor reservation - Reserving stream corridors and valleys to accommodate natural stream meandering, aggradation, degradation, and over bank flows allows streams to find their own form and generate less ongoing erosion. In California, open stream corridors in recent urban developments have produced recreational open space, irrigation of streamside plantings, and the aesthetic amenity of flowing water.

Bank treatment - The use of armoring, vegetative cover, and flow deflection may be used to influence a channel's form, stability, and biotic habitat. To prevent bank erosion, armoring can be done with rigid construction materials, such as concrete, masonry, wood planks and logs, riprap, and gabions. Concrete linings have been criticized because of their lack of provision of biotic habitat. In contrast, riprap and gabions make relatively porous and flexible linings. Boulders, placed in the bed reduce velocity and erosive power.

Riparian vegetation can stabilize the banks of streams that are at or near a condition of equilibrium. Binding networks of roots increase bank shear strength. During flood flows, resilient vegetation is forced into erosion-inhibiting mats. The roughness of vegetation leads to lower velocity, further reducing erosive effects. Structural flow deflection can protect banks from erosion or alter fish habitat. By concentrating flow, a deflector causes a pool to be scoured in the bed.

Geomorphic restoration - Restoration refers to alteration of disturbed streams so their form and behavior emulate those of undisturbed streams. Natural meanders are retained, with grading to gentle slopes on the inside of curves to allow point bars and riffle-pool sequences to develop. Trees are retained to provide scenic quality, biotic productivity, and roots for bank stabilization, supplemented by plantings where necessary.

A restorative approach can be successful where the stream is already approaching equilibrium. However, if upstream urbanization continues new flow regimes will be generated that could disrupt the equilibrium of the treated system.

Grade Control - A grade control structure is a level shelf of a permanent material, such as stone, masonry, or concrete, over which stream water flows. A grade control structure is called a sill, weir, or drop structure, depending on the relation of its invert elevation to upstream and downstream channels.

A sill is installed at the preexisting channel bed elevation to prevent upstream migration of nick points. It establishes a firm base level below which the upstream channel can not erode.

A weir or check dam is installed with invert above the preexisting bed elevation. A weir raises the local base level of the stream and causes aggradation upstream. The gradient, velocity, and erosive potential of the stream channel are reduced. A drop structure lowers the downstream invert below its preexisting elevation, reducing downstream gradient and velocity. Weirs and drop structure control erosion by dissipating energy and reducing slope velocity.



When carefully applied, grade control structures can be highly versatile in establishing human and environmental benefits in stabilized channels. To be successful, application of grade control structures should be guided by analysis of the stream system both upstream and downstream from the area to be reclaimed.

**Examples**

The California Department of Water Resources began the Urban Stream Restoration Program in 1985. The program provides grant funds to municipalities and community groups to implement stream restoration projects. The projects reduce damages from streambank and watershed instability and floods while restoring streams' aesthetic, recreational, and fish and wildlife values.

In Buena Vista Park, upper floodway slopes are gentle and grassed to achieve continuity of usable park land across the channel of small boulders at the base of the slopes.

The San Diego River is a large, vegetative lined channel, which was planted in a variety of species to support riparian wildlife while stabilizing the steep banks of the floodway.

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## Objectives

- Cover
- Contain
- Educate
- Reduce/Reuse

## Description

It is important to control litter to eliminate trash and other materials in stormwater runoff. Waste reduction is a major component of waste management and should be encouraged through training and public outreach. Management of waste once it is collected may involve reuse, recycling, or proper disposal.

## Approach

### Pollution Prevention

- Reuse products when possible.
- Encourage recycling programs with recycling bins, used oil collection, etc.

## Suggested Protocols

### Solid Waste Collection

- Implement procedures, where applicable, to collect, transport, and dispose of solid waste at appropriate disposal facilities in accordance with applicable federal, state, and local laws and regulations.
- Include properly designed trash storage areas. If feasible provide cover over trash storage areas.
- Regularly inspect solid waste containers for structural damage. Repair or replace damaged containers as necessary.

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	<input checked="" type="checkbox"/>
Metals	<input checked="" type="checkbox"/>
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>



- Secure solid waste containers; containers must be closed tightly when not in use.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc. may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).
- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.
- Refer to SC-34 Waste Handling and Disposal for more information regarding solid waste facilities.

#### *Waste Reduction and Recycling*

- Recycle wastes whenever possible. Many types of waste can be recycled, recycling options for each waste type are limited. All gasoline, antifreeze, waste oil, and lead-acid batteries can be recycled. Latex and oil-based paint can be reused, as well as recycled. Materials that cannot be reused or recycled should either be incinerated or disposed of at a properly permitted landfill.
- Recycling is always preferable to disposal of unwanted materials.
- Recycling bins for glass, metal, newspaper, plastic bottles and other recyclable household solid wastes should be provided at public facilities and/or for residential curbside collection.

#### *Controlling Litter*

- Post "No Littering" signs and enforce anti-litter laws.
- Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- Clean out and cover litter receptacles frequently to prevent spillage.

#### *Illegal Dumping*

Substances illegally dumped on streets and into the storm drain system and creeks include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clipping, and pet wastes.

- Post "No Dumping" signs with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Landscaping and beautification efforts of hot spots might also discourage future dumping.
- See SC-74 Drainage System Maintenance, and SC-10 Non-Stormwater Discharges.

## Requirements

### Costs

- The costs for a solid waste source control program vary depending on the type of method. The cost of a community education program or a plan to increase the number of trash receptacles can be very minimal. Costs for structural controls such as trash racks, bar screens, and silt traps can be quite costly ranging from \$250,000 to \$900,000.
- A collection facility or curbside collection for used oil may result in significant costs. Commercial locations (automobile service stations, quick oil change centers, etc.) as collection points eliminate hauling and recycling costs.
- Collection and disposal of hazardous waste can be very expensive and requires trained operators; laboratory and detection equipment; and extensive record keeping including dates, types, and quantities.
- Use of volunteer work forces can lower storm drain stenciling program costs. Stenciling kits require procurement of durable/disposable items. The stenciling program can aid in the cataloging of the storm drain system. One municipality from the state of Washington has estimated that stenciling kits cost approximately \$50 each. Stencils may cost about \$8 each including the die cost on an order of 1,000. Re-orders cost about \$1/stencil. Stencil designs may be available from other communities. Stencil kits should be provided on a loan basis to volunteer groups free of charge with the understanding that kit remnants are to be returned.

### Maintenance

- The primary staff demand for stenciling programs is for program setup to provide marketing and training. Ongoing/follow-up staff time is minimal because of volunteer services.
- Staffing requirements are minimal for oil recycling programs if collection/recycling is contracted out to a used oil hauler/recycler or required at commercial locations.
- Staff requirements for maintaining good housekeeping BMPs at waste handling sites is minimal.

## Supplemental Information

### Further Detail of the BMP

#### Waste Reduction

An approach to reduce stormwater pollution from waste handling and disposal is to assess activities and reduce waste generation. The assessment is designed to find situations where waste can be eliminated or reduced and emissions and environmental damage can be minimized. The assessment involves collecting process specific information, setting pollution prevention targets, and developing, screening and selecting waste reduction options for further study. Starting a waste reduction program is economically beneficial because of reduced raw material purchases and lower waste disposal fees.

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# Water & Sewer Utility Maintenance SC-76



## Objectives

- Contain
- Educate
- Reduce/Minimize

## Description

Although the operation and maintenance of public utilities are not considered chronic sources of stormwater pollution, some activities and accidents can result in the discharge of pollutants that can pose a threat to both human health and the quality of receiving waters if they enter the storm drain system. Sewage incident response and investigation may involve a coordinated effort between staff from a number of different departments/agencies. Cities that do not provide maintenance of water and sewer utilities must coordinate with the contracting agency responsible for these activities and ensure that these model procedures are followed.

## Approach

### Pollution Prevention

Inspect potential non-stormwater discharge flow paths and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).

### Suggested Protocols

#### *Water Line Maintenance and Cleaning*

Procedures can be employed to reduce pollutants from discharges associated with water utility operation and maintenance activities. Planned discharges may include fire hydrant testing, flushing water supply mains after new construction, flushing lines due to complaints of taste and odor, dewatering mains for maintenance work. Unplanned discharges from treated, recycled water, raw water, and groundwater systems operation and maintenance activities can occur from water main

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	<input checked="" type="checkbox"/>
Trash	
Metals	
Bacteria	<input checked="" type="checkbox"/>
Oil and Grease	<input checked="" type="checkbox"/>
Organics	<input checked="" type="checkbox"/>
Oxygen Demanding	<input checked="" type="checkbox"/>



# **SC-76 Water & Sewer Utility Maintenance**

breaks, sheared fire hydrants, equipment malfunction, and operator error.

## *Planned discharges*

- Identify a suitable discharge option in the following order of preference:
  - Apply to the land.
  - Reuse water for dust suppression, irrigation, or construction compaction.
  - Discharge to a sanitary sewer system with approval.
  - Discharge to the storm drain system using applicable pollution control measures. (Only available to clean water discharges such as water main/ water storage tank/water hydrant flushing).
- If water is discharged to a storm drain, control measures must be put in place to control potential pollutants (i.e. sediment, chlorine, etc.). Examples of some storm drain protection options include:
  - Silt fence – appropriate where the inlet drains a relatively flat area.
  - Gravel and wire mesh sediment filter – Appropriate where concentrated flows are expected.
  - Wooden weir and fabric – use at curb inlets where a compact installation is desired.
- Prior to discharge, inspect discharge flow path and clear/cleanup any debris or pollutants found (i.e. remove trash, leaves, sediment, and wipe up liquids, including oil spills).
- General Design considerations for inlet protection devices include the following:
  - The device should be constructed such that cleaning and disposal of trapped sediment is made easy, while minimizing interference with discharge activities.
  - Devices should be constructed so that any standing water resulting from the discharge will not cause excessive inconvenience or flooding/damage to adjacent land or structures.
- The effectiveness of control devices must be monitored during the discharge period and any necessary repairs or modifications made.

## *Unplanned Discharges*

- Stop the discharge as quickly as possible.
- Inspect flow path of the discharged water:
  - Identify erodible areas which may need to be repaired or protected during subsequent repairs or corrective actions



# **Water & Sewer Utility Maintenance SC-76**

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- Identify the potential for pollutants to be washed into the waterway
- If repairs or corrective action will cause additional discharges of water, select the appropriate procedures for erosion control, chlorine residual, turbidity, and chemical additives. Prevent potential pollutants from entering the flow path.

## *Sanitary Sewer Maintenance*

Applicable to municipalities who own and operated a sewage collection system. Facilities that are covered under this program include sanitary sewer pipes and pump stations owned and operated by a municipality. The owner of the sanitary sewer facilities is the entity responsible for carrying out this prevention and response program.

- Clean sewer lines on a regular basis to remove grease, grit, and other debris that may lead to sewer backups.
- Establish routine maintenance program. Cleaning should be conducted at an established minimum frequency and more frequently for problem areas such as restaurants that are identified
- Cleaning activities may require removal of tree roots and other identified obstructions.
- During routine maintenance and inspection note the condition of sanitary sewer structures and identify areas that need repair or maintenance. Items to note may include the following:
  - Cracked/deteriorating pipes
  - Leaking joints/seals at manhole
  - Frequent line plugs
  - Line generally flows at or near capacity
  - Suspected infiltration or exfiltration.
- Prioritize repairs based on the nature and severity of the problem. Immediate clearing of blockage or repair is required where an overflow is currently occurring or for urgent problems that may cause an imminent overflow (e.g. pump station failures, sewer line ruptures, sewer line blockages). These repairs may be temporary until scheduled or capital improvements can be completed.
- Review previous sewer maintenance records to help identify "hot spots" or areas with frequent maintenance problems and locations of potential system failure.

## *Spills and Overflows*

- Identify and track sanitary sewer discharges. Identify dry weather infiltration and inflow first. Wet weather overflow connections are very difficult to locate.

# **SC-76 Water & Sewer Utility Maintenance**

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- Locate wet weather overflows and leaking sanitary sewers using conventional source identification techniques such as monitoring and field screening. Techniques used to identify other illicit connection sources can also be used for sewer system evaluation surveys (see SC74 Drainage System Operation and Maintenance).
- Implement community awareness programs for monitoring sanitary sewer wet weather overflows. A citizen's hotline for reporting observed overflow conditions should be established to supplement field screening efforts.
- Establish lead department/agency responsible for spill response and containment. Provide coordination within departments.
- When a spill, leak, and/or overflow occurs and when disinfecting a sewage contaminated area, take every effort to ensure that the sewage, disinfectant and/or sewage treated with the disinfectant is not discharged to the storm drain system or receiving waters. Methods may include:
  - Blocking storm drain inlets and catch basins
  - Containing and diverting sewage and disinfectant away from open channels and other storm drain fixtures (using sandbags, inflatable dams, etc.)
  - Removing the material with vacuum equipment
- Record required information at the spill site.
- Perform field tests as necessary to determine the source of the spill.
- Develop notification procedures regarding spill reporting.

## *Septic Systems*

- Ensure that homeowners, installers, and inspectors are educated in proper maintenance of septic systems. This may require coordination with staff from other departments. Outreach to homeowners should include inspection reminders informing them that inspection and perhaps maintenance is due for their systems. Recommend that the system be inspected annually and pumped-out regularly.
- Programs which seek to address failing septic systems should consider using field screening to pinpoint areas where more detailed onsite inspection surveys are warranted.

## *Training*

- Conduct annual training of water utility personnel and service contractors. (field screening, sampling, smoke/dye testing, TV inspection).
- OSHA-required Health and Safety Training 29 CFR 1910.120 plus annual Refresher Training (as needed).
- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and federal OSHA 29 CFR 1910.146).

# **Water & Sewer Utility Maintenance SC-76**

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## ***Spill Response and Prevention***

- See previous section regarding spills and overflows.
- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

## ***Other Considerations***

- Enact ordinance granting "right-of-entry" to locate potentially responsible parties for sewer overflows.
- Reliance on individual onsite inspection to detect failed septic systems can be a major limitation. The individual onsite inspection is very labor-intensive and requires access to private property to pinpoint the exact location of the failing system.
- A significant limitation to correcting failing septic systems is the lack of techniques available for detecting individual failed septic systems.

## **Requirements**

### ***Costs***

- Departmental cooperation recommended for sharing or borrowing staff resources and equipment from municipal wastewater department.
- Infiltration, inflow, and wet weather overflows from sanitary sewers are very labor and equipment intensive to locate.
- The costs associated with detecting and correcting septic system failures are subject to a number of factors, including availability of trained personnel, cost of materials, and the level of follow-up required to fix the system problems.

### ***Maintenance***

- Minimum 2-person teams to perform field screening and associated sampling.
- Larger teams required for implementing other techniques (i.e. zinc chloride smoke testing, fluorometric dye testing, television camera inspection and physical inspection with confined space entry) to identify sewer system leaks.
- Program coordination required for handling emergencies, record keeping, etc.
- Many of the problems associated with improper use of septic systems may be attributed to lack of user knowledge on operation and maintenance. Educational materials for homeowners and training courses for installers and inspectors can reduce the incidence of pollution from these widespread and commonly used pollution control devices.

# **SC-76 Water & Sewer Utility Maintenance**

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## **Supplemental Information**

### ***Further Detail of the BMP***

#### ***Onsite Sewage Disposal Systems***

New onsite sewage disposal systems should be designed, located, and installed away from open waterbodies and sensitive resources such as wetlands and floodplains. A protective separation between the OSDS and groundwater should also be established. OSDSs should be operated and maintained to prevent surface water discharges and reduce pollutant loadings to groundwater. Inspection of OSDSs should occur regularly and repairs made immediately. New or replacement plumbing fixtures should be of the high efficiency type.

#### ***Typical Sanitary Sewer Problems***

- Old and deteriorated main and lateral pipes - Sewers range in age from 30 to 100 years with an average age of 50 years.
- Cracked sewer pipes - Existing sewers are mostly clay pipes which can crack as they deteriorate with age and also by earth movement.
- Misaligned and open pipe joints - Most of the mortar used to seal the joints between sections of clay pipe has deteriorated.
- Undersized sewer pipe - The existing sewer system is overloaded due to new sewer hook-ups, underground water infiltration, and illegal roof and/or yard drain connections.
- Defective manholes - Old manholes are made of bricks. Typical problems associated with brick manholes are loose bricks, missing bricks, and misaligned manholes.
- Missing and/or unrecorded sewer pipes and manholes - This problem is typical in the easement/backline sewer. Sewer pipe locations shown on the sewer record map are different from the actual sewer location.
- Sewer main under houses and other improvements - Complaints of sewer main alignment crossing the house and other improvements. A solution to this problem requires an agreement with the property owner for a new sewer easement at a relocated line.

#### ***Causes of Sanitary Sewer Backups***

- Root infiltration - Tree roots are a major cause of backups.
- Water inflow/infiltration - Rain water entering the sewer pipe causes overflows.
- Solids - Typical solids that buildup in the pipe and cause backups are grease, dirt, bones, tampons, paper towels, diapers, broken dishware, garbage, concrete, and debris.
- Structural defects in pipes and manholes - Sags in the line, cracks, holes, protruding laterals, misaligned pipe, offset joints are all possible causes of backups.

# **Water & Sewer Utility Maintenance SC-76**

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## *Design Considerations*

Sanitary sewer overflows can often be reduced or eliminated by a number of practices, in addition to sewer system cleaning and maintenance, including the following:

- Reducing infiltration and inflow through rehabilitation and repair of broken or leaking sewer lines.
- Enlarging or upgrading the capacity of sewer lines, pump stations, or sewage treatment plants.
- Constructing wet weather storage and treatment facilities to treat excess flows.
- Addressing SSOs during sewer system master planning and facilities planning.

## *Septic Systems*

Two field screening techniques that have been used with success at identifying possible locations of failing septic systems are the brightener test and color infrared (CIR) aerial photography. The first involves the use of specific phosphorus-based elements found in many laundry products, often called brighteners, as an indicator of the presence of failing onsite wastewater systems. The second technique uses color infrared (CIR) aerial photography to characterize the performance of septic systems. This method has been found to be a quick and cost-effective method for assessing the potential impacts of failing systems and uses variations in vegetative growth or stress patterns over septic system field lines to identify those systems that may potentially be malfunctioning. Then a more detailed onsite visual and physical inspection will confirm whether the system has truly failed and the extent of the repairs needed. These inspections may be carried out by county health departments or other authorized personnel.

## **References and Resources**

Alameda Countywide Clean Water Program on-line  
<http://www.ci.berkeley.ca.us/pw/Storm/stormala.html>

Los Angeles County Stormwater Quality. Public Agency Activities Model Program. On-line:  
[http://ladpw.org/wmd/npdes/public\\_TC.cfm](http://ladpw.org/wmd/npdes/public_TC.cfm)

Orange County Stormwater Program  
[http://www.ocwatersheds.com/StormWater/swp\\_introduction.asp](http://www.ocwatersheds.com/StormWater/swp_introduction.asp)

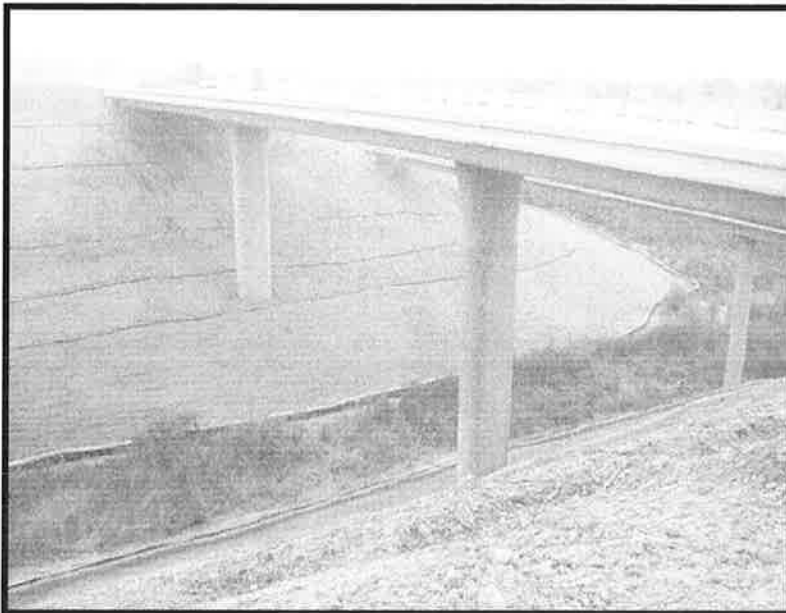
Santa Clara Valley Urban Runoff Pollution Prevention Program. 1997 Urban Runoff Management Plan. September 1997, updated October 2000.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 1998. Water Utility Operation and Maintenance Discharge Pollution Prevention Plan. June

United States Environmental Protection Agency (USEPA). 2001. Illicit Discharge Detection and Elimination. On-line: [http://cfpub.epa.gov/npdes/stormwater/menuofbmps/illi\\_1.cfm](http://cfpub.epa.gov/npdes/stormwater/menuofbmps/illi_1.cfm)

# **SC-76 Water & Sewer Utility Maintenance**

United States Environmental Protection Agency (USEPA). 2001. Pollution Prevention/Good Housekeeping for Municipal Operators Septic System Controls. On-line:  
[http://www.epa.gov/npdes/menuofbmps/poll\\_14.htm](http://www.epa.gov/npdes/menuofbmps/poll_14.htm)



## Description and Purpose

Stream channels, streambanks, and associated riparian areas are dynamic and sensitive ecosystems that respond to changes in land use activity. Streambank and channel disturbance resulting from construction activities can increase the stream's sediment load, which can cause channel erosion or sedimentation and have adverse affects on the biotic system. BMPs can reduce the discharge of sediment and other pollutants to minimize the impact of construction activities on watercourses. Streams on the 303(d) list and listed for sediment may require numerous measures to prevent any increases in sediment load to the stream.

## Suitable Applications

These procedures typically apply to all construction projects that disturb or occur within stream channels and their associated riparian areas.

## Limitations

Specific permit requirements or mitigation measures such as Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game supercede the guidance in this BMP.

- If numerical based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. Streams listed as 303(d) impaired for sediment, silt, or turbidity, are required to conduct sampling

## Objectives

EC	Erosion Control	<input checked="" type="checkbox"/>
SE	Sediment Control	<input checked="" type="checkbox"/>
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	<input checked="" type="checkbox"/>
WM	Waste Management and Materials Pollution Control	

## Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

## Targeted Constituents

Sediment	<input checked="" type="checkbox"/>
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

## Potential Alternatives

Combination of erosion and sediment controls.



to verify that there is no net increase in sediment load due to construction activities.

**Implementation*****Planning***

- Proper planning, design, and construction techniques can minimize impacts normally associated with in stream construction activities. Poor planning can adversely affect soil, fish, wildlife resources, land uses, or land users. Planning should take into account: scheduling; avoidance of in-stream construction; minimizing disturbance area and construction time period; using pre-disturbed areas; selecting crossing location; and selecting equipment.

***Scheduling***

- Construction activities should be scheduled according to the relative sensitivity of the environmental concerns and in accordance with EC-1, Scheduling. Scheduling considerations will be different when working near perennial streams vs. ephemeral streams and are as follows.
- When in-stream construction is conducted in a perennial stream, work should optimally be performed during the rainy season. This is because in the summer, any sediment-containing water that is discharged into the watercourse will cause a large change in both water clarity and water chemistry. During the rainy season, there is typically more and faster flowing water in the stream so discharges are diluted faster. However, should in-stream work be scheduled for summer, establishing an isolation area, or diverting the stream, will significantly decrease the amount of sediment stirred up by construction work. Construction work near perennial streams should optimally be performed during the dry season (see below).
- When working in or near ephemeral streams, work should be performed during the dry season. By their very nature, ephemeral streams are usually dry in the summer, and therefore, in-stream construction activities will not cause significant water quality problems. However, when tying up the site at the end of the project, wash any fines (see Washing Fines) that accumulated in the channel back into the bed material, to decrease pollution from the first rainstorm of the season.
- When working near ephemeral or perennial streams, erosion and sediment controls (see silt fences, straw bale barriers, etc.) should be implemented to keep sediment out of stream channel.

***Minimize Disturbance***

- Minimize disturbance through: selection of the narrowest crossing location; limiting the number of equipment trips across a stream during construction; and, minimizing the number and size of work areas (equipment staging areas and spoil storage areas). Place work areas at least 50 ft from stream channel. Field reconnaissance should be conducted during the planning stage to identify work areas.

***Use of Pre-Disturbed Areas***

- Locate project sites and work areas in areas disturbed by prior construction or other activity when possible.



## *Selection of Project Site*

- Avoid steep and unstable banks, highly erodible or saturated soils, or highly fractured rock.
- Select project site that minimizes disturbance to aquatic species or habitat.

## *Equipment Selection*

- Select equipment that reduces the amount of pressure exerted on the ground surface, and therefore, reduces erosion potential and/or use overhead or aerial access for transporting equipment across drainage channels. Use equipment that exerts ground pressures of less than 5 or 6 lb/in<sup>2</sup>, where possible. Low ground pressure equipment includes: wide or high flotation tires (34 to 72 in. wide); dual tires; bogie axle systems; tracked machines; lightweight equipment; and, central tire inflation systems.

## **Streambank Stabilization**

### ***Preservation of Existing Vegetation***

- Preserve existing vegetation in accordance with EC-2, Preservation of Existing Vegetation. In a streambank environment, preservation of existing vegetation provides the following benefits.

### *Water Quality Protection*

- Vegetated buffers on slopes trap sediment and promote groundwater recharge. The buffer width needed to maintain water quality ranges from 15 to 100 ft. On gradual slopes, most of the filtering occurs within the first 30 ft. Steeper slopes require a greater width of vegetative buffer to provide water quality benefits.

### *Streambank Stabilization*

- The root system of riparian vegetation stabilizes streambanks by increasing tensile strength in the soil. The presence of vegetation modifies the moisture condition of slopes (infiltration, evapo transpiration, interception) and increases bank stability.

### *Riparian Habitat*

- Buffers of diverse riparian vegetation provide food and shelter for riparian and aquatic organisms. Minimizing impacts to fisheries habitat is a major concern when working near streams and rivers. Riparian vegetation provides shade, shelter, organic matter (leaf detritus and large woody debris), and other nutrients that are necessary for fish and other aquatic organisms. Buffer widths for habitat concerns are typically wider than those recommended for water quality concerns (100 to 1500 ft).
- When working near watercourses, it is important to understand the work site's placement in the watershed. Riparian vegetation in headwater streams has a greater impact on overall water quality than vegetation in downstream reaches. Preserving existing vegetation upstream is necessary to maintain water quality, minimize bank failure, and maximize riparian habitat, downstream of the work site.

### *Limitations*

- Local county and municipal ordinances regarding width, extent and type of vegetative buffer required may exceed the specifications provided here; these ordinances should be investigated prior to construction.

*Streambank Stabilization Specific Installation*

- As a general rule, the width of a buffer strip between a road and the stream is recommended to be 50 ft plus four times the percent slope of the land, measured between the road and the top of stream bank.

**Hydraulic Mulch**

- Apply hydraulic mulch on disturbed streambanks above mean high water level in accordance with EC-3, Hydraulic Mulch to provide temporary soil stabilization.

*Limitations*

- Do not place hydraulic mulch or tackifiers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication (eutrophication is an algal bloom caused by excessively high nutrient levels in the water).

**Hydroseeding**

- Hydroseed disturbed streambanks in accordance with EC-4, Hydroseeding.

*Limitations*

- Do not place tackifiers or fertilizers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication.

**Soil Binders**

- Apply soil binders to disturbed streambanks in accordance with EC-5, Soil Binders.

*Limitations*

- Do not place soil binders below the mean high water level. Soil binder must be environmentally benign and non-toxic to aquatic organisms.

**Straw Mulch**

- Apply straw mulch to disturbed streambanks in accordance with EC-6, Straw Mulch.

*Limitations*

- Do not place straw mulch below the mean high water level, as this material could wash into the channel and impact water quality or possibly cause eutrophication.

**Geotextiles and Mats**

- Install geotextiles and mats as described in EC-7, Geotextiles and Mats, to stabilize disturbed channels and streambanks. Not all applications should be in the channel, for example, certain geotextile netting may snag fish gills and are not appropriate in fish bearing streams. Geotextile fabrics that are not biodegradable are not appropriate for in stream use. Additionally, geotextile fabric or blankets placed in channels must be adequate to sustain anticipated hydraulic forces.

**Earth Dikes, Drainage Swales, and Lined Ditches**

- Convey, intercept, or divert runoff from disturbed streambanks using EC-9, Earth Dikes and Drainage Swales.

## *Limitations*

- Do not place earth dikes in watercourses, as these structures are only suited for intercepting sheet flow, and should not be used to intercept concentrated flow.
- Appropriately sized velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

## ***Velocity Dissipation Devices***

- Place velocity dissipation devices at outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels in accordance with EC-10, Velocity Dissipation Devices.

## ***Slope Drains***

- Use slope drains to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area in accordance with EC-11, Slope Drains.

## *Limitations*

- Appropriately sized outlet protection and velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

## **Streambank Sediment Control**

### ***Silt Fences***

- Install silt fences in accordance with SE-1, Silt Fence, to control sediment. Silt fences should only be installed where sediment laden water can pond, thus allowing the sediment to settle out.

### ***Fiber Rolls***

- Install fiber rolls in accordance with SE-5, Fiber Rolls, along contour of slopes above the high water level to intercept runoff, reduce flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. In a stream environment, fiber rolls should be used in conjunction with other sediment control methods such as SE-1, Silt Fence or SE-9 Straw Bale Barrier. Install silt fence, straw bale barrier, or other erosion control method along toe of slope above the high water level.

### ***Gravel Bag Berm***

- A gravel bag berm or barrier can be utilized to intercept and slow the flow of sediment laden sheet flow runoff in accordance with SE-6, Gravel Bag Berm. In a stream environment gravel bag barriers can allow sediment to settle from runoff before water leaves the construction site and can be used to isolate the work area from the live stream.

## *Limitations*

- Gravel bag barriers are not recommended as a perimeter sediment control practice around streams.

### ***Straw Bale Barrier***

- Install straw bale barriers in accordance with SE-9, Straw Bale Barrier, to control sediment. Straw bale barriers should only be installed where sediment laden water can pond, thus allowing the sediment to settle out. Install a silt fence in accordance with SE-1, Silt Fence,

on down slope side of straw bale barrier closest to stream channel to provide added sediment control.

**Rock Filter***Description and Purpose*

Rock filters are temporary erosion control barriers composed of rock that is anchored in place. Rock filters detain the sediment laden runoff, retain the sediment, and release the water as sheet flow at a reduced velocity. Typical rock filter installations are illustrated at the end of this BMP.

*Applications*

- Near the toe of slopes that may be subject to flow and rill erosion.

*Limitations*

- Inappropriate for contributing drainage areas greater than 5 acres.
- Requires sufficient space for ponded water.
- Ineffective for diverting runoff because filters allow water to slowly seep through.
- Rock filter berms are difficult to remove when construction is complete.
- Unsuitable in developed areas or locations where aesthetics is a concern.

*Specifications*

- Rock: open graded rock, 0.75 to 5 in. for concentrated flow applications.
- Woven wire sheathing: 1 in. diameter, hexagonal mesh, galvanized 20gauge (used with rock filters in areas of concentrated flow).
- In construction traffic areas, maximum rock berm heights should be 12 in. Berms should be constructed every 300 ft on slopes less than 5%, every 200 ft on slopes between 5% and 10%, and every 100 ft on slopes greater than 10%.

*Maintenance*

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Reshape berms as needed and replace lost or dislodged rock, and filter fabric.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

## ***K-rail***

### *Description and Purpose*

This is temporary sediment control that uses K-rails to form the sediment deposition area, or to isolate the near bank construction area. Install K-rails at toe of slope in accordance with procedures described in NS-5, Clear Water Diversion.

Barriers are placed end to end in a pre-designed configuration and gravel filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

### *Appropriate Applications*

- This technique is useful at the toe of embankments, cuts or fills slopes.

### *Limitations*

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

### *Implementation*

- Refer to NS-5, Clear Water Diversion, for implementation requirements.

## **Instream Construction Sediment Control**

There are three different options currently available for reducing turbidity while working in a stream or river. The stream can be isolated from the area in which work is occurring by means of a water barrier, the stream can be diverted around the work site through a pipe or temporary channel, or one can employ construction practices that minimize sediment suspension.

Whatever technique is implemented, an important thing to remember is that dilution can sometimes be the solution. A probable "worst time" to release high TSS into a stream system might be when the stream is very low; summer low flow, for example. During these times, the flow may be low while the biological activity in the stream is very high. Conversely, the addition of high TSS or sediment during a big storm discharge might have a relatively low impact, because the stream is already turbid, and the stream energy is capable of transporting both suspended solids, and large quantities of bedload through the system. The optimum time to "pull" in-stream structures may be during the rising limb of a storm hydrograph.

### ***Techniques to minimize Total Suspended Solids (TSS)***

- **Padding** - Padding laid in the stream below the work site may trap some solids that are deposited in the stream during construction. After work is done, the padding is removed from the stream, and placed on the bank to assist in re-vegetation.
- **Clean, washed gravel** - Using clean, washed gravel decreases solid suspension, as there are fewer small particles deposited in the stream.
- **Excavation using a large bucket** - Each time a bucket of soil is placed in the stream, a portion is suspended. Approximately the same amount is suspended whether a small amount of soil is placed in the stream, or a large amount. Therefore, using a large excavator bucket instead of a small one, will reduce the total amount of soil that washes downstream.

- **Use of dozer for backfilling** - Using a dozer for backfilling instead of a backhoe follows the same principles – the fewer times soil is deposited in the stream, the less soil will be suspended.
- **Partial dewatering with a pump** - Partially dewatering a stream with a pump reduces the amount of water, and thus the amount of water that can suspend sediment.

### ***Washing Fines***

#### *Definition and Purpose*

- Washing fines is an “in-channel” sediment control method, which uses water, either from a water truck or hydrant, to wash stream fines that were brought to the surface of the channel bed during restoration, back into the interstitial spaces of the gravel and cobbles.
- The purpose of this technique is to reduce or eliminate the discharge of sediment from the channel bottom during the first seasonal flow. Sediment should not be allowed into stream channels; however, occasionally in-channel restoration work will involve moving or otherwise disturbing fines (sand and silt sized particles) that are already in the stream, usually below bankfull discharge elevation. Subsequent re-watering of the channel can result in a plume of turbidity and sedimentation.
- This technique washes the fines back into the channel bed. Bedload materials, including gravel cobbles, boulders and those fines, are naturally mobilized during higher storm flows. This technique is intended to delay the discharge until the fines would naturally be mobilized.

#### *Appropriate Applications*

- This technique should be used when construction work is required in channels. It is especially useful in intermittent or ephemeral streams in which work is performed “in the dry”, and which subsequently become re-watered.

#### *Limitations*

- The stream must have sufficient gravel and cobble substrate composition.
- The use of this technique requires consideration of time of year and timing of expected stream flows.
- The optimum time for the use of this technique is in the fall, prior to winter flows.
- Consultation with, and approval from the Department of Fish and Game and the Regional Water Quality Control Board may be required.

#### *Implementation*

- Apply sufficient water to wash fines, but not cause further erosion or runoff.
- Apply water slowly and evenly to prevent runoff and erosion.
- Consult with Department of Fish and Game and the Regional Water Quality Control Board for specific water quality requirements of applied water (e.g. chlorine).

## *Inspection and Maintenance*

- None necessary

## **Costs**

Cost may vary according to the combination of practices implemented.

## **Inspection and Maintenance**

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).

## **References**

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

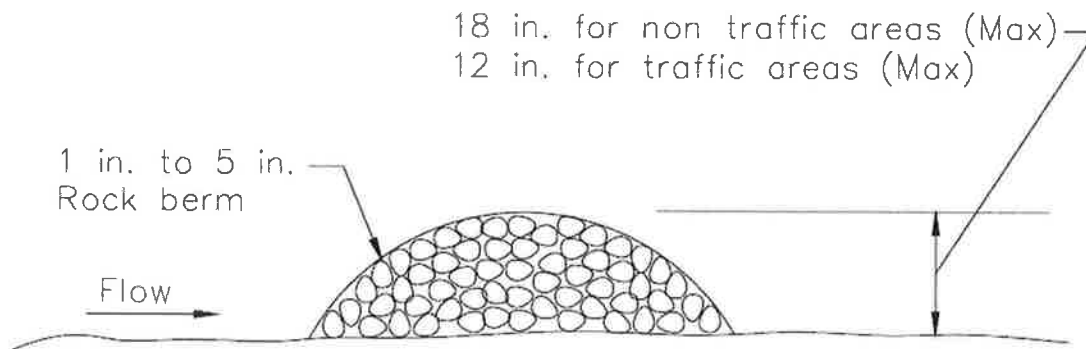
Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, An Inventory of Current Practices (Draft), USEPA, 1990.

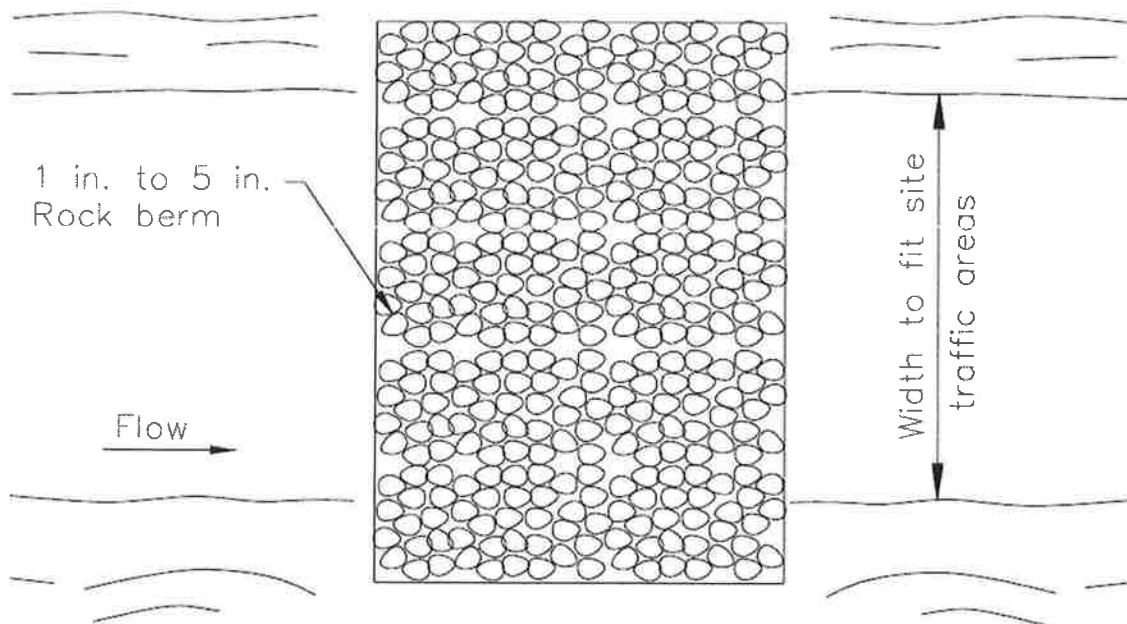
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



SECTION



PLAN

TYPICAL ROCK FILTER  
NOT TO SCALE



# Stormwater Management Program

## Best Management Practices Inventory

	A Owner/Maintenance Responsibility	B Street Address	C Telephone Number	D Sec/B/I/Lt	E BMP Type	F Inspection Date Requirement	G Date Installed	H Municipal Easement	I Maintenance Manual On File
1									
2									
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**Village of Mamaroneck**  
**Stormwater Management Program**  
**Construction Project Stormwater Pollution Prevention Plan Inventory (SWPPP)** (Page 1 of 2)

Item	Project
Project Name	
Project Owner	
Project Address	
Site Size (in acres)	
Telephone No. Owner	
Telephone No. Engineer	
Telephone No. Contractor	
Telephone No. (24 hour emergency))	
Start Date	
Estimated Completion Date	
List of BMP's During Construction	
1	
2	
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**Village of Mamaroneck**  
**Stormwater Management Program**  
**Construction Project Stormwater Pollution Prevention Plan Inventory (SWPPP)**      **(Page 2 of 2)**

Item	Project
List of Post Construction BMP's Inspection and Maintenance Criteria Received and on File	
1 Visual Inspection	
2 Cleaning	
3	
4	
5	
6	
7	
8	
9	
10	
Access Needed for Post BMP's Maintenance in Perpetuity Agreement(s) Received	
Project Completed, All Documentation Received and Filed Certificate of Occupancy Issued <b>(DATE)</b>	

[illegible][illegible]

**EXAMPLE, EX. PLE, EXAMPLE**  
**Village of Mamaroneck, New York**  
**Stormwater Management Program**  
**Minimum Measure 1 (Public Education and Outreach)**  
**Minimum Measure 2 (Public Participation and Involvement)**

<b>Item (Description)</b>	<b>Quantity</b>	<b>Location of Activity</b>	<b>Date</b>
Illicit Discharge Brochures	50 each	Village Hall and Recreation Office	January 1, 2013
Pet Waste Brochures	50 each	Village Hall and Recreation Office	January 1, 2013
Lawn Care Brochures	50 each	Village Hall and Recreation Office	January 1, 2013
Restaurant and Food Store Brochures	85	All facilities in Village	February 5, 2013
Service Station Brochures	25	All facilities in Village	February 5, 2013
Vehicle Washing Flyers	50	Harbor Festival	July 12-15, 2013
Neighbor Cleanup Day	100 participants 53- 40 gallon bags of trash collected	Village Wide	September 12, 2013
Stream Walk Sheldrake River, Columbus Park	10 participants 5-40 gallon bags of trash collected	Columbus Park	April 4, 2013
Presentation on Village Stormwater Activities	25 residents present	Village Hall	April 25, 2013
Illicit Discharge Brochures (Refill)	50 each	Village Hall and Recreation Office	Jun 30, 2013
Pet Waste Brochures (Refill)	50 each	Village Hall and Recreation Office	August 17, 2013

Water Index Number	Waterbody Name (W/PWL ID)	County	Type	Class	Cause/Pollutant	Source	Year
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### Part 1 - Individual Waterbody Segments with Impairment Requiring TMDL Development (con't)

Atlantic Ocean/Long Island Sound Drainage Basin							
(MW1.2) SI (portion 1)	* Arthur Kill, Class I, and minor tribs (1701-0010)	Richmond	Estuary	I	Floatables <sup>8</sup>	Urban/Storm/CSO	2002
(MW1.2) SI (portion 1)	Arthur Kill, Class I, and minor tribs (1701-0010)	Richmond	Estuary	I	Oxygen Demand <sup>1</sup>	Urban/Storm/CSO	2012
(MW1.2) SI (portion 2)	* Arthur Kill, Class SD, and minor tribs (1701-0182)	Richmond	Estuary	SD	Floatables <sup>8</sup>	Urban/Storm/CSO	2012
(MW1.2) SI (portion 2)	Arthur Kill, Class SD, and minor tribs (1701-0182)	Richmond	Estuary	SD	Oxygen Demand <sup>1</sup>	Urban/Storm/CSO	2012
(MW1.2) SI (portion 3)	* Newark Bay (1701-0183)	Richmond	Estuary	SD	Floatables <sup>8</sup>	Urban/Storm/CSO	2002
(MW1.2) SI (portion 4)	* Kill Van Kull (1701-0184)	Richmond	Estuary	SD	Floatables <sup>8</sup>	Urban/Storm/CSO	2002
(MW1.2) SI (portion 4)	Grassmere, Arbutus and Wolfes Lakes (1701-0357)	Richmond	Lake	B	Phosphorus	Urban/Storm/CSO	2002
(MW2.3) ER-1-5-P1043	Van Cortlandt Lake (1702-0008)	Richmond	Lake	B	Phosphorus	Onsite WTS, Urban	2002
(MW2.4) ER-3	Bronx River, Upper, and tribs (1702-0107)	Bronx	River	C	Oxygen Demand <sup>1</sup>	Urban Runoff	2002
(MW2.4) ER-3	Bronx River, Upper, and tribs (1702-0107)	Westchester	River	C	Pathogens	Urb/Storm Runoff	2002
(MW2.4) ER/LIS-LNB	Little Neck Bay (1702-0029)	Westchester	River	C	Pathogens	Urb/Storm Runoff	2004
(MW3.1) LIS (portion 2a)	* Larchmont Harbor (1702-0116)	Queens	Estuary	SB	Pathogens	Urban/Storm/CSO	1998
(MW3.1) LIS (portion 2a)	Larchmont Harbor (1702-0116)	Westchester	Estuary	SB	Floatables	Urb/Storm, Municipl	2002
(MW3.2) LIS-2	Hutchinson River, Middle, and tribs (1702-0074)	Westchester	Estuary	SB	Pathogens	Urb/Storm, Municipl	2002
(MW3.2) LIS-2	Hutchinson River, Middle, and tribs (1702-0074)	Westchester	River	B	Oil/Grease	Urb/Storm, Industr	2002
(MW3.2) LIS-2	Hutchinson River, Middle, and tribs (1702-0074)	Westchester	River	B	Oxygen Demand <sup>1</sup>	Urb/Storm, Industr	2002
(MW3.2) LIS-2	Hutchinson River, Middle, and tribs (1702-0074)	Westchester	River	B	Pathogens	Urb/Storm, Industr	2002
(MW3.2) LIS-2-P1075	* Reservoir No.1/Lake Isle (1702-0075)	Bronx	Lake	B	Phosphorus	Urban/Storm Runoff	2012
(MW3.3) LIS (portion 2b)	* Mamaroneck Harbor (1702-0125)	Westchester	Estuary	SB	Floatables	Urb/Storm, Municipl	2002
(MW3.3) LIS (portion 2b)	Mamaroneck Harbor (1702-0125)	Westchester	Estuary	SB	Pathogens	Urb/Storm, Municipl	2002
(MW3.3) LIS-8	Mamaroneck River, Lower (1702-0071)	Westchester	River	SC	Oxygen Demand <sup>1</sup>	Urb/Storm Runoff	2002
(MW3.3) LIS-8	Mamaroneck River, Lower (1702-0071)	Westchester	River	SC	Silt/Sediment	Urb/Storm Runoff	2002
(MW3.3) LIS-8	Mamaroneck River, Upp, & minor tribs (1702-0123)	Westchester	River	C	Oxygen Demand <sup>1</sup>	Urb/Storm Runoff	2002
(MW3.3) LIS-8-1	Mamaroneck River, Upp, & minor tribs (1702-0123)	Westchester	River	C	Silt/Sediment	Urb/Storm Runoff	2002
(MW3.3) LIS-8-1	Sheldrake River (1702-0069)	Westchester	River	C	Phosphorus	Urb/Storm Runoff	2002
(MW3.3) LIS-8-1	Sheldrake River (1702-0069)	Westchester	River	C	Silt/Sediment	Urb/Storm Runoff	2002
(MW3.3) LIS-8-P1094	* Silver Lake (1702-0040)	Westchester	Lake	B	Phosphorus	Urban/Storm Runoff	2012
(MW3.4) LIS (portion 2c)	* Milton Harbor (1702-0063)	Westchester	Estuary	SB	Floatables	Urb/Storm, Municipl	2002
(MW3.4) LIS (portion 2c)	Milton Harbor (1702-0063)	Westchester	Estuary	SB	Pathogens	Urb/Storm, Municipl	2002
(MW3.4) LIS-11	Blind Brook, Lower (1702-0062)	Westchester	River	SC	Silt/Sediment	Urb/Storm Runoff	2002
(MW3.4) LIS-11	Blind Brook, Upper, and tribs (1702-0130)	Westchester	River	C	Silt/Sediment	Urb/Storm Runoff	2002
(MW3.6) LIS (portion 2d)	* Port Chester Harbor (1702-0260)	Westchester	Estuary	SB	Floatables	Urb/Storm, Municipl	2002
(MW3.6) LIS (portion 2d)	Port Chester Harbor (1702-0260)	Westchester	Estuary	SB	Pathogens	Urb/Storm, Municipl	2002
(MW3.6) LIS-13	Byram River, Lower (1702-0132)	Westchester	Estuary	SC	Pathogens	Onsite WTS, Urb Runoff	2004
(MW4.2b) LIS-MB (portion 2)	* Manhasset Bay, and tidal tribs (1702-0141)	Nassau	Estuary	SB	Pathogens	Urb/Storm Runoff	2002
(MW4.3a) LIS-HH	Hempstead Harbor, south, & tidal tribs (1702-0263)	Nassau	Estuary	SB	Pathogens	Urb/Storm Runoff	2002
(MW4.3a) LIS-HH-38	Glen Cove Creek, Lower, and tribs (1702-0146)	Nassau	Estuary	SC	Pathogens	Urb/Storm, Mun/Ind	2002
(MW4.3a) LIS-HH-38	Glen Cove Creek, Lower, and tribs (1702-0146)	Nassau	Estuary	SC	Silt/Sediment	Urb/Storm, Mun/Ind	2002

Water Index Number	Waterbody Name (WI/PWL ID)	County	Type	Class	Cause/Pollutant	Source	Year
<b>Part 2c - Multiple Segment/Categorical Impaired Waterbody Segments (shellfishing)</b>							
(Might be addressed by a waterbody specific TMDL or a pollutant/source specific TMDL or other strategy to attain water quality standards)							
<u>Atlantic Ocean/Long Island Sound Drainage Basin</u>							
(MW0.0) AO (portion 1)	<u>Atlantic Ocean Coastline (1701-0014)</u>	Queens	Ocean	SA	Pathogens	Urban/Storm Runoff	2012
(MW1.2) RB (portion 1)	Raritan Bay, Class SA (1701-0002)	Richmond	Estuary	SA	Pathogens	Urban/Storm/CSO	1998
(MW3.1) LIS (portion 1b)	New Rochelle Harbor (1702-0259)	Westchester	Estuary	SA	Pathogens	Urban/Storm, Municipal	2002
(MW3.1) LIS (portion 2)	Long Island Sound, Westchester Co. Waters (1702-0001)	Westchester	Estuary	SA	Pathogens	Urban/CSO, Municipal	1998
(MW4.1) LIS (portion 3)	Long Island Sound, Nassau County Waters (1702-0028)	Nassau	Estuary	SA	Pathogens	Urban/CSO, Municipal	1998
(MW4.2b) LIS-MB (portion 1)	Manhasset Bay, and tidal tribs (1702-0021)	Nassau	Estuary	SA	Pathogens	Urban/Storm Runoff	1998
(MW4.3b) LIS-41-P145	Dosoris Pond (1702-0024)	Nassau	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW5.4b) LIS-P339	Flax Pond (1702-0240)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2012
(MW5.4g) LIS-FI-P1101,P1102	Beach/Island Ponds, Fishers Island (1701-0283)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW6.1a) GB-P397	Spring Pond (1701-0230)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2012
(MW6.1c) GB.LPB-CH-93, P420	Mud/East Creeks and tribs (1701-0377)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2012
(MW6.1c) GB.LPB-CH-94	Wickham Creek and tribs (1701-0378)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2012
(MW6.1d) GB.LPB-CH-96	West Creek and tidal tribs (1701-0246)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2012
(MW6.3b) GB.GPB-122a-P652	Scallop Pond (1701-0354)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW6.3g) BIS..P764	Oyster Pond/Lake Munchogue (1701-0169)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	1998
(MW6.3i) AO-SB-155	Phillips Creek, Lower, and tidal tribs (1701-0299)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW6.3i) AO-SB-QgC	Quogue Canal (1701-0301)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW7.2a) AO-MB (portion 4)	Forge River, Lower and Cove (1701-0316)	Suffolk	Estuary	SA	Pathogens	Urban/Storm, Agric.	2002
(MW7.6) AO-GSB (portion 6)	Nicoll Bay (1701-0375)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW7.8) AO-GSB (portion 7)	Great Cove (1701-0376)	Suffolk	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW8.1) SOB	South Oyster Bay (1701-0041)	Nassau	Estuary	SA	Pathogens	Urban/Storm Runoff	1998
(MW8.2) EB	East Bay (1701-0202)	Nassau	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW8.3) MDB	Middle Bay (1701-0208)	Nassau	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW8.3) MDB-ERI	East Rockaway Inlet (1701-0217)	Nassau	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW8.3) MDB-RC	Reynolds Channel, east (1701-0215)	Nassau	Estuary	SA	Pathogens	Urban/Storm Runoff	2002
(MW8.4) HB	Hempstead Bay (1701-0032)	Nassau	Estuary	SA	Pathogens	Urban/Storm Runoff	1998
(MW8.4a) HB-236	Woodmere Channel (1701-0219)	Nassau	Estuary	SA	Pathogens	Urban/Storm Runoff	2002

#### More Information Regarding Shellfishing

Waters impaired for shellfishing use are based on shellfishing closures issues by New York State Department of Environmental Conservation Shellfisheries Program and the National Shellfish Sanitation Program. Because the specific extent and conditions of the closures are reported more precisely and more frequently through these programs than through the Section 303(d) List, this shellfish closure information provides better delineated and more timely information regarding the support of shellfishing use in the waters of New York than does the Section 303(d) List. For the most current shellfishing closure information, refer to <http://www.dec.state.ny.us/website/dfwmr/marine/shellfish/sfnish/index.htm>.



# Atlantic/Long Island Sound Basin      Priority Waterbodies List      Table 1

Water Index Number	Waterbody/Segment Name (ID) Use Impairment(s)	County	Seg Size	Type	Class	W.B.Category
(MW3.2) LIS- 7	East Creek and tidal tribs (1702-0042) Aquatic Life SUSPECTED of being STRESSED Recreation SUSPECTED of being STRESSED	Westchester	10.7 Acre	Estuary	SC	MinorImpacts
(MW3.3) LIS (portion 2b) <b>2010 Section 303(d) Listed Water</b>	<b>Mamaroneck Harbor (1702-0125)</b> Public Bathing KNOWN to be IMPAIRED Recreation KNOWN to be IMPAIRED Aquatic Life KNOWN to be STRESSED Aesthetics KNOWN to be STRESSED Fish Consumption SUSPECTED of being STRESSED	Westchester	127.2 Acre	Estuary	SB	Impaired Seg
(MW3.3) LIS- 8 <b>2010 Section 303(d) Listed Water</b>	<b>Mamaroneck River, Lower (1702-0071)</b> Aquatic Life KNOWN to be IMPAIRED Recreation KNOWN to be IMPAIRED Aesthetics KNOWN to be STRESSED	Westchester	75.9 Acre	Estuary	SC	Impaired Seg
(MW3.3) LIS- 8 <b>2010 Section 303(d) Listed Water</b>	Mamaroneck River, Upper, and minor tribs (1702-0123) Aquatic Life KNOWN to be IMPAIRED Recreation KNOWN to be IMPAIRED	Westchester	33.9 Mile	River	C	Impaired Seg
(MW3.3) LIS- 8- 1 <b>2010 Section 303(d) Listed Water</b>	<b>Sheldrake River and tribs (1702-0069)</b> Fish Consumption KNOWN to be IMPAIRED Aquatic Life SUSPECTED of being IMPAIRED Recreation SUSPECTED of being IMPAIRED Aesthetics KNOWN to be STRESSED	Westchester	7.5 Mile	River	C	Impaired Seg
(MW3.3) LIS- 8- 1-P1087	Sheldrake Lake/Upper Larchmont Reservoir (1702-0067) Water Supply KNOWN to be STRESSED Public Bathing KNOWN to be STRESSED Recreation SUSPECTED of being STRESSED	Westchester	28.5 Acre	Lake	A	MinorImpacts



# Atlantic/Long Island Sound Basin      Priority Waterbodies List      Table 1

Water Index Number	Waterbody/Segment Name (ID) Use Impairment(s)	County	Seg Size	Type	Class	W.B.Category
(MW3.1) LIS (portion 1)	Long Island Sound, Western Portion (1702-0027) Aquatic Life KNOWN to be IMPAIRED Public Bathing KNOWN to be STRESSED Recreation KNOWN to be STRESSED Aesthetics KNOWN to be STRESSED Fish Consumption SUSPECTED of being STRESSED	Bronx	8243.1 Acre	Estuary	SB	Impaired Seg
		Causes: D.O./Oxygen Demand, Nutrients Sources: Atmosph. Deposition, Comb. Sewer Overflow, Municipal, Other ...				
(MW3.1) LIS (portion 1a)	Eastchester Bay (1702-0007) Aquatic Life KNOWN to be IMPAIRED Public Bathing KNOWN to be STRESSED Recreation KNOWN to be STRESSED Aesthetics KNOWN to be STRESSED Fish Consumption SUSPECTED of being STRESSED	Bronx	962.2 Acre	Estuary	SB	Impaired Seg
		Causes: D.O./Oxygen Demand, Nutrients, Pathogens Sources: Comb. Sewer Overflow, Municipal, Other Source, Urb/Storm R...				
(MW3.1) LIS (portion 1b) <b>2010 Section 303(d) Listed Water</b>	New Rochelle Harbor (1702-0259) Shellfishing KNOWN to be PRECLUDED Public Bathing KNOWN to be IMPAIRED Aquatic Life KNOWN to be IMPAIRED Recreation KNOWN to be STRESSED Aesthetics KNOWN to be STRESSED Fish Consumption SUSPECTED of being STRESSED	Westchester	281.1 Acre	Estuary	SA	Impaired Seg
		Causes: Aesthetics, D.O./Oxygen Demand, Nutrients, Pathogens Sources: Municipal, Municipal, Other Source, Urban/Storm Runoff, Othe...				
(MW3.1) LIS (portion 2) <b>2010 Section 303(d) Listed Water</b>	<b>Long Island Sound, Westchester Co Waters (1702-0001)</b> Shellfishing KNOWN to be PRECLUDED Aquatic Life KNOWN to be IMPAIRED Public Bathing KNOWN to be STRESSED Recreation KNOWN to be STRESSED Aesthetics KNOWN to be STRESSED Fish Consumption SUSPECTED of being STRESSED	Westchester	13726.5 Acre	Estuary	SA*	Impaired Seg
		Causes: <b>D.O./Oxygen Demand, Nutrients, Pathogens</b> Sources: Atmosph. Deposition, Comb. Sewer Overflow, Municipal, Other ...				