

## CHAPTER 6

# STORM WATER MANAGEMENT PRACTICES

### INTRODUCTION

Storm water management practices for urban and urbanizing areas should include both practices to control the runoff from new development and practices to treat the runoff from existing developed areas. Management practices for new development are ones that control storm water at the source through development standards such as lot characteristics, drainage system types, and local on-site storage (through ordinances). Management practices for existing development are those that must be retrofitted into the existing urban landscape to control existing sources of water and pollutants. These management practices include illicit discharge detection, street sweeping, fertilizer management, catch basin cleaning and pet waste control. Management practices for existing development are often limited by location and density of existing buildings, roads, and utilities, and, therefore, must take advantage of limited space and site conditions.

This chapter discusses some additional storm water management practices that address pollutant control, which are required as part of the Town's Municipal Separate Storm Sewer System (MS4) Permit. Sections will include construction site erosion control and post construction storm water management ordinances, illicit discharge detection and elimination, pollution prevention planning, storm sewer system mapping, and public education and outreach.

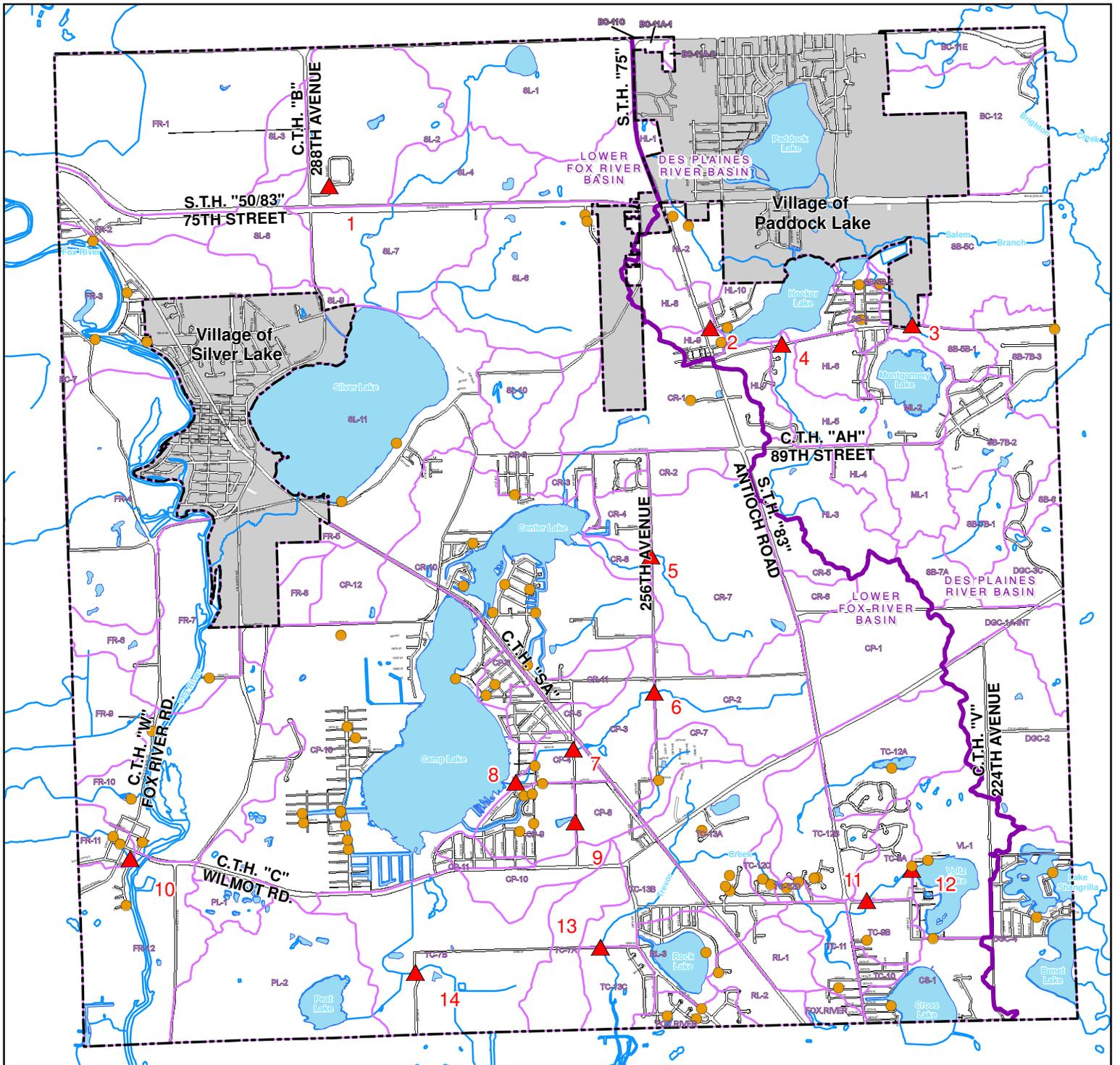
### CONSTRUCTION SITE EROSION CONTROL

It has been estimated that soil erosion from construction sites can equal or exceed 35 to 45 tons/acre/year, which is much higher than the average soil loss rates from agricultural lands. Construction site erosion can be controlled through practices such as siltation barriers, sedimentation basins, storm sewer inlet protection, tracking pads, diversion swales, and seeding and mulching. Acceptable design standards for construction site erosion control devices are outlined in the Wisconsin Department of Natural Resources (WDNR) Technical Standards (available on the WDNR website).

In August of 2008, the Town adopted a Construction Site Erosion Control Ordinance based on the WDNR model ordinance, which reflects the requirements of the NR 151 standards. This ordinance requires that all construction sites with one or more acres of land disturbing construction activity use Best Management Practices (BMPs) that achieve, to the maximum extent practicable, a reduction of 80% of the Total Suspended Solids (TSS) load carried in runoff on an average annual basis, as compared with no sediment or erosion controls, until the construction site has undergone final stabilization. A copy of the Construction Site Erosion and Sediment Control Ordinance is included in Appendix G.

### POST-CONSTRUCTION STORM WATER MANAGEMENT

Uncontrolled, post-construction runoff has a significant impact upon the water resources and the health, safety and general welfare of the community due to the additional amounts of impervious areas associated with new development. Impervious surfaces are considered to be solid surfaces that prevent rainfall from infiltrating back into the ground, thus leading the rainfall to run off these surfaces in greater quantities and at higher velocities with an increased pollutant loading. Specifically, post-construction runoff can:



**FIGURE 6-1  
TOWN OF SALEM  
MAJOR OUTFALL MAP**

**DRAFT**

**Legend**

- ▲ Major Outfall Location
- Outfall Location
- Major Watershed Boundary
- Subbasin Boundaries
- ~ Water of the State - Waterways
- ~ Water of the State - Open Waters
- Outside Town Boundary
- Municipal Boundary

ID Number	Subbasin	Size
1	LF-20	2 - 24"
2	SB-2C	36"
3	SB-5B	36" x 48" Ellipse
4	SB-2B	36"
5	TC-2	36"
6	TC-4	46" Box
7	TC-4	2 - 36"
8	TC-4	96" x 36" Box
9	TC-5	36"
10	LF-27	84" Box
11	TC-9	36"
12	TC-9	4 - 15"
13	TC-13	72" Box
14	TC-7	192" x 72" Arch Box



NTS

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1. Degrade physical stream habitat by increasing stream bank erosion, increasing streambed scour, diminishing groundwater recharge, diminishing stream base flows and increasing stream temperature.
2. Diminish the capacity of lakes and streams to support fish, aquatic life, recreational and water supply uses by increasing pollutant loading of sediment, suspended solids, nutrients, heavy metals, bacteria, pathogens and other urban pollutants.
3. Alter wetland communities by changing wetland hydrology and by increasing pollutant loads.
4. Reduce the quality of groundwater by increasing pollutant loading.
5. Threaten public health, safety, property, and general welfare by overtaxing storm sewers, drainage ways, and other minor drainage facilities.
6. Threaten public health, safety, property, and general welfare by increasing major flood peaks and volumes.
7. Undermine floodplain management efforts by increasing the incidence and levels of flooding.
8. Aggravate excessive infiltration and inflow of water into sanitary sewer connections during peak storm events, causing the conveyance system to surcharge, overflow, or backup into basements.

In August of 2008, the Town adopted a Post-Construction Storm Water Management Ordinance, which established long-term, post construction runoff management requirements that will diminish these threats to public health, safety, welfare and the aquatic environment. This ordinance is based on the WDNR model ordinance which reflects the requirements of the NR 151 standards. It requires that all construction sites with one or more acres of land disturbing construction activity implement a post-construction storm water management plan that incorporates best management practices that are designed, installed and maintained to address the specific TSS reduction, peak discharge reduction, and infiltration requirements set forth in NR 151.

A copy of the Post-Construction Storm Water Management Ordinance is included in Appendix H.

### **ILLICIT DISCHARGE DETECTION AND ELIMINATION**

An illicit discharge is defined as any drain or conveyance, whether on the surface or subsurface, which allows an illegal substance to enter the municipal storm water conveyance system and, ultimately, waters of the state. Examples of possible illicit discharges are sanitary sewage, wash water (commercial car washes, commercial laundry, etc), liquid wastes (oil, paint, and process water), and even tap water (from leaks and losses in the water supply system). These discharges can enter the storm water conveyance system either directly or indirectly. Examples of the modes of entry can include sanitary sewer cross-connections, straight pipe connections, ground water seepage through cracks in the system, or spills that enter the system through a storm drain inlet or ditch.

Eliminating illicit discharges is a critical component to restoring urban watersheds. There is both a public health and economic impact as the result of these discharges. When bodies of water cannot meet designated uses for drinking water, fishing, or recreation, tourism and waterfront home values may fall; beaches can be closed; and fishing may become restricted. Significant impacts for aquatic life and habitat are also realized. Numerous fish kills and other aquatic life losses have occurred in watersheds as a result of illicit or accidental dumping that result in lethal pollutant concentrations in receiving waters.

Since these discharges can be so detrimental to the health of waters of the state, the Town's MS4 Permit requires development, implementation and enforcement of an illicit discharge detection and elimination program. This program includes adopting and enforcing an illicit discharge ordinance, developing illicit discharge response procedures, completing an initial field screening of all major outfalls in the Town, and completing annual dry weather field screenings at these major outfall locations beginning in 2010.

Total Area: 2.06Ac.  
Percentage Impervious: 75%  
Percentage Pervious: 25%



**FIGURE 6-2**  
**TOWN OF SALEM**  
**DEPARTMENT OF HIGHWAYS YARD SITE MAP**

**DRAFT**

**Legend**

 Yard Boundary



## Ordinances

In 2008 the Town adopted an illicit discharge ordinance to prohibit the discharge of substances or materials that are not entirely composed of storm water into receiving bodies of water, storm water conveyance systems, or other drainage facilities, or onto driveways, sidewalks, parking lots or other impervious areas that drain into the storm water conveyance system. Exclusions outlined in this ordinance include:

1. Discharges authorized by a permit issued by the WDNR.
2. Discharges resulting from fire fighting activities.
3. Discharges from uncontaminated ground water, potable water source, roof drains, foundation drains and sump pumps, air conditioning condensation, lawn watering, water main and hydrant flushing, and swimming pools if the water has been reasonably dechlorinated.
4. Discharges from individual automobile washing by automobile owners.
5. Facility maintenance activities undertaken by any federal, state, county, or municipal agency, such activities, however, being subject to construction erosion control measures.

This ordinance also establishes an inspection and enforcement authority for any violators. The Town's ordinance is included in Appendix I.

## Response Procedures

In 2008, the Town developed illicit discharge response procedures to be used to use while responding to either resident complaints or when suspected illicit discharges are found in the field during inspections. These response procedures are attached in Appendix J, but in summary, the response procedures include five basic steps in order to isolate and fix an illicit discharge as follows:

1. Field investigation of the potential illicit discharge concern location will be performed.
2. Drainage area investigation will be completed if there is reasonable evidence of an illicit discharge to narrow down possible sources of the discharge.
3. When the drainage area is identified, a storm drain network investigation will be completed to further narrow the source of the discharge via smoke testing or video testing.
4. Once the illicit discharge has been isolated to a specific area, an on-site investigation can be performed by dye testing methods.
5. Correction and enforcement actions will be taken.

## Annual Dry Weather Field Screening

As stated previously, illicit discharge inspections need to be completed during periods of dry weather at all of the major outfalls within the Town. Figure 6-1 illustrates the 14 major outfall locations that will need to be investigated annually as part of this program. The following inspection procedures shall be implemented:

1. Visual inspection will be performed during dry weather periods (June through August, at least 72 hours after any significant rainfall).
2. Inspections will be performed by Town Highway Department staff or the Town Engineer.
3. Data will be recorded in the field at the time of visual inspection by means of an inspection form. A photograph will also be taken of each outfall.
4. All of the inspection forms used for the initial field screening will be compiled into a binder for easy access while out in the field. A copy of the previous inspection form is included for reference.

5. Following completion of the field inspections, the data will be scanned in electronically for record keeping and annual reporting. The results of the inspections will be discussed with the Town Administrator.

In addition, Town Highway Department staff will be educated on the importance of recognizing illicit discharges and reacting properly to occurrences through the continuing education aspect of the Town’s public education and outreach requirements.

An initial dry weather field screening was completed in August of 2009, which entailed investigating the 14 major outfalls within the Town of Salem. The characteristics of the outfall and the water discharging (if any) from the outfall were noted, including the color of the water, the turbidity of the water, and whether or not a surface sheen and/or odor was present. Of the 14 outfalls that were inspected, no illegal connections or illicit discharges were detected. A sample was taken at Major Outfall #2 due to the presence of scum and a slight sheen on the waters surface. However, further testing of this sample indicated that there was only 0.05 mg/L of detergent present in the sample, which was below the accepted parameter of 0.25 mg/L, as shown in Table 6-1, so no further investigation was necessary. A summary of the initial field screening inspections as well as the inspection forms and photos for each outfall are included in Appendix K.

**Table 6-1  
Testing Results of Major Outfall #2**

Parameter	Expected Range	Actual Parameter Reading
pH Level*	6.0 – 9.0	7.6
Total Chlorine Level*	< 0.2 mg/L	0.00 mg/L
Total Copper Level*	< 0.1 mg/L	0.00 mg/L
Total Phenol Level*	< 0.5 mg/L	0.00 mg/L
Detergents Level*	< 0.25 mg/L	0.05 mg/L

\* Expected ranges represent maximum readings as used by the WDNR and the City of Milwaukee

**POLLUTION PREVENTION**

There are many management practices to control the source of storm water pollutants for existing development. This section will cover the management practices that the Town included as part of the Storm Water Pollution Prevention Plan created in 2008 for compliance with their MS4 Permit. These programs include routine inspections, street sweeping, catch basin cleaning, roadway deicing, leaf and grass clipping management, fertilizer management, pollution prevention planning for the Town’s Department of Highways Yard, and storm water education for municipal personnel.

**Inspections & Maintenance of Town-Owned Storm Water Facilities**

The Town of Salem owns and operates two wet detention basins. One of these wet ponds is located in the southwest quadrant of the intersection of 104<sup>th</sup> Street and 264<sup>th</sup> Avenue. This pond was constructed with a 12” outlet culvert that discharges into Camp Lake. The other wet pond is bordered to the east by 268<sup>th</sup> Avenue, to the north by 111<sup>th</sup> Place, and to the south by 113<sup>th</sup> Street. This pond is actually a chain of five interconnected basins each with a 20-foot broad crested weir connecting them together before the ultimate discharge point into Camp Lake. Both facilities were installed to help protect water quality in Camp Lake since there is a large amount of agricultural lands that drain to this lake.

Both of these facilities will be inspected annually to ensure that they are operating efficiently and any maintenance is addressed as needed. Routine vegetative maintenance will also continue to be completed regularly to maintain the pollutant removal operating efficiency.

### **Street Sweeping and Catch Basin Cleaning**

Street sweeping involves the removal of dust, debris and trash from parking lots and street surfaces. The theory behind street sweeping is that the materials are removed from the streets where they are deposited, so they are no longer available to be transported by surface runoff into lakes and streams. This practice is most effective in urban areas with curbed streets because pollutants are redistributed along the curb by wind turbulence generated from automobile traffic. In areas without a curb, much of the pollution mass is blown out into adjacent grass ditch areas.

The majority of the Town of Salem's streets have a rural cross section that includes gravel shoulders and drainage ditches, which limit the effectiveness of this practice. Therefore, street sweeping has never been considered in the past. However, the Town recently recognized the need for street sweeping with the growing amount of curbed streets within the developing subdivisions. Therefore, the Town decided to purchase a used mechanical broom street sweeper to address this issue. It is anticipated that the Highway Department crews will sweep all the curbed streets at a frequency of once per year during the spring. The debris collected from street sweeping will then be collected by the Town's Waste Management contractor (Green Valley Disposal Co.).

Catch basins are sumps or chambers installed in storm sewer inlets designed to trap coarse sediment. By trapping these coarse sediments, the catch basin prevents trapped solids from clogging the sewer or being washed into receiving waters. To be effective, however, the sumps need to be cleaned periodically. The Town owns very few catch basins and, therefore, does not need a formal catch basin cleaning program. All catch basin cleaning will continue to be done after the fall season and on an as-needed basis to collect any yard waste that got into the system.

### **Application of Road Salt or Deicer**

Winter maintenance activities generally consist of plowing and salting roadways during snow/ice conditions. The goal of winter maintenance is to make roadways safe within the limitations of resources. The Town of Salem uses a salt/sand mix for roadway deicing to maintain public safety. This salt/sand mixture consists of approximately 60% sand, and the remaining 40% is made up of salt, birdseye gravel and chloride. The quantity of each component of the deicing mixture is determined by the roadway temperature. The individual components are stored within a 500 ton salt storage shed located at the Highway Department Yard site. The Town of Salem Highway Department crews are responsible for all winter maintenance activities within the Town. The deicing mixture is combined when the highway crews are loading the trucks. The Town will continue to use this salt/sand mixture at a quantity to maintain the safety of the roadways while limiting the negative environmental impacts.

### **Leaf and Yard Waste Management**

The leach material from fallen leaves and lawn clippings is a major source of phosphorus in urban storm water runoff. Preventing these materials from being placed in an area where they can be washed away into downstream receiving waters can help reduce phosphorus loadings. In previous years, a leaf and yard waste program was not available to the Town of Salem residents, but the Town recently decided to initiate a formal program to help address this issue. Starting in the spring of 2008, residents are encouraged to bring in all yard waste to the Town Hall for disposal. The Town's contracted waste management providers, Green Valley Disposal Co., picks up this yard waste for off-site composting. This service will

be available to residents all year long. Residents are also encouraged to mulch their own yard waste on their own property.

### **Application of Lawn and Garden Fertilizers**

Fertilizer management involves the control of the rate, timing, and method of fertilizer application in urban areas so that excess nutrients do not contaminate the surface or groundwater. By applying fertilizers at rates that are proportional to the lawns needs, excess nutrients are not available to be transported by runoff.

The Town of Salem uses very little fertilizer application. Fertilizer is applied for weed control twice per year at municipal buildings and parks, all of which are less than 5-acre sites. To pursue safer fertilizer applications, the Town shall apply fertilizer in the spring and fall seasons only; spilled fertilizer should be promptly cleaned up; and the practice of leaving a buffer strip of unfertilized lawn along ditches, waterways and ponds should be used.

### **Municipal Garages & Storage Areas**

The Town of Salem's Department of Highways Yard is located off of 258<sup>th</sup> Court. The facility's address and contact information are:

11200 258<sup>th</sup> Court  
Salem, WI 53179  
Mike Murdock – Highway Department Supervisor  
Main Phone (262) 862-6012

The Department of Highways yard serves as a staging and storage area for equipment and materials used for Town operations. The entire facility is paved, and access to the facility is obtained via a driveway on 258<sup>th</sup> Court.

Structures located at the Department of Highways Yard consist of three buildings. The main building serves as an office and lunchroom for personnel, a storage area for tools, equipment and liquid chemicals, and maintenance and storage area for vehicles. A salt storage building directly abuts this building to the northwest and has a capacity of 500 tons of salt. The third building is an older garage area in the back of the yard for additional vehicle and equipment storage.

The main building also contains an area designated for light maintenance and washing of vehicles. Detergents used for washing are phosphate-free and biodegradable. Liquid chemicals stored inside the Department of Highways garage include anti-freeze and motor oil, which are securely stored in covered drums. Since all vehicles are stored within the garage, chemicals could be contained in the event of a spill, because the floor drains within the garage are connected to the sanitary sewer system.

Outdoor uncovered operations include scrap piping material storage, aggregate piles, a vehicle fueling area, and other miscellaneous equipment and materials storage. On-site fuel storage is contained within underground tanks and is available for the Town's Highway and Fire Department vehicles. These underground fuel tanks are permitted by the EPA and are inspected regularly. The Department of Highways yard drains to various low-points in the yard, which eventually drains to Camp Lake about a half mile west of this facility before the ultimate discharge point of the Lower Fox River.

Figure 6-2 presents a site map of the Town's Department of Highway's facility showing the following features:

1. The facility property boundaries
2. A depiction of the storm water collection system
3. The total surface area in acres, including the percentage that is impervious such as paved, roofed, or highly compacted soil and the percentage that is pervious such as grassy areas and woods
4. Topographic information of the site
5. The name and location of receiving waters
6. The location of activities and materials that have the potential to contaminate storm water

The following have been identified as potential sources of storm water contamination:

1. Storage and maintenance areas for material handling equipment
2. Access roads/driveways
3. Vehicle maintenance, fueling and cleaning areas
4. Any other areas capable of contaminating storm water runoff

It should be noted that since the current Department of Highways Yard is an inefficient space that doesn't afford much room for operations, the Town is in the process of constructing a new facility that will be located across 258<sup>th</sup> Court, with access off of CTH C. This facility is planned to be finished in 2010 and will have a wet detention basin and an infiltration basin to settle out sediments from site runoff, as well as modern material management structures for salt and sand storage.

### **Education of Municipal Personnel**

The following efforts shall be completed annually by the Town of Salem to keep all municipal personnel educated on storm water management issues and regulations in place:

1. Regular briefings on the progress of storm water programs, policies and procedures relating to storm water, including storm water regulations, will be given to the staff. The following topics will be addressed:
  - a. Spill Prevention and Response – identify potential spill areas and drainage routes, how to report spills, proper material handling procedures, and how to implement the facility's spill response procedures
  - b. Good Housekeeping – instruction on proper clean up frequencies of work areas to prevent storm water contamination, and location and proper usage of housekeeping equipment
  - c. Material Management Practices – instruction on maintaining materials in an organized manner, location and markings of toxic and hazardous substances, and proper and safe handling procedures for toxic and hazardous substances
2. Current storm water information will be made available to staff through staff meetings and will be posted throughout the facility.
3. Staff will be encouraged to attend area training and education sessions on storm water-related topics such as erosion control techniques.

### **Measures to Reduce Municipal Sources of Contamination**

To reduce municipal sources of contamination the following actions will be implemented:

1. Source Area Controls – to the maximum extent practicable, and to the extent it is cost effective, the use of source area control best management practices designed to prevent storm water from becoming contaminated will be used. Some examples of source area controls are as follows:
  - a. Erosion Control Measures – areas that are prone to soil erosion are protected to keep soil out of the storm water discharge.
  - b. Preventive Maintenance – regular inspection, testing, and cleaning of municipal equipment and operational systems. (Examples: fuel pumps, storage tanks for waste fluids, structural controls, etc.)
  - c. Quarterly Inspection of the Department of Highways facility for possible pollutant contamination
2. Best Management Practices (BMPs) – Currently the Town owns two wet detention basins to help protect water quality. These facilities will continue to be inspected and maintained regularly to ensure the pollutant removal efficiencies. If opportunities arise to install any additional storm water BMPs at an affordable cost, the Town should consider doing so.

### **MUNICIPAL SEPARATE STORM SEWER SYSTEM MAP**

The Town developed a Municipal Separate Storm Sewer System (MS4) Map in 2008 as part of the MS4 Permit requirements. This mapping requirement is meant to help the Town identify all waterways and wetlands within the Town and the sub watersheds that drain to them, as well as identify the conveyance systems and storm water management facilities. This map includes the following:

1. Identification of waters of the state, name and classification of receiving water(s), identification of whether receiving water is an Outstanding Resource Water (ORW), Exceptional Resource Water (ERW), or listed as an impaired water under s. 303(d) of the Clean Water Act, storm water drainage basin boundaries for each MS4 outfall and MS4 conveyance systems.
2. Identification of any known threatened or endangered resources, historical property and wetlands.
3. Identification of all known MS4 outfalls discharging to waters of the state and other MS4s. Major outfalls shall be uniquely identified.
4. Location of any known discharge to the MS4 that has been issued Wisconsin Pollutant Discharge Elimination System (WPDES) permit coverage by the Department. A list of WPDES permit holders in the permittee's area may be obtained from the Department.
5. Location of municipally owned or operated structural storm water management facilities including wet detention basins, infiltration basins, and manufactured treatment devices. If the permittee will be taking credit for pollutant removal from privately-owned facilities, they must be identified.
6. Identification of publicly owned parks, recreational areas and other open lands.
7. Location of municipal garages, storage areas and other public works facilities.
8. Identification of streets.

### **PUBLIC EDUCATION AND OUTREACH**

The Town of Salem is a participant in the Southeast Wisconsin Clean Water Network Program along with approximately 20 other permitted municipalities within the Root-Pike Watershed. This group of municipalities has hired the Root Pike WIN organization to manage this program, with the Town of Bristol acting as the fiscal agent. A program proposal was developed by the Root-Pike WIN organization to outline how this program will meet the MS4 Permit requirements for all communities involved. This program is officially called the "Keep Our Waters Clean" program and is included in Appendix L.

In general, the long term goals for this program come from the requirements of the MS4 Permit and focus on improving urban storm water quality and eliminating illicit discharges. The goals of this plan are to increase awareness and understanding of the problems and to promote the adoption of new behaviors that will ultimately achieve the following:

1. Improve quality and reduce quantity of storm water runoff from existing urban areas to meet or exceed state and local standards.
2. Improve quality and reduce quantity of storm water runoff from all new development and redevelopment to meet or exceed state and local standards.
3. Identify and eliminate all unpermitted wastewater discharges into the storm water conveyance system.

This program began implementation on November 1, 2008. The group has held multiple meetings up to this point and decided that the first project to be undertaken was to send out a storm water issues survey to the general public so that the group can better understand what the current perception is for storm water management issues within the watershed. This will also assist in setting up measurable goals for the program. An advisory committee is currently working with staff at the the UW-Madison Environmental Resources Department to set up this social indicators survey. Multiple surveys will be sent out to different target groups in the fall of 2009. Once the surveys are returned, the results will be analyzed to assess the current needs for public education of storm water management issues.

In addition to the Southeast Wisconsin Clean Waters Program, the Town is committed to providing residents with informational and educational materials regarding storm water management. The Town has, and will continue, to post information such as educational brochures and volunteer/event information on the Storm Water Education tab on the Town's website. This information will also be made available as hard copies at the Town Hall.