Final Report

Pollution Prevention Program

Prepared for the:

City of Manitowoc
900 Quay Street
Manitowoc, WI 54220
WPDES Permit No. WI-S050075-1

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1.0 MUNICIPAL STRUCTURAL STORM WATER MANAGEMENT FACILITIES INSPECTION AND MAINTENANCE

The City of Manitowoc has a combination of wet detention, dry detention, and sub-surface water quality best management practices (BMPs) as part of their structural storm water management facilities in addition to storm sewers, ditches, inlets and catch basins.

As new public storm water management facilities are implemented, they are added to the city’s GIS system or Microstation CADD files. New water quality management facilities (public and private) are mapped with GPS and added to the city’s GIS in a pond layer by the Engineering Department (see map pocket of this report for current facilities map).

Both public and private storm water quality BMPs are inspected on a routine basis. New private storm water quality facilities BMPs require a maintenance agreement with the city. Maintenance agreements with owners of private BMPs specify that facilities are to be inspected twice per year and document inspections and any maintenance in a report submitted to the Engineering Department in October.

The Engineering Department goal is to inspect public facilities twice per year and after approximately 2 inches of rainfall (similar to private facility requirements). A form is used during the inspection (see sample in Appendix C) and then entered into the city’s database. A work order will be developed and forwarded to Public Works if necessary.

It is also the goal of the Engineering Department to inspect private facilities annually. If private facilities require maintenance based on a routine inspection by the city, a letter will be written to the owner requesting that specific repairs be made within a given time period. Confirmation of completed repairs is required. The city does not conduct maintenance on private BMPs unless as a condition of the individual maintenance agreement.

Inspection and maintenance of various municipally owned, operated, and maintained facilities is discussed in the following sections by facility type.

1.1 Municipal Wet Detention Facilities

At the time of this report, there were a total of three (3) wet detention facilities owned, operated, and maintained by the city (see map pocket of this report for current facilities map). GIS mapping and database are kept current by the Engineering Department.

Inspection

The Engineering Department is responsible for routine inspection of municipal wet detention facilities. City owned facilities are normally inspected on a semi-annual (two times per year) basis. The inspection includes a condition assessment of embankments, inlet pipes/outlet structures, wetland vegetation, storm sewer system components, sedimentation levels, and other notes as needed. A form and database exist to track the inspections.
Maintenance

The Department of Public Works (DPW) is responsible for routine maintenance of city owned facilities in conjunction with their normal duties. Specific maintenance or repair needs other than routine maintenance as noted below are either generated by the Engineering Department following inspection, DPW staff if identified during routine maintenance activities, or on a complaint basis through other means.

No formal maintenance plan is currently in place for each specific facility. The following routine maintenance activities are typically conducted by the DPW:

- Grass is cut on the upland areas of the facilities seasonally as needed.
- Wetland areas are specifically avoided during grass cutting.

(Litter/debris removal (from the grounds or from outlet/inlet areas) and general grounds maintenance is not currently conducted during vegetation management activities.)

1.2 Municipal Dry Detention Facilities

At the time of this report, there was a total of one (1) dry detention facility owned, operated, and maintained by the city (see map pocket of this report for current facilities map). GIS mapping and database are kept current by the Engineering Department. This facility is currently identified for retrofit to a wet detention facility.

Inspection

The Engineering Department is responsible for routine inspection of municipal dry detention facilities. City owned facilities are normally inspected on a semi-annual basis. The inspection includes a condition assessment of embankments, inlet pipes/outlet structures, wetland vegetation, storm sewer system components, sedimentation levels, and other notes as needed. A form and database exist to track the inspections.

Maintenance

The DPW is responsible for routine maintenance of city owned facilities in conjunction with their normal duties. Specific maintenance or repair needs other than routine maintenance as noted below are either generated by the Engineering Department following inspection, DPW staff if identified during routine maintenance activities, or on a complaint basis through other means.

No formal maintenance plan is currently in place for each specific facility. The following routine maintenance activities are typically conducted by the DPW:

- Grass is cut on the upland areas of the facility seasonally as needed.
- Wetland areas (if applicable) are specifically avoided during grass cutting.

(Litter/debris removal (from the grounds or from outlet/inlet areas) and general grounds maintenance is not currently conducted during vegetation management activities.)

1.3 Municipal Sub-Surface Water Quality Devices

At the time of this report, there were no sub-surface water quality devices owned, operated, and maintained by the city. One (1) is currently being planned and will be incorporated into the Engineering Department and Public Works as needed.
**Inspection**

There is the potential that either the Engineering Department will be responsible for routine inspection of municipal sub-surface water quality devices or that the DPW will initiate a procedure of inspection will be the same as the new catch basin program.

**Maintenance**

It is anticipated that the DPW will be responsible for routine maintenance of city sub-surface water quality devices in conjunction with their normal duties associated with catch basins. Specific maintenance or repair needs are expected to be generated by DPW staff if identified during routine maintenance activities or by the Engineering Department if they conduct inspections.

No specific formal maintenance plan is currently anticipated for these types of facilities and it is likely that they will be added to the city’s catch basin maintenance list.

### 1.4 Inlets, Catch Basins, and Manholes

At the time of this report, there were a total of approximately 5,926 inlets and 35 catch basin facilities owned, operated, and maintained by the city. Inlets are off-line structures with grates to let flow in and have no sumps (the invert of the outlet pipe is at the same elevation as the bottom of the structure). Catch basins are off-line structures with grates to let flow in and have sumps (the invert of the outlet pipe is generally 18” above the bottom of the structure). Where the mainline sewer and manholes are placed under the curb, there are approximately 748 manholes with open grates and 15 catch basin manholes to let flow in the mainline sewer system. Inlets, catch basins, catch basin manholes, and manholes are updated annually in the city’s record files maintained by the Engineering Department electronically in Microstation software.

*(Additional information on Catch Basin Cleaning is found in Sections 2 and 3 of this report.)*

**Inspection**

Inlet grates (on all structures – inlets, catch basins, grated manholes) are checked and cleaned after rainfall events. The city is broken up into four (4) general areas that are canvassed by DPW crews following events and all debris on grates is removed by staff over the course of one (1) to two (2) days.
Inlets

The DPW is responsible for informal annual inspection during the fall cleaning. An informal/undocumented condition assessment is conducted that includes grate, structure, curb, outlet pipe, etc. Work orders for specific repairs are generated as needed.

Catch Basins

The DPW is responsible for semi-annual (two times per year) inspection of catch basins during the semi-annual cleaning. The use of catch basins in the city’s storm water program is relatively new and will become a larger part of regular system maintenance in the future. An informal/undocumented condition assessment is conducted that includes grate, structure, curb, outlet pipe, etc. Work orders for specific repairs are generated as needed. (Additional information on Catch Basin Cleaning is found in Sections 2 and 3 of this report.)

Catch Basin Manholes

The DPW is responsible for semi-annual (two times per year) inspection of catch basin manholes during a semi-annual cleaning. An informal/undocumented condition assessment is conducted that includes grate, structure, curb, outlet pipe, etc. Work orders for specific repairs are generated as needed.

Maintenance

Inlets

Inlets are maintained on an annual basis by the DPW. Maintenance includes cleaning of debris and if necessary scheduled repair work (concrete, grate, etc).

The following maintenance activities are typically conducted by the DPW on an annual basis:

- Sediment and debris is typically removed with “sewer spoons”.
- Tonnage of sediment removed is recorded for the program as a whole but not tracked on a per structure basis.

Catch Basins

The DPW is responsible for routine maintenance of these facilities in conjunction with their normal duties. Specific maintenance or repair needs (concrete, grate, etc) are either generated by DPW staff if identified during routine maintenance activities or on a complaint basis through other means.

The following maintenance activities are to be implemented in spring 2009 and conducted by the DPW on a semi-annual basis:

- Sediment is typically removed with a Vac-Con unit as needed:
  - Cleaning time can take as little as 10 minutes per catch basin structure when cleaning several basins in the same area.
  - Cleaning time can take 20-30 minutes if de-mobilization/mobilization is required.
- Excess water will be decanted into the sanitary sewer system.
- Tonnage of sediment removed is recorded for the program as a whole but not tracked on a per structure basis.

(Additional information on Catch Basin Cleaning is found in Sections 2 and 3 of this report.)
Manholes (with sumps)

The DPW is responsible for routine maintenance of these facilities in conjunction with their normal duties. Specific maintenance or repair needs (concrete, grate, etc) are either generated by DPW staff if identified during routine maintenance activities or on a complaint basis through other means.

The following maintenance activities are typically conducted by the DPW on a semi-annual basis:

- Sediment is typically removed with a Vac-Con unit as needed.
- Tonnage of sediment removed is recorded for the program as a whole but not tracked on a per structure basis.

1.5 Storm Sewers

At the time of this report, there were a total of 775,844 linear feet (146.94 miles) of storm sewers owned, operated, and maintained by the city. Storm sewer mapping is updated annually in the city’s electronic record files maintained by the Engineering Department.

Inspection

There is currently no city-wide inspection program that has been developed to conduct a condition evaluation of all sewers over a specific time period (say 10 years) as is commonly developed for sanitary sewers. The city currently contracts the televising and cleaning of approximately 50,000 linear feet of storm sewers on an annual basis as part of road reconstruction projects or for other reason (floods complaint, etc).

Maintenance

There is currently no routine scheduled maintenance of storm sewers outside of the annual cleaning and televising. Specific maintenance or repair needs are typically identified by the Engineering Department following the review of the cleaning and televising report and DPW most often to conducts repairs or replacements.

1.6 Ditches and Culverts

At the time of this report, ditches associated with the city’s system were not quantified or mapped and are a relatively small part of the overall storm water management system.
Inspection

There is currently no routine inspection of ditches except for during routine grass cutting by the DPW. Grass is cut as needed and based on height as monitored by the DPW.

Maintenance

There is currently no routine scheduled maintenance of ditches beyond routine grass cutting. Specific maintenance or repair needs (such as sediment buildup or damaged culverts) are either generated by the DPW during routine grass cutting or on a complaint basis through other means.

DPW staff will carry out maintenance activities on an as-needed basis. Normal maintenance includes grading of ditches to remove accumulated sediment, culvert replacement, and vegetation restoration (seeding).

Recommendations

- Have DPW also pick up debris (from grounds and off of inlet/outlet grates) and conduct visual inspection of key facility components during routine grass cutting.
- Evaluate/consider constructing deeper sumps in catch basins as a standard practice. At an 18 inch sump depth, the top 12 inches is an active scour zone leaving only 6 inches for settling/storage. A deeper sump would allow for more time between cleanings.
- Implement catch basin cleaning/inspection program, see also Sections 2 and 3 of this report for additional guidance.

Measurable Goals

1. Inspect all city owned wet detention facilities 2 times per year and after rain events > 2.00 inches of rainfall in a 24 hour period. Document activity in the Annual Report.
2. Retrofit city owned dry detention pond by 2013.
2.0 STREET SWEEPING AND CATCH BASIN CLEANING

2.1 Street Sweeping

Equipment

The city currently owns two (2) Elgin Pelican Street Sweepers (1991 and 1998 model years). They are conventional mechanical sweepers. The sweepers are stored and maintained at the City of Manitowoc Department of Public Works Service Building at 2655 South 35th Street.

Frequency

There are approximately 320 curb miles of street in the City of Manitowoc. Both street sweepers are deployed at the same time (unless under maintenance). Street sweeping currently starts at 3:00 am Monday through Friday and ends at approximately 9:45 am. More than six (6) hours of active sweeping is conducted daily.

The city currently sweeps all curb and gutter roadways owned and maintained by the city in the downtown area twice per week (on Mondays and Fridays). The downtown area is roughly bounded by State Street to the north, Marshall Street to the south, S. 14th Street to the west, and Lake Michigan to the east. Streets are not swept when raining, so downtown sweeping is then conducted the next day. After downtown is swept (approximately 5:30 am), the sweepers move to other areas of the city.

All other curbed areas of the city are swept once every six (6) to seven (7) days (less than a two week rotation). However, in fall when trees are losing their leaves, street sweeping efficiency is reduced.

Non-curbed streets are not swept.

There are currently no parking controls in place to aid in street sweeping efficiency. However, it was stated during the development of this program that there are very few parked cars in the downtown area during sweeping. An informal parking survey by DPW sweeper staff aided in the development of the revised sweeping program.

The city is generally swept following informal sweeping routes. Paper maps of the city streets are maintained by the DPW in the DPW Service Building at 2655 South 35th Street. As daily sweeping is completed, street sweeper drivers mark off which streets were swept that day. A sweeping data table is maintained the tracks daily sweeping by sweeper that is color coded to the area swept. DPW staff indicates the date, miles driven, curb (broom) miles swept, and estimated yards of material collected.

Street sweepings are temporarily deposited on the street when sweepers are full. Temporarily deposited sweeping pile locations are called in to the DPW building and collected by a DPW crew with a loader. Pick up time for materials will vary but are removed before the end of the day at a minimum. Street sweepers with partial loads are transported to the DPW yard at the end of the day and deposited for collection by the loader crew. Sweepers are washed out every day after sweeping in a designated wash area.

Staffing

The city maintains a staff of approximately 20 persons under the direction of the DPW Operations Manager that can participate in the street sweeping program.
Schedule

In general, the normal street sweeping program commences in mid March and continues through October, depending on weather influences. DPW staff will sweep at other times of the year weather permitting.

Recommendations

Recommendations of the recently completed Stormwater Quality Plan include the following:

1. The purchase of two high-efficiency street sweepers;
2. Maintaining the current street sweeping frequency; and
3. The implementation of parking controls.

Measurable Goals

1. Purchase two (2) high efficiency street sweepers by October 11, 2008.
2. Implement parking controls to be effective by April 2009 (start of 2009 street sweeping season).
3. Implement new street sweeper routes based on parking control plan by April 2009.

2.2 Catch Basin Cleaning

At the time of this report, there were a total of 35 catch basin facilities owned, operated, and maintained by the city. The use of catch basins in the city’s storm water program is relatively new and will become a larger part of regular system maintenance in the future. The following program is recommended for at least the first two (2) years of the catch basin cleaning program to collect sediment deposition data to further refine the maintenance needed for catch basins.

Catch basins are off-line structures with grates to let flow in and have sumps (the invert of the outlet pipe is generally 18” above the bottom of the structure for current planned and constructed catch basins). Catch basin locations are updated annually in the city’s Microstation files maintained by the Engineering Department.

Each catch basin will be assigned an ID in a database with information on the structure to assist in maintenance activities. At a minimum, the depth from the bottom of the structure to the invert of the outlet pipe “sump depth” and the depth from the bottom of the structure to the top of the grate “structure depth” should be in the database. Ideally, a “cleaning depth” would also be established on a data sheet (see Inspection section below) to expedite the decision on whether or not to clean the catch basin. Initially, the cleaning elevation should be established such that if the sump is at least 40 percent full, it should be cleaned. Therefore, the “cleaning depth” should be set equal to “structure depth” – 0.4 x “sump depth”.

(Additional information on Inlets and Manholes (with Sumps) is found in Section 1.4 of this report.)

Inspection

The DPW is responsible for semi-annual (two times per year) inspection of catch basins during the semi-annual cleaning.
For all inspections, conduct an informal condition assessment that includes grate, structure, curb, outlet pipe, etc. Develop work orders for specific repairs as needed.

The inspection procedure for cleaning is as follows:

1. First Inspection Cycle
   a. For first inspection after installation, take a survey rod or other appropriate measuring device and place the rod through the catch basin grate into the structure. (Do not push the rod through any softer material to try and meet resistance.).
   b. Read the distance on the rod and record as the "rod depth".
   c. "Sediment depth" can be calculated by taking the "structure depth" – "rod depth" and can be calculated manually in the field or in the database.
   d. Clean catch basin as indicated in the Maintenance Section.

2. Subsequent Inspection Cycles
   a. For subsequent inspections (approximately 6 months after first cleaning and all future inspections), take a survey rod or other appropriate measuring device and place the rod through the catch basin grate into the structure. (Do not push the rod through any softer material to try and meet resistance.).
   b. Read the distance on the rod and record as the "rod depth".
   c. "Sediment depth" can be calculated by taking the "structure depth" – "rod depth" and can be calculated manually in the field or in the database but is not necessary to decide if cleaning is necessary or not.
   d. To determine if cleaning is necessary, compare the "rod depth" to the "cleaning depth". If the "rod depth" is less than the "cleaning depth" then the sump is greater than 40 percent full and the catch basin should be cleaned (see Maintenance Section). If the "rod depth" is greater than the "cleaning depth", then the structure is less than 40 percent full and the inspection is completed, and the catch basin does not need to be cleaned unless future readings indicate that the structure is not collecting sediment as expected, in which case the "cleaning depth" should be reevaluated and a "specific cleaning" depth established.
**Maintenance**

**Equipment**

The city currently owns one (1) Vac-Con Unit for catch basin cleaning. The Vac-Con Unit is stored and maintained at the City of Manitowoc Department of Public Works Service Building at 2655 South 35th Street.

**Frequency**

The DPW is responsible for routine maintenance of these facilities in conjunction with their normal duties. Cleaning frequency is as determined by the Inspection Section above but is generally conducted semi-annually if the catch basin sump is at least 40 percent full or a unique cleaning depth is specified for the individual catch basin.

**Cleaning Procedure**

Specific maintenance or repair needs (concrete, grate, etc) are either generated by DPW staff if identified during routine maintenance activities or on a complaint basis through other means and are conducted outside of this routine cleaning program.

If, following the inspection program, the catch basin is identified for cleaning; the following maintenance activities are conducted:

- The Vac-Con unit is set up (if needed).
- The grate is removed and the sediment is vacuumed out.
- The grate is replaced and the unit is either moved to another nearby catch basin for cleaning if needed, or packed up for transport to another location.
- After cleaning is complete for the day, excess water will be decanted into the sanitary sewer system.
- Catch basin cleanings are quantified and disposed of as described in Section 3 of this report. Volume (estimated tonnage) of sediment removed is recorded for the program as a whole but not tracked on a per structure basis.

There are currently no parking controls in place to aid in catch basin cleaning efficiency.

Catch basin sediment depth and record of cleaning will be maintained in a database to document and track cleaning.

**Staffing**

The city maintains a staff of approximately 35 persons under the direction of the DPW Operations Manager that can participate in the catch basin cleaning program.

**Schedule**

In general, the normal catch basin cleaning is accomplished during the year beginning in late March and continues through October, depending on weather influences and staff availability.
Recommendations

The recently completed Stormwater Quality Plan did not include any recommendations for catch basin cleaning. Recommendations include the following:

1. Completion of the mapping and inventory currently underway for identifying catch basins and add new catch basins as they are constructed.
2. Development of key catch basin data as identified.
3. Implementation of the adaptive management cleaning scheduled as outlined in this program to aid in resource allocation. This is done by documenting the depth of material present in the catch basin at the time of cleaning and measuring again on subsequent cleanings over a two (2) to three (3) year period. The time frame is necessary to initiate the program, understand sediment buildup, and evaluate the impact of the revised street sweeping program. After the two (2) to three (3) year period, it may be decided that catch basin cleaning can be accomplished by maintaining a single city-wide scheduled cleaning, or optimized by developing standard cleaning frequency based on catch basin areas or individual catch basins.
4. Evaluate the use of deeper sumps for catch basins. Deeper sumps are able to provide greater sediment storage and are less susceptible to scour. At an 18 inch sump depth, the top 12 inches is an active scour zone leaving only 6 inches for settling/storage. A deeper sump would allow for more time between cleanings.

Measurable Goals

3. Implement catch basin cleaning program by October 11, 2008 as identified in this report.
3.0 STREET SWEEPING AND CATCH BASIN CLEANING DISPOSAL

3.1 Street Sweeping and Catch Basin Cleaning Disposal

Street Sweeping

Street sweeping may be temporarily stockpiled on streets during the day as current broom sweepers only have a 3 cubic yard capacity. Additional temporary stockpiling takes place at the end of the day at the DPW site as the sweepers return from the day’s routes. DPW staff collects temporary stockpiles in street areas and the DPW yard on a daily basis and take them to the city gravel pit for disposal. Inlet cleaning debris is also disposed of at the city gravel pit.

The DPW maintains records of the approximate quantity of material dumped in the gravel pit measuring the material in loads (approximately 8 cubic yards to a load). A review of records from July 2007 shows a range of 2-5 loads (typically 2 or 3) are taken to the gravel pit on an almost daily basis by a single vehicle. October records show that the range of loads increases to 5-9 loads taken to the city gravel pit and requires an increase in vehicles (typically two) and trips of either once or twice per day. The increased fall quantity is attributed to leaves.

Catch Basins

Catch basins are cleaned with a Vac-Con unit. After structures are cleaned and before the material is dumped, excess water is decanted into the sanitary sewer system. Temporary stockpiling of catch basin material is conducted as needed for additional drying and for combination of similar materials. Waste material from catch basin cleaning is quantified and ultimately taken to the city gravel pit for disposal.

Recommendations

Street sweeping, catch basin, detention pond waste materials are regulated by the Solid Waste group of the WDNR. Because of the volume demand and price of landfill disposal, there is increasing interest in alternate uses of these materials in everything from road bed base course to landscaping berms. This may require obtaining a low hazard exemption for the waste material.

Unless specifically permitted, disposal of street sweeping, catch basin, and detention pond waste materials should be disposed of at a licensed landfill or managed in accordance with WDNR guidance under a low hazard exemption. Appropriate funding for disposal will need to be developed in the city storm water budget as this is a new expense.

Measurable Goals

1. Initiate disposal of street sweeping and catch basin cleanings in a licensed landfill in 2009 unless alternate methods are allowable.
4.0 ROAD SALT APPLICATION AND SNOW DISPOSAL

4.1 Roadway De-Icing (Road Salt) Application

Equipment

The city currently uses a variety of equipment for snow plowing and de-icing (road salt) application. Up to 38 pieces of equipment are currently available requiring 38 staff for plowing or loading snow. The city also currently rents nine (9) graders to assist in plowing the city’s 17 present routes. Equipment is stored and maintained at the City of Manitowoc Department of Public Works Service Building at 2655 South 35th Street. Equipment and staffing resources are under the direction of the DPW Operations Manager.

Frequency

Salt is applied when conditions are or are expected to produce ice on the roadways. Salt is applied to specific salting route streets first. All salting route streets will be plowed during salting operations when snow accumulates to ½ inch or more.

If snow or ice is expected to persist, salt is applied at intersections on residential and secondary streets. Once authorized by the Director of Public Works or Superintendent of Public Works, side streets are plowed if 3” or more of snow has fallen.

Sand is only used on an as needed basis. Calcium Chloride is added to salt if temperatures are below 15 degrees.

The city maintains a formal written snow plowing and salting policy.

4.2 Snow Disposal

Snow Disposal is not a direct component of the city’s pollution prevention program as required by the current Storm Water Permit. The city feels that snow disposal is a closely tied component of the road salting snow. A number of disposal sites are located throughout the city. Setbacks from water features are an important element of the snow disposal site selection process. Significant excess debris that remains after snow melt is removed by DPW staff and any re-seeding needed is conducted in the spring.

Recommendations

De-icing is done by the city following best practices as they believe necessary to maintain public safety.

The WDNR has recommended in the past that municipalities review and consider the information in Guideline 35.30 – Application Rates for De-icing of 2-lanes and 4-lanes and greater from the Wisconsin State Highway Maintenance Manual. This guideline is provided in Appendix A of this document as a resource.

Some Wisconsin municipalities are exploring the use of salt brine and other deicing compounds/mixes to reduce the quantity of direct salt usage as well as a method to reduce annual salting program costs.

It is recommended that the city review alternative/additive compounds and incorporate methods that maintain safety, reduce salt usage, and reduce cost where deemed appropriate.

The DNR has provided snow disposal BMPs. This information is provided in Appendix B in this document.
Measurable Goals

1. Document amount of salt and other de-icing agents used in the Annual Report.
2. Evaluate the use of salt brine and other de-icing agents by October 11, 2010.
5.0 COLLECTION AND DISPOSAL OF LEAVES AND GRASS CLIPPINGS

5.1 Collection and Disposal Of Leaves And Grass Clippings (Yard Waste)

Yard Waste Collection

The city sponsors three (3) pickups for yard waste each year.

1. Spring - In the spring yard thatchings, leaves, and brush are picked up.
2. In the summer, a brush pick-up is done with the brush taken to the Manitowoc County compost center and chipped.
3. In the fall, there is one (1) brush pickup and continual leaf pick up until the leaves have all fallen. Citizens are asked to pile the yard waste on their terrace for city crews to pickup. Leaves are generally picked up using a vacuum unit; however, in very heavy areas a loader is used and is more effective at leaf removal. Crews divide the city into quarters and spend one (1) week picking up each quarter. This is followed by a city wide sweep to pick up any additional yard waste that was put out after the planned pickup date.

The requirements and procedures are published in the local paper, posted to the city web site, and scrolled on the local cable station.

All residential lot owners are eligible for pickup.

Grass Clippings are NOT managed by the city.

An information and education resource (“door hanger”) developed by the city on yard waste services is currently in draft format and planned for distribution in fall.

Yard Waste Disposal

There is no temporary storage of yard waste materials on city property. Yard waste materials collected by city staff are either taken directly to private locations requesting compost materials (DPW maintains a list of these locations) or to the Manitowoc County Compost Center.

Residents may take their yard waste directly to the County Compost Site and can also pick up some recycled materials such as compost and wood chips. Directions and hours of operation for the site are featured on the city’s information.

Recommendations

Leaf and yard waste collection and disposal appears to be conducted in a manner consistent with normal best management practices and no recommendations to modify the program are made at this time.

Measurable Goals

1. Annually educate land owners on appropriate leaf and grass clipping/recycling and document outreach method/date in the Annual Report.
6.0 MUNICIPAL STORM WATER POLLUTION PREVENTION PLANNING

6.1 Municipal Storm Water Pollution Prevention Planning (SWPPP)

From reviewing city-owned and operated municipal garages, storage areas, and other municipal sources of storm water pollution, the following facilities have been identified as candidates for development of site-specific SWPPPs:

Department of Public Works Service Building
2655 South 35th Street
Manitowoc, WI 54220

Parks Facility Building
1105 Fleetwood Drive
Manitowoc, WI 54220

A SWPPP will be developed for each of these sites on or before December 31, 2008. The site-specific SWPPPs will include forms and guidance for quarterly inspections.

A visit was made to the City of Manitowoc Marina at 425 Maritime Drive. The marina is leased to a private management agency that is responsible for the day to day operation of the facility. Commercial and private boat maintenance and storage is conducted at the marina. The marina is covered under an individual storm water permit and has a SWPPP that was developed in 1998. The brief inspection did not reveal any concerns at this time. A copy of the Marina Environmental Management Policy provided to annual and “visiting” boaters was provided and a copy of the marina NPDES permit and SWPPP was requested for the city’s files.

Recommendations

Any recommendations associated with the site specific SWPPPs are contained in the individual SWPPP reports.

Measurable Goals

1. Complete SWPPPs for DPW and Parks sites by October 11, 2008.
3. Implement recommendations for DPW and Parks sites in accordance with individual plans and document progress in the Annual Report.
7.0  MUNICIPAL APPLICATION OF LAWN AND GARDEN FERTILIZERS

7.1 Municipal Application of Lawn and Garden Fertilizers

The WDNR, thorough NR 151, requires that municipalities that apply lawn and garden fertilizers on municipally controlled pervious (grassed) surfaces over five (5) acres, do so in accordance with a site-specific nutrient application schedule based on appropriate soil tests.

The City of Manitowoc owns several greenway and park areas that fit the criteria of grassed areas exceeding five (5) acres or more. The city maintains mapping for all parcels including parks and open spaces over five (5) acres.

From discussion with DPW, Parks, Building Inspection, Fire, Cemetery, and other city agencies, none of the departments are applying fertilizers to areas greater than five (5) acres and no nutrient management plans are developed or needed at this time.

Recommendations

Should the city decide to conduct fertilizing grassed areas greater than five (5) acres, it will be done so with a site-specific nutrient application schedule based on appropriate soil tests.

Measurable Goals

1. If the city elects to implement fertilizer application on sites with five (5) acres or more of pervious area, a site-specific nutrient application schedule will first be developed.
8.0 EDUCATION OF MUNICIPAL STAFF

8.1 Education of Municipal Staff

The City of Manitowoc will educate appropriate municipal staff and other personnel involved in implementing this program.

Recommendations

Educate all staff involved with storm water management.

Building inspectors and DPW/Engineering staff involved with erosion control should attend WDNR or other erosion control training within one (1) year of employment and approximately every three (3) years thereafter.

DPW and Park staff at SWPPP sites should review relevant SWPPPs within 30 days of employment. DPW Foreman and Park Superintendent should review Quarterly Inspection Reports annually, document any new procedural changes, evaluate comments from inspection reports and new procedures that require incorporation into and update of SWPPP. Procedural changes and SWPPP changes should be communicated to relevant staff on an annual basis after review.

The Stormwater Aide and other staff as needed should attend at least one (1) storm water related course or conference annually.

Elements of this Pollution Prevention Plan should be presented to appropriate municipal staff within 90 days of acceptance by the WDNR.

Measurable Goals

1. Include an educational component for appropriate staff relative to their area of work. Document training in the Annual Report.
9.0 MEASURES TO REDUCE STORM WATER CONTAMINATION WITHIN SOURCE WATER PROTECTION AREAS

9.1 Measures To Reduce Storm Water Contamination within Source Water Protection Areas

Based on the City of Manitowoc’s General Storm Water Discharge Permit, the City of Manitowoc is required to review, and where appropriate, incorporate measures to reduce municipal sources of storm water contamination within source water protection areas. The information contained on Wisconsin’s source water assessment program as available at:

http://www.dnr.state.wi.us/org/water/dwg/swap/index.htm will be used as a resource in this effort.

From discussion with Wisconsin Department of Natural Resources (WDNR) Staff in the Source Water Protection Program, there is not a regulatory component or set of requirements directly associated with storm water management. The goal of the program is to protect drinking water sources including groundwater (specifically through the well head protection) and surface water sources (not regulatory).

A Source Water Assessment for Manitowoc Public Utilities, dated May 7, 2003, was developed by the WDNR Bureau of Drinking Water and Groundwater. That report identifies source water contaminant categories and a source water assessment for both the Manitowoc Surface Water and Groundwater Systems.

The City of Manitowoc drinking water is supplied by the Manitowoc Public Utilities (MPU). The primary source of raw water is Lake Michigan through an intake approximately two (2) miles off shore which undergoes a microfiltration treatment process.

A secondary source of raw water is through one (1) or more “Ranney Wells” known as “Collector C” located just south of Silver Creek Park. From the MPU website describing the water treatment process, these wells were identified as sources of “clean groundwater” used to augment the water that passes through the microfiltration process. From discussion with MPU staff, water from these sources does not go through the microfiltration process but is chlorinated. These wells utilize horizontal shafts, like the spokes of a wheel, to increase collection capabilities. Collector C was put into service in 1944. The Source Water Assessment identifies this system as a set of three (3) wells (Well 1 - #BG251, Well 2 - #BG252, and Well 3 - #BG253) ranging in depth form 60 to 86 feet. From discussion with WDNR staff, it was indicated that Well 2 was deactivated in 1994 shortly after the assessment was completed. It was confirmed with MPU staff that Well 2 (identified by MPU staff as Well “B”) was abandoned in 2001.

The likelihood of contamination of the primary municipal water source two (2) miles off shore in Lake Michigan by storm water runoff is much less likely than the influence of storm water runoff on the secondary water source of the “Ranney Wells”.

From discussion with MPU staff, Well 1 (or Well A) was identified as in the area of the MPU water plant. The well was characterized in the Source Water assessment as moderately susceptible to contamination by microbes and SOCs/pesticides and susceptible to contamination by nitrate, arsenic, nickel, volatile organic compounds (VOCs), and ethylene dibromide (EDB).

From discussion with MPU staff, Well 3 (or Well C) was identified as on a parcel of land owned by the city, but surrounded by undeveloped lands in the town near the lakeshore at Grandpa Road (an extension of Silver Creek Road). The well was characterized in the Source Water assessment as having a low susceptibility to contamination by EDB and inorganic compounds (IOC s), moderately susceptible to contamination by microbes and SOCs/pesticides and susceptible to contamination by nitrate and volatile organic compounds (VOCs).

Much of the reason for the susceptibility of either of the two (2) wells is because they are shallow, in sand and gravel areas with no hydrogeological barrier to prevent or retard the downward movement of
contaminants. Typical wellhead protection plans document restrictions and setback distances for particular land uses, sewers, septic tanks, etc. Because of the concern for intentional contamination of wells and water sources, documents describing wells and water supply sources are not generally widely available for public viewing. It was agreed by MPU staff that there should be some level of understanding, coordination, and review by City Engineering staff, particularly when evaluating zoning or site plans in the wellhead protection areas.

Typical wellhead protection plans include several storm water related restrictions including placing storm sewer mains no closer than 50 feet from a well and storm water drainage ponds must be a minimum of 400 feet from a well.

A wellhead protection ‘slide show’ and other information can be found on the WDNR website at: http://www.dnr.state.wi.us/org/water/dwg/gw/wellhead.htm.

**Recommendations**

1. City of Manitowoc Engineering Staff should contact the Manager of Water Production (currently Rob Michaelson at 920-686-4354) and obtain a copy of the wellhead protection plan for the two (2) remaining “Rann.ey Wells”.

2. The well locations and protection areas should be documented in GIS and remain for internal use only (not published or provided to any outside sources without careful consideration and coordination with MPU).

3. New development and redevelopment plans should be reviewed for conflicts to setbacks, land use, and storm water management restrictions in the wellhead protection areas.

4. MPU should report to the WDNR that Well 2 was properly abandoned so that it can be appropriately documented.

**Measurable Goals**

1. Meet with MPU staff within 90 days of acceptance by WDNR of this plan to obtain a copy of the wellhead protection plan.

2. Incorporate setbacks and land use restrictions into an appropriate internal GIS layer within 90 days of obtaining the plan.
APPENDIX A

(Wisconsin) State Highway Maintenance Manual 35.30
(De-icing Application Rates 12/2002)
A. De-icing Application Rates (4-lanes and greater)

See page 2 of 3

B. De-icing Application Rates (2-lanes)

See page 3 of 3
DE-ICING APPLICATION RATES FOR PRE-WETTED SALT – (4-LANES AND GREATER)

This guide is not meant to be a substitute for the use of judgment and the observation of the result of treatments on existing conditions. It is meant to show variables that usually occur together and the treatment that has proven to be the most successful. This guide should then be used to assist in deciding on the best fitting course of action depending on existing conditions.

<table>
<thead>
<tr>
<th>WEATHER CONDITIONS</th>
<th>SALT APPLICATION RATE (Pounds of Material Per Lane Mile of Pavement)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAVEMENT TEMPERATURE</td>
<td>PRECIPITATION</td>
<td></td>
</tr>
<tr>
<td><strong>28°F AND ABOVE</strong></td>
<td>Snow</td>
<td>Initial at 200 lbs of Salt Repeat at 100-200 lbs of Salt</td>
</tr>
<tr>
<td></td>
<td>Sleet/Freezing Rain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Snow/Sleet</td>
<td>Initial at 100-300 lbs of Salt Repeat at 100-200 lbs of Salt</td>
</tr>
<tr>
<td></td>
<td>Freezing Rain</td>
<td>Initial at 200-400 lbs of Salt Repeat at 100-200 lbs of Salt</td>
</tr>
<tr>
<td><strong>23-28°F</strong></td>
<td>Dry Snow</td>
<td>Plow Only</td>
</tr>
<tr>
<td></td>
<td>Wet Snow/Sleet</td>
<td>Initial at 200-400 lbs of Salt Repeat at 100-300 lbs of Salt</td>
</tr>
<tr>
<td><strong>15-23°F</strong></td>
<td>Dry Snow</td>
<td>Plow Only</td>
</tr>
<tr>
<td></td>
<td>Ice/Snow Pack</td>
<td>200-400 lbs salt, sand/salt mix, or salt mixed dry calcium chloride</td>
</tr>
</tbody>
</table>

Notes:

1. Mechanical means of snow removal is the preferred method. Before applying any de-icing agent, the surface should be cleared of as much snow and ice as possible.
2. Application rates listed above are "maximum recommended rates". The operator should strive to apply only the amount of salt/de-icing agents necessary to accomplish the desired level of service. Rates may vary with regard to pavement temperature, type of pavement, and weather conditions.
3. This table assumes the salt is pre-wetted.
4. Ground speed controllers should be calibrated annually or more often as necessary to assure that preset application rates are within acceptable levels.
5. When wind speed is over 15 mph, use caution when salting.
6. Consider the maintenance section cycle time when determining application rates.
DE-ICING APPLICATION RATES FOR PRE-WETTED SALT – (2-LANES)

This guide is not meant to be a substitute for the use of judgment and the observation of the result of treatments on existing conditions. It is meant to show variables that usually occur together and the treatment that has proven to be the most successful. This guide should then be used to assist in deciding on the best fitting course of action depending on existing conditions.

<table>
<thead>
<tr>
<th>WEATHER CONDITIONS</th>
<th>SALT APPLICATION RATE (Pounds of Material Per Lane Mile of Pavement)</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PAVEMENT TEMPERATURE</strong></td>
<td><strong>PRECIPITATION</strong></td>
<td><strong>INITIAL</strong></td>
</tr>
<tr>
<td><strong>28°F AND ABOVE</strong></td>
<td>Snow</td>
<td>Initial at 200 of Salt</td>
</tr>
<tr>
<td></td>
<td>Sleet/Freezing Rain</td>
<td></td>
</tr>
<tr>
<td><strong>23-28°F</strong></td>
<td>Snow/Sleet</td>
<td>Initial at 100-300 of Salt</td>
</tr>
<tr>
<td></td>
<td>Freezing Rain</td>
<td>Initial at 100-300 of Salt</td>
</tr>
<tr>
<td><strong>15-23°F</strong></td>
<td>Dry Snow</td>
<td>Plow Only</td>
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<td></td>
<td>Wet Snow/Sleet</td>
<td>Initial at 100-300 of Salt</td>
</tr>
<tr>
<td></td>
<td>Dry Snow</td>
<td>Plow Only</td>
</tr>
<tr>
<td><strong>Below 15°F</strong></td>
<td>Ice/Snow Pack</td>
<td>100-300 lbs salt, sand/salt mix, or salt mixed with dry Calcium Chloride</td>
</tr>
</tbody>
</table>

Notes:

1. Mechanical means of snow removal is the preferred method. Before applying any de-icing agents, the roadway surface should be cleared of as much snow and ice as possible by mechanical means.
2. Application rates listed above are "maximum recommended rates". The operator should strive to apply only the amount of salt/de-icing agents necessary to accomplish the desired level of service. Rates may vary with regard to pavement temperature, type of roadway surface, and weather conditions.
3. This table assumes the salt is pre-wetted.
4. Ground speed controllers should be calibrated annually or more often as necessary to assure that preset application rates are within acceptable levels.
5. When wind speed is over 15 mph, use caution when salting.
6. Consider the maintenance section cycle time when determining application rates.
<table>
<thead>
<tr>
<th>PREDICTED PRECIPITATION EVENT</th>
<th>Recommended Locations</th>
<th>Application</th>
<th>Rate</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frost or Black Ice</td>
<td>Bridge Decks and Trouble Spots</td>
<td>20-30 (frost) 30-40 (Black Ice)</td>
<td>50-150</td>
<td>1) Consider treating approaches as well as bridge decks. 2) Treat ice patches, if needed, with pre-wetted salt at 100 lb/lane-mi.</td>
</tr>
<tr>
<td>Sleet</td>
<td>Bridge Decks and Trouble Spots and Intersections</td>
<td>20 Recommended 30 Maximum</td>
<td>200-400(1) 100-300(2)</td>
<td>1) Consider treating approaches as well as bridge decks. 2) Treat ice patches, if needed, with pre-wetted salt at 100 lb/lane-mi.</td>
</tr>
<tr>
<td>Freezing Rain</td>
<td>Any area of concern</td>
<td>Not Recommended</td>
<td>200-400(1) 100-300(2)</td>
<td>It is not recommended to apply liquid de-icing agents in an anti-icing mode prior to freezing rain events.</td>
</tr>
<tr>
<td>Light Snow (&lt; 1/2 in./hr.)</td>
<td>Trouble Spots and Intersections</td>
<td>30 Recommended 40 Maximum</td>
<td>100-200</td>
<td>If anti-icing is performed prior to a snow event, re-application may be necessary to prevent re-freeze. It may also be necessary to switch to a de-icing mode.</td>
</tr>
<tr>
<td>Moderate or Heavy Snow (≥ 1/2 in./hr)</td>
<td>Trouble Spots and Intersections</td>
<td>40 Recommended 50 Maximum</td>
<td>100-300</td>
<td>1) Do not apply liquid anti-icing agents onto heavy snow accumulation or packed snow. 2) Applications will need to be more frequent at lower temperatures and higher snowfall rates. 3) If anti-icing is performed prior to a snow event, re-application may be necessary to prevent re-freeze. It may also be necessary to switch to a de-icing mode.</td>
</tr>
</tbody>
</table>

Notes:
- Anti-icing operations typically should be conducted during normal, non-overtime working hours and low traffic volume periods.
- It is not recommended to apply de-icing agents in an anti-icing mode when the pavement temperature is below 20°F or drifting is a problem.
- Time initial anti-icing agent applications and subsequent de-icing agent applications to prevent deteriorating conditions or development of packed and bonded snow.

(1) 4-Lanes and Greater
(2) 2 Lanes
APPENDIX B

WDNR Snow Disposal Management Guidance
TYPICAL PILE CONFIGURATIONS AND LOCATIONS

As snow accumulates throughout the winter in urban areas, it is at times collected and deposited at sites away from high traffic and congested areas. The snow is dumped on open land sites or occasionally into surface waters.

The size of snow storage piles will vary with the size of the urban area and the amount of snowfall received. The disposal sites are normally located as close as possible to the areas from which the snow is removed in order to keep transportation costs low. Open lots, parks, unused parking lots, rivers, lakes, streams, wetlands, and ponds have all been used as disposal sites.

POLLUTANTS

Plowed or dumped snow may contain chlorides, sodium, lead, cadmium, zinc, chromium, oil and grease, sediments, bacteria, nitrates, litter and debris. The amount and types of pollutants will vary with traffic density and will depend on how quickly snow is removed from the streets.

Chlorides, sodium, and sediments are contributed to snow by the use of road salt and sand on streets in order to reduce traffic accidents. It has been estimated that after each snow storm, 1,000 pounds of road salt is applied to each mile of two lane road. Oil and grease, lead, cadmium, zinc and chromium are from automobiles. Pet wastes contribute bacteria and nitrates, and litter and debris originate from a number of sources. Snow left on city streets for any length of time takes on a gritty black appearance which is evidence of the many types of pollutants it contains.
Chloride levels in dumped snow have been found to range from 6 mg/l to 2250 mg/l. Interim chloride toxicity values recommended for use in Wisconsin are 788 milligrams/liter and 399 milligrams/liter for acute and chronic toxicity, respectively. Chlorides form a saline layer along the bottom of lakes that can prevent normal mixing. This can lead to reduced oxygen levels in the bottom waters and increased nutrient release from the sediments. These added nutrients may stimulate plant growth. Increased chloride levels may also result in the release of mercury from contaminated sediments (Schreiber, 1986).

Chlorides readily move through the soil and can enter the groundwater as stockpiled snow melts. The groundwater enforcement standard for chlorides in Wisconsin is 250 mg/l. Some wells in Wisconsin have become contaminated above the drinking water standard for chlorides with the source documented as road salt use (Schreiber, 1986).

Sodium levels in stock piled and dumped snow have ranged from 7 mg/l to 220 mg/l (Seaway Port Authority). Increased sodium concentrations may prevent mixing of waters in lakes (as do increased chloride concentrations) and result in increased nutrient release from sediments. High concentrations of sodium and chloride lead to deterioration of soil structure, resulting in decreased permeability, loss of vegetation, and increased erosion (Schreiber, 1986).

Sediment, primarily sand from road salt and sand mixtures, is also a contaminant of concern in snow. One New England state found that an average of 358 cubic yards of sand was deposited every year on a snow dumping site (Vermont ECD). One study measured total suspended sediments (TSS) at concentrations as high as 2,250 mg/l (Pierstorff). Wisconsin state effluent limits set maximum levels of TSS at 50 mg/l at a number of facilities. Sand can have a blanketing effect on lakes and streams, smothering fish spawning areas, and vegetation. Snow dumping in surface waters in Ontario has been curtailed because of the amount of sediment in snow (O'Brien).

Lead levels have ranged from 0.9 mg/l to 9.8 mg/l in dumped snow, cadmium levels from 0.01 to 0.14 mg/l, and chromium levels from 0.05 to 16 mg/l. (Pierstorff, 1980). These amounts would exceed Wisconsin groundwater standards and the lead and chromium levels
would exceed acute toxicity criteria effluent discharge limits for some surface waters in Wisconsin. Lead is usually found in an insoluble form in snow and is attached to particulate matter; therefore, there is little potential for groundwater contamination. It can however, accumulate in the soil, thus impairing the structure and changing soil fertility (Schreiber, 1986). Heavy metals can also build up in the tissues of aquatic plants and animals and subsequently accumulate in animals that consume them. Possible effects of heavy metals include liver and kidney damage, tumors, birth defects, brain damage, lung and respiratory concerns, learning disabilities, and neurological damage (Schueller, 1992).

Oil and grease concentrations in dumped snow have ranged from 1.3 mg/l to 28 mg/l. (Pierstorff, 1980). Daily maximum effluent standards established at some facilities in Wisconsin have limits for oil and grease at 20 mg/l. Oil and grease can contribute polycyclic aromatic hydrocarbons to surface waters and cause an oil sheen to appear on the surface of the water.

The visual impression of snow dumping is also a problem. No one likes to see a truckload of dirty snow being dumped into the local river or stream. The general public associates this with pollutants being added to the stream (Vermont ECD).

**SOURCE AREA CONTROLS**

**Reduce Contaminants in Snow**

The first source area control which should be considered is to reduce the amount of contaminants in snow. This can be done by plowing more frequently and reducing the amount of road salt used, reducing vehicle miles traveled by encouraging the use of public transportation and ride sharing, and removing snow from roadways within 48 hours to reduce the contaminant load in the collected snow. Decreasing plowing and reducing the amount of salt used should never be done at the risk of public safety.

Vermont's "smart salting" program calculates salt application rates using infrared sensors on trucks to measure winter pavement temperatures, which are typically 7 to 40 degrees F warmer than the air. When the pavement is so cold (about -6 degrees F) that salt would be inefficient, crews apply sand or other abrasives. Sand is
frequently mixed with salt to help embed the sand into colder surfaces and increase friction. Overall, state transportation crews have found that applying salt and sand in frequent doses during a snowfall, versus "waiting out the storm" achieves the best results. They are using 25 percent less salt and sand than in previous years (WNDR brochure, 1995).

Once these source area reduction practices are put into place, the next step to consider is how best to dispose of the snow that will be collected. Land disposal is the preferred option over direct dumping into surface waters. Direct disposal of snow into surface waters should only be done in emergency situations.

**Land Disposal**

Land disposal of snow offers a number of options over snow dumping directly into a surface water.

- Refuse and litter can easily be collected after the snow has melted.
- Sediments build up on land rather than in lakes and streams.
- Contaminants that tend to cling to soil can be filtered out.
- There is less potential for a concentrated dose of contaminants entering lakes and streams. The contaminants gradually seep into the soil or are carried downslope as the snow melts (Schreiber, 1986).

The land disposal site must be carefully chosen. The best disposal sites are those that drain to a detention basin which captures meltwater pollutants. The potential for surface and groundwater contamination must be evaluated at each disposal site. The soil texture should be fine grained to allow for the capture of metals and prevent chlorides from seeping into the groundwater. Fine grained soils will allow for more overland flow vs. infiltration as the snow gradually melts.
Areas of fractured bedrock should also be avoided as these areas can serve as direct conduits of pollutants to the groundwater.

The site should also be located at least 1,000 feet from any private well and down gradient from any wells or groundwater recharge areas (such as gravel pits) and preferably near groundwater discharge areas (Schreiber, 1986 and Vermont ECD).

Wetland areas should also be avoided to prevent surface water contamination and damage to wildlife and wetland vegetation.

Sanitary landfills should not be used for snow disposal as the added moisture can accelerate the movement of leachate from the landfill (Schreiber, 1986 and WDNR Brochure, 1995).

**Site Selection Criteria**

The following factors should be considered when selecting a site:

- The site should be far enough away from surface waters to allow for slow dispersal of snow as it melts. This will allow for capture of most sediments and pollutants and result in a gradual release of any remaining contaminants to the surface waters. A minimum setback of 150 feet is recommended.

- If the site is located in a floodplain, it should not contribute to the potential for flooding.

- Runoff rates should be estimated and a site selected that allows for the receiving water's ability to absorb the amount of runoff and pollutants entering it at any given time. Site selection should also take into account downstream uses of the surface water.

- The alternate and future uses of the site should be known. Human exposure to contaminants remaining on the site after the snow melts should be avoided. Therefore, recreation areas should not be used for snow disposal.
The site should be easily accessible to the trucks hauling the snow. This will reduce the potential for haulers to dispose of snow at sites other than the approved sites.

Noise should also be considered. Residents do not appreciate numerous trucks driving up and down residential streets.

Visual impacts should also be considered and consequently residential areas avoided (Schreiber, 1986).

Site Maintenance

Once a site is selected, the runoff needs to be controlled and the site maintained. The following site preparation and maintenance practices should be followed:

- A sediment barrier or trap should be constructed. This could consist of a detention basin, berm, silt fence or staked hay bales. For example, a coarse gravel berm down gradient of the dumped snow will slow and disperse flow and trap sediments and debris.

- Vegetation should be well established and maintained at the site during the growing season. This will help capture pollutants and prevent soil erosion.

- All litter and debris should be removed from the site after the snow melts. A fence should also be erected to capture windblown litter if this is a problem during the period when snow is melting.

- Sediment should also be removed or evenly dispersed over the site to allow for capture by the vegetation. This will also prevent heavy sediment buildup from smothering vegetation (Schreiber, 1986, Vermont ECD).
Surface Water Disposal

Surface water disposal should only be done in emergency situations or when a suitable land disposal site is not available. All attempts should be made to find a proper land disposal site before surface water disposal is considered. If surface water disposal is considered, only major rivers should be used and water quality standards should be maintained.

Before dumping snow into surface waters, state laws should be checked. Most states require permits to discharge waste material, pollutants or any substance into waters of the state. Most states do allow for surface water disposal of snow on a case-by-case basis during emergency situations. Permission must be obtained from the state.

If surface water disposal is chosen, only clean snow should be dumped. Clean snow is that which has been removed from streets within 48 hours after the snowfall.

The Vermont ECD describes heavily contaminated snow as snow that is:

- Subject to moderate to large traffic volumes
- From downtown areas
- Heavily or frequently sanded or salted
- From large parking lots (> 25 spaces or 1/2 acre)

Snow from such areas should not be dumped directly into surface waters even if collected within 48 hours after the snow fall.
Bibliography


Schueller, Michelle, Bulk Storage Pile Contamination of Stormwater: Concerns and Recommendations for Wisconsin, Wisconsin Department of Natural Resources, April, 1992.


Vermont - Snow Dumping and Vermont's Water Resources Environmental Conservation Department-Water Quality Division, undated.

"Where to go With the Snow" - Snow Treatment and Disposal guidance for Municipalities", WDNR Publication WR-154, REV 95.
APPENDIX C

Sample Facilities Inspection Form
### City of Manitowoc

**WET DETENTION POND INSPECTION**

<table>
<thead>
<tr>
<th>Facility ID: 0603</th>
<th>Location:</th>
<th>Inspector/Date: , ( )</th>
</tr>
</thead>
</table>

#### EMBANKMENTS
- Slumping/Stability
- Erosion
- Burrow Holes
- Woody Plants

#### WETLAND VEGITATION
- Invasive Species
- Action Taken
- Date:

#### INLET PIPES/OUTLET STRUCTURES
- Erosion
- Clogging/Debris/Litter
- Structural Integrity Description

#### STORM SEWER SYSTEM
- Swr_Debris
- Swr_TV
- Swr_Integrity
- Other Damage

#### SEDIMENTATION
- Removal
- Action Taken
- Date:

<table>
<thead>
<tr>
<th>Pond Levels</th>
<th>- Elevation -</th>
<th>Main Pond</th>
<th>Forebay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Sediment: 0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Existing Bottom: 0.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remaining = ft ft</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
APPENDIX D

Stormwater BMPs
About AECOM
AECOM (NYSE: ACM) is a global provider of professional technical and management support services to a broad range of markets, including transportation, facilities, environmental and energy. With more than 40,000 employees around the world, AECOM is a leader in all of the key markets that it serves. AECOM provides a blend of global reach, local knowledge, innovation, and technical excellence in delivering solutions that enhance and sustain the world’s built, natural, and social environments.

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