Minimum Control Measure 6
Pollution Prevention and Good Housekeeping
Practices for Municipal Facilities

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APPENDICES

1. INTRODUCTION

1.1. Basis for the Standard Operating Procedures (SOPs)

On August 1, 2013, the Minnesota Pollution Control Agency issued a National Pollutant Discharge Elimination System (NPDES) General Permit (GP) for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s). The MS4 GP requires the City of Alexandria to alter their own actions as well as work with other governmental agencies to help ensure a reduction in the amount and type of pollution that:

- Collects on streets, parking lots, open spaces, and storage and vehicle maintenance areas and is discharged into local waterways.
- Results from actions such as environmentally damaging land development and flood management practices or poor maintenance of storm sewer systems.

This SOP manual will assist the City of Alexandria in using targeted best management practices that are intended on reducing the discharge of pollutants from municipal activities.

1.2. Objectives of the SOPs

This manual is intended to provide guidance on Good Housekeeping Practices for Municipal Operations as follows:

- Provide BMPs used for municipal activities.
- Provide methods for employing spill prevention and response.
- Provide tools for documenting inspections of ponds, structural stormwater BMPs, outfalls, and municipal facilities.

1.3. Training, Inspection, and Maintenance

City employees shall receive job relevant training at regular intervals with an emphasis on protecting water quality. New and seasonal employees shall receive training upon their return to work. All employees shall receive training when changes in procedures, practices, techniques, or requirements takes place. Documentation of stormwater management training events including a list of topics covered, names of employees in attendance, and date of each event shall be kept on file at the City.

Using the inspection forms in Appendix B, trained employees shall inspect as follows:

- Municipal Facility and Stockpiles – quarterly
- Structural Stormwater BMPs – annually
- Ponds – one time per MS4 permit cycle
- Outfalls – one time per MS4 permit cycle

Based on inspection findings, determination shall take place of if repair, replacement, or maintenance measures are necessary in order to ensure the structural integrity, proper function, and treatment effectiveness of structural stormwater BMPs. Necessary maintenance shall be completed as soon as possible to prevent or reduce the discharge of pollutants to stormwater.

2. POLLUTION PREVENTION

2.1. Dumpsters/Garbage Storage

Activities and Definition

Potential for pollutants can occur if proper garbage management is not in place. An appropriate number of dumpster should be located throughout the facility to provide enough storage for daily activities. In addition facility dumpsters are to be marked for proper materials disposal.

Preparation

a. Train employees on proper trash disposal.
b. Locate dumpsters and trash cans in convenient, easily observable areas.
c. Provide properly labeled recycling bins to reduce the amount of garbage disposed.
d. Where applicable install berms, curbing, or vegetation strips around storage areas to control water entering/leaving storage areas.
e. Whenever possible store garbage containers beneath a covered structure or inside to prevent contact with stormwater.

Process

a. Inspect garbage bins for leaks regularly and have repairs made immediately by responsible party.
b. Request/use dumpsters and trash cans with lids and without drain holes.
c. Locate dumpsters on a flat, hard surface that does not slope or drain directly into the storm drain system.

Clean-up/Follow-up

a. Keep areas around dumpsters clean of all garbage.
b. Have garbage bins emptied regularly to keep from overfilling.
c. Wash out bins or dumpsters over floor drains connected to sanitary sewer system as needed to keep odors from becoming a problem.

Documentation

a. NA

2.2. Parking Lot Maintenance

Activities and Definition

Parking Lots can potentially generate increased pollutant loads to the stormwater system from run-off. A well maintained parking surface can help to reduce some of those pollutant concerns.

Preparation

a. Conduct regular employee training to reinforce proper housekeeping.
b. Restrict parking in areas to be swept prior to and during sweeping using regulations as necessary.
c. Perform regular maintenance and services in accordance with the recommended vehicle maintenance schedule on sweepers to increase and maintain efficiency.

Process

a. Sweep parking areas, at a minimum of twice annually, or as needed, or as directed by the City's responsible official.
b. Hand sweep sections of gutter if soil and debris accumulate.
c. Pick-up litter as required to keep parking areas clean and orderly.

Clean-up/Follow-up

a. Dispose of sweepings properly (appropriate facility).
b. Street sweepers to be cleaned out in a manner as instructed by the manufacturer and in a location that swept materials cannot be introduced into a storm drain.
c. Swept materials will not be stored in locations where stormwater could transport fines into the storm drain system.

Documentation

a. NA

2.3. Parks – Chemical Application Pesticides, Herbicides, Fertilizers

Activities and Definition

A pivotal part of the beautification of the city is a great parks system. The health and beauty of lawns and natural areas take the application of some chemicals and fertilizers.

Preparation

a. Ensure seasonal and full-time City staff are adequately trained in proper use and application of fertilizers and pesticides for maintenance of City lands.

b. Make sure your state Chemical Handling Certification is complete and up-to-date before handling any chemicals.
c. Calibrate fertilizer and pesticide application equipment to avoid excessive application.
d. Use pesticides only if there is an actual pest problem and periodically test soils for determining proper fertilizer use.
e. Time and apply the application of fertilizers, herbicides or pesticides to coincide with the manufacturer's recommendations for best results ("Read the Label").
f. Know the weather conditions. Do not use pesticides if rain is expected. Apply pesticides only when wind speeds are low (less than 5 mph).

Process

a. Always follow the manufacturer's recommendations for mixing, application and disposal ("Read the Label").
b. Do not mix or prepare pesticides for application near storm drains. Preferably mix pesticides inside a protected area with impervious secondary containment (preferably indoors) so that spills or leaks will not contact soils.
c. Employ techniques to minimize off-target application (e.g. spray drift, over broadcasting.) of pesticides and fertilizers.

Clean-up/Follow-up

a. Sweep pavements or sidewalks where fertilizers or other solid chemicals have fallen, back onto grassy areas before applying irrigation water.
b. Triple rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
c. Always follow all federal and state regulations governing use, storage and disposal of fertilizers, herbicides or pesticides and their containers ("Read the Label").

Documentation

a. NA

2.4. Parks – Cleaning Equipment

Activities and Definition

There are many benefits to taking proper care of the City's equipment. Prolonging the life of the equipment by taking the time to maintain critical parts is an essential part of the Parks departments daily activities.

Preparation

a. Review process with all Parks employees.

Process

a. Wipe off dirt, dust and fluids with disposable towel.
b. Wash equipment in approved wash station.

Clean-up/Follow-up

a. Dispose of towels in proper trash receptacle
b. Sweep floor and dispose of debris.

Documentation

a. NA

2.5. Parks – Mowing and Trimming

Activities and Definition

Regular mowing and trimming activities have potential to deposit materials onto hard surfaces. Care should be taken to insure mowing or trimming refuse is disposed of properly.

Preparation

a. Process overview with employees.
b. Check the oil and fuel levels of the mowers and other equipment. Fill in proper areas if needed.

Process

a. Install temporary catch basin protection on potentially affected basins.
b. Put on eye and hearing protection.
c. Mow and trim the lawn.
d. Sweep or blow clippings to grass areas.
e. Remove inlet protection if used.

Clean-up/Follow-up

a. Mowers are to be scraped and brushed at designated location.
   1. Dry spoils are dry swept and disposed of properly
b. Wash equipment in approved wash station.

Documentation

a. NA

2.6. Parks – Open Space Management

Activities and Definition

Open space provides great value to the park system that go beyond ball fields. This includes stormwater retention and potential flood relief.

Preparation

a. Provide a regular observation and maintenance of parks, golf courses, and other pubic open spaces.
b. Identify public open spaces that are used for stormwater detention and verify that detention areas are included on the storm drain system mapping, inspection schedules, and maintenance schedules.

Process

a. Ensure that any storm drain or drainage system components on the property are properly maintained.
b. Avoid placing bark mulch (or other floatable landscaping materials) in stormwater detention areas or other areas where stormwater runoff can carry the mulch into the storm drainage system.
c. Follow all SOPs related to irrigation, mowing, landscaping, and pet waste management.

Clean-up/Follow-up

a. Keep all outdoor work areas neat and tidy. Clean by sweeping instead of washing whenever possible. If areas must be washed, ensure that wash water will enter a landscaped area rather than the storm drain. Do not use soap for outdoor washing.
b. Pick up trash on a regular basis.

Documentation

a. NA

2.7. Parks – Pet Waste

Activities and Definition

Pet waste has the potential to be a contributor to downstream degradation if not maintained and properly disposed of.

Preparation

a. Adopt and enforce ordinances that require pet owners to clean up pet wastes and use leashes in public areas. If public off-leash areas are designated, make sure they are clearly defined. Avoid designating public off-leash areas near streams and water bodies.
b. Whenever practical and cost effective, install dispensers for pet waste bags and provide disposal containers at locations such as trail heads or parks where pet waste has been a problem. Provide signs with instructions for proper cleanup and disposal.

Process

a. Check parks and trails for pet waste as needed.
b. Check public open space for pet waste prior to mowing and watering.
c. Provide ordinance enforcement as needed.

Clean up / follow-up

a. Remove all pet waste; provide temporary storage in a covered waste container, and dispose of properly. Preferred method of disposal is at a solid waste disposal facility.

Documentation

a. Document problem areas for possible increased enforcement and/or public education signs.

2.8. Parks – Planting Vegetation (Starters)

Activities and Definition

Vegetation is a key component of establishing healthy ecosystems that hold water and nutrients on site.

Preparation

a. Call the appropriate numbers for location of utilities.
b. Decide where any spoils will be taken.

Process

a. Dig holes; place spoils near the hole where they may easily be placed back around the roots. Avoid placing spoils into the gutter system.
b. Bring each plant near the edge of the hole dug for it.

c. Check the depth of the hole, and adjust the depth if necessary. The depth of the hole for a tree should be as deep as the root ball, so that the top of the root ball is level with the top of the hole.
d. Carefully remove pot or burlap
e. Place the plant in the hole
f. Backfill the hole with existing spoils, compost, and a litter fertilizer if desired. Do not use excessive amendments.
g. Water the plant.
h. Stake the plant if necessary to stabilize it.

Clean-up/Follow-up

a. Remove any extra spoils into truck or trailer. Place the spoils on a tarp if there is likelihood that some of the dirt would be lost through openings in the bed.
b. Sweep dirt from surrounding pavement(s) into the planter area.
c. Transport spoils to their designated fill or disposal area.

Documentation

a. N/A

2.9. Parks – Planting Vegetation (Seeds)

Activities and Definition

Vegetation is a key component of establishing healthy ecosystems that hold water and nutrients on site

Preparation

a. Call the appropriate numbers for location of utilities.
b. Decide where any spoils will be taken.
c. Decide on the application rate, method, water source, and ensure adequate materials are on hand.
d. Grade and prepare soil to receive the seed. Place any extra soil in a convenient location to collect.

Process

a. Place the seed and any cover suing the pre-determined application method (and rate).
b. Lightly moisten the seed.

Clean-up/Follow-up

a. Remove any extra spoils into truck or trailer. Place the spoils on a tarp if there is likelihood that some of the dirt would be lost through openings in the bed.
b. Sweep dirt from surrounding pavement(s) into the planter area.
c. Transport spoils to their designated fill or disposal area.

Documentation

a. NA

2.10. Parks – Transporting Equipment

Activities and Definition

Equipment Transportation is a pivotal part of the daily activities that occurs on a daily basis.

Preparation

a. Determine equipment needed for transport and method (trailer, truck bed) needed to transport equipment.
b. Conduct pre-trip inspection of equipment.

Process

a. Load and secure equipment on trailer or truck.
b. Load and secure fuel containers for equipment usage.

Clean-up/Follow-up

a. Off load equipment.
b. Store equipment and trailer in proper location.
c. Conduct post-trip inspection of equipment.
d. Wash equipment if needed, according to the written procedure for Cleaning Equipment.

Documentation

a. NA

2.11. Stormwater – Pond Assessment Procedures (TSS & TP)

Activities and Definition

The following pond assessment procedures and schedule shall be followed to determine the Total Suspended Solids (TSS) and Total Phosphorous (TP) treatment effectiveness of City-owned and operated ponds that are constructed for the collection and treatment of stormwater (Appendix C).

Assessment Procedure

At the initiation of the pond assessment, the City shall evaluate the City-owned and operated stormwater treatment ponds in year 1 to determine the highest priority pond(s) for assessing TSS and TP effectiveness. In order to create a pond assessment schedule for the City-owned and operated stormwater treatment ponds the City shall prioritize ponds to assess using the following criteria:

- Age of pond.
- Contributing drainage area characteristics (size, land use, upland treatment, etc.).
- Estimate of pond loading
- Known concerns based on inspections.
- Type and location of receiving water.
- Sensitivity of receiving water.
- Complaints received from the public.

The ponds that have been identified as having the highest priority shall be added to a schedule to receive a more thorough assessment in year 1. The remaining ponds will be reassessed in year 2-5 using the same criteria, until all ponds have been assessed within the 5-year MS4 permit term.

Additional Survey of Pond

From the initial assessment completed in year 1, the City will perform a more thorough analysis of the ponds that are found to be half full of sediment, as well as the ponds that are continually showing signs of needing maintenance (i.e. public complaint, significant vegetation growth, etc.). The following steps shall be taken to assess the City pond(s) for TSS and TP treatment effectiveness:

a. Gathering of background information. This may include the following:
    - Original design information, if available (record drawings, design calculations, etc.).
    - Determination of contributing drainage area.
    - As-built survey information, if completed and available.
    - Other significant information available that pertains to the pond.

b. Site investigation and/or survey of existing pond conditions. This may include the following:
   - Determination of sediment levels in the pond.
   - Identification of outlet details (elevations, type and condition of structure(s), etc.).
   - Identification of inlet details (number, type, elevations, etc.).
   - Other significant pond characteristics and details.

c. Desktop evaluation of existing TSS and TP treatment effectiveness by completing water quality calculations using the survey data obtained, P8, Pondnet, or other suitable modeling methods.

Clean-up/Follow-up

a. Once the assessment of each pond is complete, the City shall determine if maintenance is required to ensure proper function and treatment effectiveness of the ponds. The City shall use 2.12 Pond Sediment Removal Projects and/or 2.13 Routine Pond Maintenance for pond maintenance needs.
b. Schedule pond maintenance activities.

Documentation

a. Record results from the analysis of the ponds that were prioritized, including inspection results.

2.12. Stormwater – Pond Sediment Removal Projects

Activities and Definition

Stormwater ponds remove pollutants transported by rain events through settling and biological uptake. To function properly, stormwater ponds need to have volume to hold water and wetland plants along the pond edges and shallow areas. Removing sediment and debris on a regular basis will help the system in getting the most TP and TSS removal.

Preparation

a. The MPCA requires the City to sample sediment prior to dredging to determine concentrations of 17 cPAHS, non-carcinogenic PAHs, arsenic, and copper.
   1. If the annual volume of sediment to be removed is less than 100 cubic yards, then no chemical testing or sediment characterization is required; however, the City is responsible for the due diligence in the reuse and/or disposal of this material.
   2. When more than 100 cubic yards of sediment need to be removed, the City will need to complete further analysis of the pond sediment. The sediment will

need to be tested and disposed of in accordance with the guidance found in the MPCA's Sediment Removal Guidance (Appendix D).
3. Testing of the ponds can be done so that areas of the pond can be segregated (e.g., if areas of the pond such as the inlets are identified to have the highest concentrations the areas around the inlet could be disposed of differently as compared to the remainder of the pond, if the areas can be segregated sufficiently).

b. If chemical testing or sediment characterization is required, the sediment samples shall be sent to an analytical laboratory for review.
c. Once the results from the analytical laboratory have been received, a maintenance and disposal plan will be developed based on the test results. The City shall use sediment removal guidance from the MPCA in Appendix D.
d. Schedule the pond maintenance work for a time when dry weather is expected. Sediment excavation projects are recommended to take place in the winter months or during a period of the year when dry conditions are expected.
e. Remove any sediment and trash from grates, placing it in a truck for disposal.
f. Do a visual inspection to make sure any grates, structures, manholes, and pipes are in good working order. Remove manhole covers and grates as necessary for inspecting.

Process

a. Provide outlet protection where feasible to minimize the amount of sediment and debris that might leave basin during sediment removal process.
b. Start removing sediment from basin by using backhoe to remove debris and sediment off the bottom.
c. Continue removing sediment from pond bottom as necessary by sweeping and shoveling.
d. Put all material removed from the pond into a dump truck.
e. Some structures might require use of a vacuum truck. If so, use the same procedures described for cleaning catch basins.

Clean-up/Follow-up

a. After removing sediment from the basin, clean off the concrete pads using dry methods (sweeping and shoveling).
b. Dispose of sediment and debris according to disposal plan.
c. Site restoration work, if applicable, shall be conducted as soon as weather conditions permit and may include:
   1. Additional clean-up or maintenance of inlet and outlet structures.
   2. Additional site stabilization work including sediment and erosion control.
   3. Establishing plant, seed, sod, mulch or vegetation to prevent erosion (above waterline).
   4. Professional engineer to sign-off on project completion

Documentation

a. Keep documentation of each detention basins/pond cleaned.
b. The following records and documentation shall be kept on file:
   1. Unique Pond identification number.
   2. Date of excavation.
   3. Volume of sediment removed.
   4. Laboratory results.
   5. Location of final disposal of sediment.
   6. As-Built prints or plans, if available.
   7. Contractor information, shipping papers/manifests/contractual agreements, if available.
   8. Any notes or comments of any other observations about the removal that will help the City operate and maintain that site in the future.

2.13. Stormwater – Routine Pond Maintenance

Activities and Definition

Stormwater ponds remove pollutants transported by rain events through settling and biological uptake. To function properly, stormwater ponds need to have volume to hold water and wetland plants along the pond edges and shallow areas. Performing maintenance to stormwater ponds is critical for the long-term operation of the MS4 system. Routine maintenance is considered a maintenance project that will remove less than 100 cubic yard of material.

Preparation

a. Schedule the pond maintenance work for a time when dry weather is expected.
b. Do a visual inspection to make sure any grates, structures, manholes, and pipes are in good working order. Remove manhole covers and grates as necessary for inspecting.

Process

a. Provide outlet protection where feasible to minimize the amount of debris that might leave basin during cleaning process.
b. Perform routine maintenance, which may include:
   a. Removal of trash and other accumulated debris from trash grate.
   b. Removal of vegetation around and/or in front of the outlet structure.
   c. Repair of side slopes to mitigate erosion issues.
   d. Replacement of riprap in front of the outlet to prevent future scour and erosion.
c. Continue cleaning structures and surrounding area as necessary by sweeping and shoveling.
d. Put all material removed from the pond into a dump truck.

e. Some structures might require use of a vacuum truck. If so, use the same procedures described for cleaning catch basins.

Clean-up/Follow-up

a. After performing maintenance, clean off the concrete pads using dry methods (sweeping and shoveling).
b. Properly dispose of the material that was removed. The City is responsible for the due diligence in the reuse and/or disposal of this material.
c. Site restoration work, if applicable, shall be conducted as soon as weather conditions permit and may include:
    1. Additional clean-up or maintenance of inlet and outlet structures.
    2. Additional site stabilization work including sediment and erosion control.
    3. Establishing plant, seed, sod, mulch or vegetation to prevent erosion (above waterline).
    4. Professional engineer to sign-off on project completion

Documentation

a. Keep documentation of each detention basins/pond cleaned including date, individuals involved in cleaning, and a description of the type of debris removed.
b. Record the amount of waste collected.
c. Keep any notes or comments of any other observations about the maintenance that will help the City operate and maintain that site in the future.

2.14. Stormwater – Outfalls

Activities and Definition

Inspection and maintenance of every stormwater outfall (with the exception of underground outfalls) shall be completed one time per MS4 permit cycle (approximately 5 years).

Preparation

a. Review Outfall Inspection Form (Appendix B).
b. Determine which outfalls to inspect each year.

Process

a. Inspect using the Outfall Inspection Form (Appendix B) preferably during dry weather conditions.
b. Note any illicit discharges and report appropriately.
c. Evaluate functionality, erosion around, and maintenance needs.

Clean-up/Follow-up

a. If needed, maintain, clean, or replace outfall.

Documentation

a. File all inspection reports in the Stormwater Permit Binder.

2.15. Stormwater – Structural Stormwater BMPs

Activities and Definition

Structural Stormwater BMP inspection and maintenance (with the exception of stormwater ponds) shall be completed annually to ensure the functionality of the storm sewer system. Structural BMPs include, but are not limited to: environmental/drop manholes, mechanical treatment systems, infiltration basins, and pervious pavement.

Preparation

c. Review Structural Stormwater BMP Inspection Form (Appendix B).
d. Do visual inspection of area surrounding BMPs.

Process

d. Inspect using the Structural Stormwater BMP Inspection Form (Appendix B) preferably during dry weather conditions.
e. Note any illicit discharges and report appropriately.
f. Evaluate functionality, erosion around, and inflow/outflow of BMP.
g. Ensure that contributing area, practice, and inlets are clear of debris and stabilized.
h. Maintain environmental manholes and mechanical treatment systems using a high powered vacuum truck to suck out standing water, oil, sediment, and floatables.
i. Maintain infiltration basins as follows:
    1. Replace pea gravel/topsoil and top surface filter fabric when clogged.
    2. Remove sediment and oil/grease from pre-treatment devices, as well as overflow structures, as needed.
    3. Mow grass filter strips as necessary and remove grass clippings.
    4. Repair undercut and eroded areas at inflow and outflow structures, as necessary.
    5. Remove trees that start to grow in the vicinity of the trench.
    6. Disc or otherwise aerate and de-thatch basin bottom if not infiltrating as designed.
j. Maintain pervious pavement as follows:
    1. Sweep twice annually.
    2. Remove stockpiled mulch, sand, salt, soil, or yard waste on pervious pavement immediately.

Clean-up/Follow-up

b. Safely transport removed materials to a designated location to dump onto a drying bed.
c. When the water evaporates, clean up the materials with a backhoe/skid loader, put it into dump truck and take to permanent disposal site (landfill).

Documentation

a. File all inspection reports in the Stormwater Permit Binder.

2.16. Streets/Storm Drain – Catch Basin Cleaning

Activities and Definition

Catch Basin Cleaning needs to be completed on a regular basis to insure the functionality of the stormsewer system.

Preparation

e. Clean sediment and trash off of grate.
f. Do visual inspection on outside of grate.
g. Make sure nothing needs to be replaced.
h. Do inside visual inspection to see what needs to be cleaned.

Process

k. Clean using a high powered vacuum truck to start sucking out standing water and sediment.
l. Use a high pressure washer to clean any remaining material out of catch basin, while capturing the slurry with the vacuum.
m. After catch basin is clean, send the rodder of the vacuum truck downstream to clean pipe and pull back sediment that might have gotten downstream of pipe.
n. Move truck downstream of pipe to next catch basin.

Clean-up/Follow-up

d. When vacuum truck is full of sediment, take it to the designated location to dump all the sediment out of truck into a drying bed.
e. When it evaporates, clean it up with a backhoe/skid loader, put it into dump truck and take to permanent disposal site (landfill).

Documentation

a. Keep any notes or comments of any problems.

2.17. Streets/Storm Drain – Curb Painting

Activities and Definition

Storm drains are gateways that allow pollutants in stormwater to flow untreated from local streets to lakes, rivers and streams. Residual oil, grease, solids, antifreeze, cigarette butts, yard waste, plastic and other wastes found on roads, parking lots and driveways pollute downstream waters by increasing phosphorus levels, reducing oxygen levels and ultimately impairing aquatic habitat for fish and other organisms as well as drinking water sources.

Preparation

a. Calculate the amount of paint required for the job.
b. Use water based paints if possible.
c. Determine whether the wastes will be hazardous or not and the required proper disposal of said wastes. Prepare surfaces to be painted without generating wastewater by sandblasting and/or scraping.
d. Thoroughly sweep up all sand, blastings, and/or paint scrapings.
e. If paint stripping is needed, use a citrus-based paint remover whenever possible since it is less toxic than chemical strippers.
f. If wastewater will be generated, use curb, dyke, etc. around the activity to collect the filter and collect the debris.

Process

a. Paint curb.
b. Prevent over-spraying of paints and / or excessive sandblasting.
c. Use drip pans and drop clothes in areas of mixing paints and painting.
d. Store latex paint rollers and brushes in air tight bags to be reused later with the same color.
e. Have available absorbent material and other BMP's ready for an accidental paint spill.

Clean-up/Follow-up

a. Paint out brushes and rollers as much as possible. Squeeze excess paint from brushes and rollers back into the containers prior to cleaning them.
b. Pour excess paint from trays and buckets back into the paint can containers and wipe with cloth or paper towels. Dispose of the towels according to the recommendations on the paint being used.
c. Rinse water-based paint brushes in the sink after pre-cleaning. Never pour excess paint or wastewater from cleanup of paint in the storm drain.

d. Cleanup oil based paints with paint thinner. Never clean oil based brushes in a sink or over a storm drain. Filter solvents for reuse if possible and / or store in approved drum for recycling.
e. Dispose of waste collected by placing it in a garbage container. Left-over paint and solvents should be stored for later use (do not place these liquids in the garbage).

Documentation

a. Write-up / report of any discharges into storm drain system.

2.18. Streets/Storm Drain – Creek Management

Activities and Definition

Storm drains, streets, and creeks are gateways that allow pollutants in stormwater to flow untreated from local streets to lakes, rivers and streams. Residual oil, grease, solids, antifreeze, cigarette butts, yard waste, plastic and other wastes found on roads, parking lots and driveways pollute downstream waters by increasing phosphorus levels, reducing oxygen levels and ultimately impairing aquatic habitat for fish and other organisms as well as drinking water sources.

Preparation

a. Monitor streams on a regular basis (Annually)
b. Check culverts and crossings after every storm.
c. Maintain access to stream channels wherever possible.
d. Identify areas requiring maintenance.
e. Determine what manpower or equipment will be required.
f. Identify access and easements to area requiring maintenance.
g. Determine method of maintenance that will be least damaging to the channel.
h. Obtain stream alteration permit.

Process

a. Remove unwanted material (debris, branches, soil) from the creek channel and place it in a truck to be hauled away.

Clean up / follow-up

a. Stabilize all disturbed soils.
b. Remove all tracking from paved surfaces near maintenance site, if applicable.
c. Haul all debris or sediment removed from area to approved dumping site.

Documentation

a. Keep log of actions performed including date and individuals involved.
b. Record the amount of materials removed or imported.
c. Keep any notes or comments of any problems.
d. Use "before" and "after" photographs to document activities as applicable.

2.19. Streets/Storm Drain – Ditch Management

Activities and Definition

Storm drains are gateways that allow pollutants in stormwater to flow untreated from local streets to lakes, rivers and streams. Residual oil, grease, solids, antifreeze, cigarette butts, yard waste, plastic and other wastes found on roads, parking lots and driveways pollute downstream waters by increasing phosphorus levels, reducing oxygen levels and ultimately impairing aquatic habitat for fish and other organisms as well as drinking water sources.

Preparation

a. Monitor ditches on a regular basis (Annually)
b. Maintain access to ditch channels wherever possible.
c. Contact affected property owners and utility owners.

Process

a. Identify areas requiring maintenance.
b. Determine what manpower or equipment will be required.
c. Identify access and easements to area requiring maintenance.
d. Determine method of maintenance that will be least damaging to the channel and adjacent properties or utilities.

Clean-up/Follow-up

a. Stabilize all disturbed soils.
b. Remove all tracking from paved surfaces near maintenance site, if applicable.
c. Haul all debris or sediment removed from area to approved dumping site.

Documentation

a. Keep log of actions performed including date and individuals involved.
b. Record the amount of materials removed or imported.
c. Keep any notes or comments of any problems.
d. Use "before" and "after" photographs to document activities as applicable.

2.20. Streets/Storm Drain – Overlays and Patching

Activities and Definition

Pollutants collect on surfaces in between storm events as a result of atmospheric deposition, vehicle emissions, winter road maintenance, construction site debris, trash, road wear and tear. Overlays and patching are a part of the maintenance of these surfaces that help prolong the life of the roadway.

Preparation

a. Measure and mark locations of manholes and valves on the curb
b. Apply temporary covers to manholes and catch basins to prevent oil and materials from getting inside of them.
c. Cracks should be properly sealed. Alligator cracks and potholes should be removed and patched. Rutting should be milled.
d. Surface should be clean and dry.
e. Uniform tack coat applied and cured prior to placement of overlay.
f. If milling is required, install inlet protection as needed.

Process

a. Check hot asphalt mix for proper temperature, percentage asphalt, gradation, air voids, and any other agency requirements.
b. Raise manhole lids and valves to elevation of new asphalt surface with riser rings.
c. Surface texture should be uniform, no tearing or scuffing.
d. Rolling should be done to achieve proper in-place air void specification.

Clean up / follow-up

a. Covering should be removed as soon as the threat of imported materials entering the system is reduced and prior to a storm event.
b. After pavement has cooled, sweep gutters to remove loose aggregate.

Documentation

a. NA

2.21. Streets/Storm Drain – Shouldering and Mowing

Activities and Definition

Pollutants collect on surfaces in between storm events as a result of atmospheric deposition, vehicle emissions, winter road maintenance, construction site debris, trash, road wear and tear, and litter from adjacent lawn maintenance (grass clippings). The shoulders of the road should be properly maintained to insure infiltration and other techniques for stormwater run-off are working with the most efficiency.

Preparation

a. Set up temporary traffic control devices

Process

a. Place import material as needed and perform grading to achieve proper drainage.
b. Mulch clippings to help reduce the amount of supplemental fertilizer required.

Clean up / follow-up

a. Clean any loose material off asphalt or gutter.

Documentation

a. NA

2.22. Streets/Storm Drain – Secondary Road Maintenance

Activities and Definition

Plans that are submitted to the City for approval will have a review process to guarantee that erosion and sediment control standards are being met.

Preparation

a. Determine length amount and type of roadbase or gravel that will be needed.
b. Determine proper equipment to be used and or any safety hazards.
c. Design proper drainage: slopes, berms, etc.

Process

a. Have truck drivers follow a designated route for hauling in the soil (See SOP for transporting soil and gravel).
b. If soils are too dry to achieve compaction, loosen surface material and moisture condition.
c. Smooth or grade soil with the desired crown or cross-slope.
d. Compact soil.

Clean up/Follow-up

a. Replace filter fabric with washed rock (if necessary) on monthly maintenance.
b. Clean up equipment according to the SOP for Cleaning Equipment

c. Clean up any debris on traveled roads, and dispose of it in the landfill.

Documentation

a. NA

2.23. Streets/Storm Drain – Concrete Work

Activities and Definition

The use of concrete is a common practice for BMP maintenance, proper management of those materials is critical for pollution prevention.

Preparation

a. Train employees and contractors in proper concrete waste management.
b. Store dry and wet materials under cover, away from drainage areas.
c. Remove any damaged concrete that may need to be replaced.
d. Prepare and compact sub-base.
e. Set forms and place any reinforcing steel that may be required.
f. Determine how much new concrete will be needed.
g. Locate or construct approved concrete washout facility.

Process

a. Install inlet protection as needed.
b. Avoid mixing excess amounts of fresh concrete on-site.
c. Moisten sub-base just prior to placing new concrete. This helps keep the soil from wicking moisture out of the concrete into the ground.
d. Place new concrete in forms.
e. Consolidate new concrete.
f. Screed off surface.
g. Let concrete obtain its initial set.
h. Apply appropriate surface finish.
i. Remove forms when concrete will not slump.

Clean-up/Follow-up

a. Perform washout of concrete trucks and equipment in designated areas only.
b. Do not washout concrete trucks or equipment into stormdrains, open ditches, streets or streams.
c. Cement and concrete dust from grinding activities is swept up and removed from the site.
d. Remove dirt or debris from street and gutter.

Documentation

a. N/A

2.24. Streets/Storm Drain – Garbage Storage

Activities and Definition

Illegal dumping of non-hazardous household waste and improper dumping of yard waste in streets, storm drains, wetlands, lakes, and other water bodies pollutes surface waters. Non-hazardous household waste includes items such as tires, furniture, common household appliances and other bulk items. Yard waste includes any organic debris such as grass clippings, leaves, and tree branches.

Preparation

a. Locate dumpsters and trash cans with lids in convenient, easily observable areas.
b. Provide properly labeled recycling bins to reduce the amount of garbage disposed.
c. Provide training to employees to prevent improper disposal of general trash.

Process

a. Inspect garbage bins for leaks regularly, and have repairs made immediately by responsible party.
b. Locate dumpsters on a flat, impervious surface that does not slope or drain directly into the storm drain system.
c. Install berms, curbing or vegetation strips around storage areas to control water entering/leaving storage areas.
d. Keep lids closed when not actively filling dumpster.

Clean-up/Follow-up

a. Keep areas around dumpsters clean of all garbage.
b. Have garbage bins emptied as often as needed to keep from overfilling.
c. Wash out bins or dumpsters as needed to keep odors from becoming a problem. Wash out in properly designated areas only.

Documentation

a. N/A

2.25. Streets/Storm Drain – Snow Removal and De-icing

Activities and Definition

The concentration of chloride is increasing in our surface and ground water largely due to stormwater runoff from road salt storage piles, areas of excessive application, or simply from years of repeated application since chloride does not degrade in soil and water. Chloride in road salt and road salt additives (e.g. ferrocyanide for anti-caking) can create toxic conditions for fish, insects and vegetation.

Preparation

a. Store de-icing material under a covered storage area or in an area where water coming off the de-icing materials is collected and delivered to the sanitary sewer or reused as salt brine.
b. Slope loading area away from storm drain inlets.
c. Design drainage from loading area to collect runoff before entering stormwater system.
d. Washout vehicles (if necessary) in approved washout area before preparing them for snow removal.
e. Calibrate spreaders to minimize amount of de-icing material used and still be effective.
f. Provide vehicles with spill cleanup kits in case of hydraulic line rupture or other spill.
g. Train employees in spill cleanup procedures and proper handling and storage of de-icing materials.

Process

a. Load material into trucks carefully to minimize spillage.
b. Periodically dry sweep loading area to reduce the amount of de-icing materials exposed to runoff.
c. Distribute the minimum amount of de-icing material to be effective on the roads.
d. Do not allow spreaders to idle while distributing de-icing materials.
e. Park trucks loaded with de-icing materials inside when possible.

Clean-up/Follow-up

a. Sweep up all spilled de-icing material around loading area.
b. Clean out trucks after snow removal duty in approved washout area.
c. Provide maintenance for vehicles in covered areas.
d. If sand is used in de-icing operations, sweep up residual sand form streets when weather permits.

Documentation

a. Keep plow route map up to date.

2.26. Streets/Storm Drain – Street Sweeping

Activities and Definition

Pollutants collect on surfaces in between storm events as a result of atmospheric deposition, vehicle emissions, winter road maintenance, construction site debris, trash, road wear and tear, and litter from adjacent lawn maintenance (grass clippings). Sweeping of materials such as sand, salt, leaves and debris from city streets, parking lots and sidewalks prevents them from being washed into storm sewers and surface waters. Timing, frequency and critical area targeting greatly influence the effectiveness of sweeping.

Preparation

a. Prioritize cleaning routes to use at the highest frequency in areas with the highest pollutant loading.
b. Restrict street parking prior to and during sweeping using regulations as necessary.
c. Increase sweeping frequency just before the rainy season, unless sweeping occurs continuously throughout the year.
d. Perform preventative maintenance and services on sweepers to increase and maintain their efficiency.

Process

a. Streets are to be swept at a minimum of twice annually, or as needed or specified by the city; Street maps are used to ensure all streets are swept at a specific interval.
b. Drive street sweeper safely and pickup debris.
c. When full take the sweeper to an approved street sweeper cleaning station.

Clean-up/Follow-up

a. Street sweepers are to be cleaned out in an approved street sweeper cleaning station.
b. Street sweeping cleaning stations shall separate the solids from the liquids.
c. Once solids have dried out, haul them to the local landfill.
d. Decant water is to be collected and routed to an approved wastewater collection system area only.
e. Haul all dumped material to the landfill.

Documentation

a. Keep street sweeping route map up to date.

2.27. Streets/Storm Drain – Transporting Soil and Gravel

Activities and Definition

Transportation of materials should be handled with pre-planning and contingency planning.

Preparation

a. Dry out wet materials before transporting.
b. Spray down dusty materials to keep from blowing.
c. Make sure you know and understand the SWPPP requirements for the site you will be working at.
d. Determine the location that the truck and other equipment will be cleaned afterwards.

Process

a. Use a stabilized construction entrance to access or leave the site where materials are being transported to/from.
b. Cover truck bed with a secured tarp before transporting.
c. Follow the SWPPP requirements for the specific site to /from which the materials are being hauled.
d. Make sure not to overfill materials when loading trucks.

Clean-up/Follow-up

a. Use sweeper to clean up any materials tracked out on the roads from site.
b. Washout truck and other equipment when needed in properly designated area.

Documentation

a. NA

2.28. Vehicles – Fueling

Activities and Definition

Fueling of equipment and vehicles should always occur in designated areas when possible. Spill prevention and planning should occur before any fueling takes place.

Preparation

a. Train employees on proper fueling methods and spill cleanup techniques.
b. Install a canopy or roof over aboveground storage tanks and fuel transfer areas.
c. Absorbent spill clean-up materials and spill kits shall be available in fueling areas and on mobile fueling vehicles and shall be disposed of properly after use.

Process

a. Shut off the engine
b. Ensure that the fuel is the proper type of fuel for the vehicle.
c. Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut off to prevent overfill.
d. Fuel vehicle carefully to minimize drips to the ground.
e. Fuel tanks shall not be topped off.
f. Mobile fueling shall be minimized. Whenever practical vehicles and equipment shall be transported to the designated fueling area in the Facilities area.
g. When fueling small equipment from portable containers, fuel in an area away from stormdrains and water bodies.

Clean-up/Follow-up

a. Immediately clean up spills using dry absorbent (e.g. kitty litter, sawdust, etc.) sweep up absorbent material and properly dispose of contaminated clean up materials.
b. Large spills shall be contained as best as possible and the Duty officer and Hazmat team should be notified as soon as possible.

Documentation

a. NA

2.29. Vehicles – Vehicle and Equipment Storage

Activities and Definition

When hazardous material comes into contact with rain or snow, the pollutants are washed into the storm sewer system and, ultimately, to surface water bodies and/or ground water. Hazardous materials have negative impacts on fish habitat, ground water drinking water sources, and recreational uses.

Preparation

a. Inspect parking areas for stains/leaks on a regular basis.
b. Provide drip pans or absorbents for leaking vehicles.

Process

a. Whenever possible, store vehicles inside where floor drains have been connected to sanitary sewer systems.
b. When inside storage is not available, Vehicles and equipment will be parked in the approved designated areas.
c. Maintain vehicles to prevent leaks as much as possible.
d. Address any known leaks or drips as soon as possible. When a leak is detected a drip pan will be placed under the leaking vehicle.
e. The shop will provide a labeled location to empty and store drip pans.
f. Clean up all spills using dry methods.
g. Never store leaking vehicles over a storm drain.

Clean-up/Follow-up

a. Any leaks that are spilled on the asphalt will be cleaned up with dry absorbent; the dry absorbent will be swept up and disposed of in the garbage.
b. The paved surfaces around the building will be swept every two weeks, weather permitting.

Documentation

a. N/A

2.30. Vehicles – Washing

Activities and Definition

MS4 vehicle washing involves the removal of dust and dirt from the exterior of trucks, boats and other vehicles, as well as the cleaning of cargo areas and engines and other mechanical parts. Washing of vehicles and equipment generates oil, grease, sediment and metals in the wash water as well as degreasing solvents, cleaning solutions and detergents used in the cleaning operations.

Preparation

a. Provide wash areas for small vehicles inside the maintenance building that has a drain system which is attached to the sanitary sewer system.
b. Provide wash areas for large vehicles on an approved outside wash pad that has a drain system which is attached to the sanitary sewer system.
c. No vehicle washing will be done where the drain system is connected to the storm sewer system.

Process

a. Minimize water and soap use when washing vehicles inside the shop building.

b. Soap should not be used when washing vehicles outside the shop building.
c. Use hoses with automatic shut off nozzles to minimize water usage.
d. When washing outside the building, it is the operator's responsibility to make sure all wash water is contained on the wash pad and does not have access to the storm drain.
e. Never wash vehicles over a storm drain.

Clean-up/Follow-up

a. Sweep wash areas after every washing to collect what solids can be collected to prevent them from washing down the drain system.
b. Clean solids from the settling pits on an as needed basis.

Documentation

a. N/A

2.31. Water – Planned Waterline Excavation Repair/Replacement

Activities and Definition

Waterline Excavation and repair of an MS4 system can potentially involve activities that could affect the health of the MS4 system. Planning is critical.

Preparation

a. Determine where discharge flow will go.
b. Place inlet protection at nearest downstream storm drain inlets.
c. Clean gutters leading to inlets.
d. Isolate waterline to be worked on.
e. Neutralize any chlorine residual before discharging water.

Process

a. Make efforts to keep water from pipeline from entering the excavation.
b. Direct any discharge to pre-determined area.
c. Backfill and compact excavation.
d. Haul of excavated material or stock pile nearby.

Clean-up/Follow-up

a. Clear gutter /waterway where water flowed.
b. Clean up all areas around excavation.
c. Clean up travel path of trucked material.

Documentation

a. Complete paperwork.

2.32. Water – Unplanned Waterline Excavation Repair/Replacement

Activities and Definition

Waterline Excavation and repair of an MS4 system can potentially involve activities that could affect the health of the MS4 system. Unplanned excavations can be additionally tricky and pre-planning is critical.

Preparation

a. Make sure service trucks have wattles, gravel bags, or other materials for inlet protection.

Process

a. Slow the discharge.
b. Inspect flow path of discharge water.
c. Protect water inlet areas.
d. Follow planned repair procedures.
e. Haul off spoils of excavation.
f. Consider use of silt filter bags on pumps.

Clean-up/Follow-up

a. Repair eroded areas as needed.
b. Follow planned repair procedures.
c. Clean up the travel path of trucked excavated material.

Documentation

a. NA

2.33. Water – Transporting Dry Excavated Materials and Spoils

Activities and Definition

Transportation of materials should be handled with pre-planning and contingency planning.

Preparation

a. Utilize truck with proper containment of materials.

b. Determine disposal site of excavated materials.

Process

a. Load
b. Check truck after loading for possible spillage.
c. Transport in manner to eliminate spillage and tracking.
d. Utilize one route for transporting.

Clean-up/Follow-up

a. Clean loading area.
b. Clean transporting route.
c. Wash off truck and other equipment in a designated equipment cleaning area.

Documentation

a. NA

2.34. Water – Transporting Wet Excavated Materials & Spoils

Activities and Definition

Transportation of materials should be handled with pre-planning and contingency planning.

Preparation

a. Utilize truck with containment for material.
b. Determine disposal site of excavated material.

Process

a. Load and Transport in manner to minimize spillage & tracking of material.
b. Check truck for spillage.
c. Utilize one route of transport.

Clean-up/Follow-up

a. Clean route of transport to provide cleaning of any spilled material.
b. Washout equipment truck and other equipment in designated wash area.

Documentation

a. NA

2.35. Water – Waterline Flushing for Routine Maintenance

Activities and Definition

Flushing is a process that rapidly removes water from the city's water piping system. Flushing uses water force to scour out materials that accumulate in the city's pipes. Water pipes are usually flushed by opening fire hydrants, where the discharged water flows off the streets the same as rainwater.

Preparation

a. Determine flow path of discharge to inlet of waterway.
b. Determine chlorine residual.
c. Neutralize chlorine residual.

Process

a. Clean flow path.
b. Protect inlet structures.
c. Use diffuser to dissipate pressure to reduce erosion possibilities.

Clean-up/Follow-up

a. Clean flow path.
b. Remove inlet protection

Documentation

a. NA

2.36. Water – Waterline Flushing after Construction/System Disinfection with Discharge to Storm Drain.

Activities and Definition

Flushing is a process that rapidly removes water from the city's water piping system. Flushing uses water force to scour out materials that accumulate in the city's pipes. Water pipes are usually flushed by opening fire hydrants, where the discharged water flows off the streets the same as rainwater.

Preparation

a. Determine chlorine content of discharge water, and select de-chlorination equipment to be used.
b. Determine flow path of discharge.

Process

a. Protect inlets in flow path.
b. Install de-chlorination equipment.
c. Sweep and clean flow path.
d. Use diffuser to reduce velocities.

Clean-up/Follow-up

a. Pick up inlet protection.
b. Clean flow paths.
c. Remove equipment from flush point.

Documentation

a. NA

2.37. Water – Chemical Handling/Transporting and Spill Release

Activities and Definition

Hotspot facilities are facilities that produce higher levels of stormwater pollutants and/or present a higher potential risk for spills, leaks or illicit discharges. Hazardous material storage and handling is of particular concern in these areas.

Preparation

a. Understand MSD sheets for handling of product.
b. Determine proper place of handling.
c. Have necessary containment and spill kits at handling place.

Process

a. Begin transfer process.
b. Discontinue operations if a spill level occurs.
c. Disconnect and store handling equipment.

Clean-up/Follow-up

a. Clean up spills with proper material.
b. Dispose of contaminated material at appropriate facility.

Documentation

a. Report spills to duty officer.

APPENDIX A
Facility Inventory

City of Alexandria
Facility Inventory

Facility	Location
Bunker of salt	Alexandria Street Department
Bunker of sand	Alexandria Street Department
Bunker of cold patch	Alexandria Street Department
Bunker of riprap	Alexandria Street Department
Bunker of gravel	Alexandria Street Department
Bunker of black dirt	Alexandria Street Department
Bunker of wood chips	Alexandria Street Department
Bunker of wood blocks	Alexandria Street Department
Dumpster for steel	Alexandria Street Department
Dumpster for cardboard	Alexandria Street Department
Dumpsters for garbage (2)	Alexandria Street Department
Waste oil barrel (500 gal)	Alexandria Street Department
Parking lot – Public	Between 5th & 6th on Fillmore
Parking lot – Public	Between 5th & 6th on Hawthorne
Parking lot – Public	Between Broadway & Hawthorne on 7th
Parking lot – City Hall	Between Fillmore & Broadway on 7th
Parking lot – Downtown Liquor	214 Broadway Street
Parking lot – Plaza Discount Liquors	400 34th Avenue West
Parking lot – Alex Police Dept.	501 3rd Avenue West
Parking lot – Alex Fire Dept.	302 Fillmore Street
Agnes Park	Agnes Blvd
Big Ole Park	2nd Ave E. & Broadway
Blue Bird Park	Curt Felt Drive
Carter Park	County Rd. #22
City Park	118 City Park Road
Dean Melton/Fillmore Park	1510 Fillmore Street
Fred Foslien Park	Victoria Drive
Geneva Crest Park	Geneva Drive
Goose Park	5th Avenue West
Knute Nelson Ball Park	303 5th Avenue West
Lake Connie Corner	7th Avenue E & Temple Street
Lake Connie Park/Pooch Playland – Dog Park	9th & Victor Street
Lake Burgen Park	Snowbird Lane SE
Lakeview Park	Lakepark Place
Legion Park	8th & Broadway
Manor Hills Park	2304 Springdale
Martin's Hope Park	2nd Avenue E & Hawthorne Street
Noonan Park	10th & Nokomis
Oak Knoll Park	1709 Oak Knoll Drive
Oakwood Trails	Woodland Park Drive NE
Runestone Park	Hwy #27 E & 6th Avenue E
Summer Meadows Park	Scenic Heights Drive
Skylark Park	Amanda Lane
Woodland Park	50th Avenue E

APPENDIX B
Inspection Forms

City of Alexandria
Pond & Structural Stormwater BMP Inspection Form

Pond ID:	**Completed By:**
Address/Nearby Landmark:	**Signature:**
Date:	**Late Rain Date:** **Amount:** (inches)

Facility Type: ☐**Pond** ☐**Structural Stormwater BMP:** ____________________

Illicit Discharge Evaluation				
Activities	**Yes√**	**No √**	**NA √**	**Comments**
Odor to discharge?				
Color to discharge?				
Floatables in discharge (ex: trash)?				
Stains/Deposits in or on structure?				
Additional Comments:				

Functional Evaluation (0 – acceptable, 1 – item needs maintenance, 2 – immediate repair)	
Overall Stabilization Condition	RATE: 0 / 1 / 2
Overall Structural Condition	RATE: 0 / 1 / 2
Flow Description (at time of inspection)	☐NONE ☐ TRICKLE ☐MODERATE ☐SUBSTANTIAL
Approximate Depth of Flow	DEPTH: _______ (inches)
Visible Sediment Delta Forming?	☐YES ☐NO
Amount of Sediment Build-up	RATE: 0 / 1 / 2
Additional Comments:	

Erosion				
Activities	**Yes√**	**No √**	**NA √**	**Comments**
Is vegetation on side slopes failing?				
Any signs of erosion?				
Additional Comments:				

Inflow/Outflow Structures				
Activities	**Yes√**	**No √**	**NA √**	**Comments**
Any signs of erosion?				
Any signs of structure settling?				
Any signs of physical damage?				
Any signs of accumulated sediment in the inlet/outlet?				
Any signs of accumulated debris, trash, etc.				
If *YES* to any of the above, schedule for maintenance.				
Any debris present?				
If *YES*, remove debris or schedule for maintenance.				
Additional Comments:				

City of Alexandria
Outfall Inspection Form

General Information:

Outfall ID #______________ | Inspected by: | Date: ____________________

Last Rain Date (if known):____________ Amount:___________ (inches)
Today's Rainfall Amount: ______________________ (inches)

Address/Nearby Landmark: ____

Weather Conditions: ☐Clear Skies ☐ Overcast ☐ Other: _____________

Photos taken? ☐Yes ☐No

Outfall Data:

Outfall Type:
- ☐Manhole
- ☐Flared End
- ☐Swale
- ☐Weir
- ☐Flume
- ☐Culvert
- ☐Other

Outfall Condition:
- ☐Clear/Functioning
- ☐Needs Maintenance/Cleaning
- ☐Needs Repair
- ☐Needs Replacement

Immediate Action Needed? ☐Yes ☐No

Other Notes: ____-

Discharge Data:

Visible Flow? ☐Yes ☐No ☐Submerged | Flow Depth: ____________(approx. inches) | Significant erosion and/or sedimentation? ☐Yes ☐No

If flow is present, describe and check all that apply:
- ☐Colored Water ________________________
- ☐Odor ________________________________
- ☐Murky, Turbid ________________________
- ☐Floating objects ______________________
- ☐Scum ______________________________
- ☐Oily Sheen __________________________
- ☐Sludge Present _______________________
- ☐Clear _______________________________
- ☐Suds ________________________________

Illicit Discharge Details:

☐Follow-up Required	Yes / No	__________
☐IDDE Source Identified	Yes / No	__________
☐Responsible Party Name		__________
☐Potential Pollutants?	Yes / No	__________
☐Enforcement Response Followed	Yes / No	__________

☐≥ 72 hours since last rainfall	Yes / No
☐Sample Collected?	Yes / No
☐Photos taken?	Yes / No
☐Corrective Action Required?	Yes / No

Additional Information:

Comments / Corrective Action Conducted:

City of Alexandria
Facility and Stockpile Inspection Form

Facility ID:	Location:
Completed by:	Signature:
Date:	Date of previous inspection:

Activities	**Yes√**	**No √**	**NA √**	**Comments**
Good Housekeeping				
Outdoor work areas and storage areas are neat and tidy.				
Access roads and parking lots are inspected for excess dirt, debris, and oil drips and are cleaned as necessary.				
General Practices				
A map of the property is available identifying the direction of stormwater flow and the location of storm drains.				
Storm drains are free of debris and stains of oil and chemicals.				
Nearby water bodies (streams, ponds, etc.) and drainage ditches are free of trash, oily sheen, foam, etc. that may be coming from the facility.				
Materials found in nearby waterbodies and drainage ditches are cleaned up.				
Landscape Maintenance				
Landscape waste and materials (i.e., grass clippings, compost, mulch) are stored in a covered, bermed, or contained area.				
Piles of mulch, compost, or yard waste are not kept next to streams, channels, or storm drain inlets.				
Grass clippings are left on the grass after mowing.				
Clippings and debris are swept off sidewalks/pavement after mowing.				
No pesticides/herbicides are sprayed near surface waters, creeks, ditches, or storm drains.				
Spot spraying is performed for weed and insect control (broadcast spraying is avoided).				
Building Maintenance				
Surface or pressure washing wastewater is directed to nearby landscaping or is allowed to evaporate if no chemicals or detergents are used and only ambient dirt is being cleaned.				
Wastewater is sent to the sanitary sewer system when chemicals or soap are being used or if materials other than ambient dirt are being cleaned from the pavement.				
Dry clean-up methods are used before pressure washing is performed (including using absorbents to clean up spills, sweeping, vacuuming, and scraping off dried debris) and debris is disposed of properly.				
Material Storage				
Materials that are potential stormwater contaminants (see Page 1) are stored under cover or in appropriately sized secondary containment.				
Materials are not loaded or unloaded near storm drain inlets or drainage ditches or over unpaved surfaces unless drains are protected.				
Unused materials are kept in original containers which are labeled to identify contents.				
Materials are not stored next to waterbodies (streams,				

drainage channels, etc.).				
Sand is stored under cover or in bermed location.				
Salt is stored under cover.				
55-gallon drums, bulk storage tanks, or other containers stored outside are specifically designed for outdoor storage.				
Secondary Containment				
The structure of secondary containment is sound.				
Water in secondary containment structures is inspected for contaminants and drained as needed.				
Contaminants and contaminated water in secondary containment is drained to the sanitary sewer or other appropriate facility.				
Equipment Storage				
Equipment is stored under cover when possible.				
Any spills and leaks from equipment are cleaned up promptly.				
Preventative maintenance is routinely performed on equipment to prevent leaks.				
Vehicle and Equipment Fueling				
Signs are present at fueling stations that prohibit "topping off" and describe spill procedures.				
Drips and leaks are spot cleaned promptly and absorbent is collected and disposed of properly.				
Fueling equipment/tanks are properly maintained and labeled (i.e., overflow protection devices, automatic shut-off valves, etc.)				
Vehicle and Equipment Maintenance				
Vehicle maintenance activities are conducted in specified area not exposed to stormwater.				
If vehicle/equipment maintenance is performed outside drip pans are placed under places where spills can occur (i.e., hose connections, filler nozzles, etc.)				
Leaking vehicles are reported to fleet maintenance.				
Vehicle and Equipment Washing				
Washwater is directed to nearby landscaping or is allowed to evaporate if no chemicals or detergents are used and only ambient dirt is being cleaned.				
Washwater is sent to the sanitary sewer system when chemicals or soap are being used or if materials other than ambient dirt are being cleaned from the pavement.				
Waste Management				
Waste is properly disposed of.				
Dumpsters or outdoor trash containers are covered at all times unless in use.				
Hazardous Waste Management				
Hazardous materials are properly labeled to identify material.				
Hazardous materials are stored to prevent exposure to stormwater runoff.				
Spill Cleanup and Prevention				
The facility has a spill response plan that is readily accessible.				
Fueling stations/islands have spill kits with absorbents immediately accessible.				
Spill kits are complete and restocked.				
Spills are cleaned up promptly.				
All employees know where spill kits are located.				
Employees are trained in proper spill containment and cleanup.				
Phone numbers and contact information for spill reporting is readily available.				

APPENDIX C
Pond Inventory

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

MS4 Pond, Wetland, and Lake Inventory Form

Municipal Separate Storm Sewer System (MS4) Program

Doc Type: Plans/Specifications/Maps

Name of MS4 Permittee	Date form completed	Unique ID Number	Type of Feature (Pond, Wetland or Lake)	Feature Common Name (If Applicable)	Y Coordinate (Latitude) Decimal Degrees	X Coordinate (Longitude) Decimal Degrees
City of Alexandria	11/3/2014	P01	Pond	Wildflower	45.91087392	-95.35109735
City of Alexandria	11/3/2014	P02	Pond	Summer Lane	45.90790066	-95.36205645
City of Alexandria	11/3/2014	P03	Pond	Wil-O-B Lane	45.90156436	-95.35636160
City of Alexandria	11/3/2014	P04	Pond	Trails Addition	45.90149861	-95.40254940
City of Alexandria	11/3/2014	P05	Pond	Trails Addition	45.90183611	-95.40139937
City of Alexandria	11/3/2014	P06	Pond	Rodeo Drive	45.89238416	-95.34855862
City of Alexandria	11/3/2014	P07	Pond	Lakeview Park N Pond	45.89270171	-95.34526738
City of Alexandria	11/3/2014	P08	Pond	Lakeview Park S Pond	45.88946045	-95.34693245
City of Alexandria	11/3/2014	P09	Pond	Birch Avenue N Pond	45.89063578	-95.33989422
City of Alexandria	11/3/2014	P10	Pond	Birch Avenue S Pond	45.88771353	-95.34073122
City of Alexandria	11/3/2014	P11.1	Pond	Depot S Pond	45.89087869	-95.37897115
City of Alexandria	11/3/2014	P11.2	Pond	Depot N Pond	45.89122704	-95.37885922
City of Alexandria	11/3/2014	P12.1	Pond	Kenwood S Pond	45.89109594	-95.37243524
City of Alexandria	11/3/2014	P12.2	Pond	Kenwood Mid Pond	45.89135466	-95.37170428
City of Alexandria	11/3/2014	P12.3	Pond	Kenwood N Pond	45.89172949	-95.37088970
City of Alexandria	11/3/2014	P13	Pond	Woodsmen	45.88951984	-95.35831725
City of Alexandria	11/3/2014	P14	Pond	Fosline Park	45.88185581	-95.33990890
City of Alexandria	11/3/2014	P15	Pond	SW Storm Sewer Pond	45.87440237	-95.39181221
City of Alexandria	11/3/2014	P16	Pond	Rosewood Lane	45.87075044	-95.35011785
City of Alexandria	11/3/2014	P17	Pond	N of Alex Clinic	45.86444409	-95.38452079
City of Alexandria	11/3/2014	P18	Pond	Burgan Sunrise N Pond	45.85083792	-95.34957154
City of Alexandria	11/3/2014	P19	Pond	Burgan Snrs Mid Pond	45.84939384	-95.34922324
City of Alexandria	11/3/2014	P20	Pond	Burgan Sunrise S Pond	45.84834368	-95.34850022
City of Alexandria	11/3/2014	P21	Pond	Industrial Park	45.85164065	-95.39640256
City of Alexandria	11/3/2014	P22	Pond	Industrial Park	45.85056512	-95.39630381
City of Alexandria	11/3/2014	P23	Pond	Industrial Park	45.85016325	-95.39459298
City of Alexandria	11/3/2014	P24	Pond	Industrial Park	45.84835255	-95.39975166
City of Alexandria	11/3/2014	L01	Lake	Henry	45.90215718	-95.37623280
City of Alexandria	11/3/2014	L02	Lake	Agnes	45.89443041	-95.37450627
City of Alexandria	11/3/2014	L03.1	Lake	Winona	45.88950911	-95.38385162
City of Alexandria	11/3/2014	L03.2	Lake	Winona	45.87816471	-95.39896507
City of Alexandria	11/3/2014	1114421	Wetland		45.84776964	-95.42472028
City of Alexandria	11/3/2014	1114425	Wetland		45.84286059	-95.42678043
City of Alexandria	11/3/2014	1114429	Wetland		45.83293935	-95.42699272

City of Alexandria
Pond Sediment Removal Form & Routine Maintenance Form

Pond ID #:	Date:
Individuals providing maintenance/cleaning:	
Volume of sediment removed (cy): If less than 100 cubic yards, perform routine pond maintenance. If 100+ cubic yards, complete laboratory testing of sediment removed and attach results.	
Location of final disposal of sediment/trash:	
Notes (including type/amount of debris/trash removed, observations/maintenance comments):	
Contractor information: (if available)	

**Pond as-built plans attached, if available

Summary of Stormwater Pond Sediment Testing Results (Revised 7-2-2012 "Stormwater Sediment" spreadsheet only)

Project Name:

Sample Date:

Parameters	Insert Reporting Limit*	Residential SRV Values	Industrial SRV Values	Sample Locations and Depths: Core Location #1 mg/kg		Core Location #2 mg/kg		Core Location #3 mg/kg	
		mg/kg	mg/kg						
Metals	mg/kg								
Arsenic		9	20						
Copper		100	9000						
Noncarcinogenic PAHs	mg/kg								
Acenapthene		1,200	5,260						
Acenapthylene		na	na						
Anthracene		7,880	45,400						
Benzo(g,h,i)perlyene		na	na						
Fluoranthene		1,080	6,800						
Fluorene		850	4,120						
2-Methylnapthalene		100	369						
Naphthalene		10	28						
Phenanthrene		na	na						
Pyrene		890	5,800						
Quinoline**		4	7						
Carcinogenic PAHs & Total B[a]P Equivalents	Insert Reporting Limit* mg/kg	Potency Equiv. Factor (PEF)		Site Conc.	BaP Equiv.	Site Conc.	BaP Equiv.	Site Conc.	BaP Equiv.
Benz[a]anthracene		0.10			0.000		0.000		0.000
Benzo[b]fluoranthene		0.10			0.000		0.000		0.000
Benzo[j]flouranthene		0.10			0.000		0.000		0.000
Benzo[k]fluoranthene		0.10			0.000		0.000		0.000
Benzo[a]pyrene		1.00			0.000		0.000		0.000
Chrysene		0.01			0.000		0.000		0.000
Dibenz[a,h]acridine		0.10			0.000		0.000		0.000
Dibenz[a,h]anthracene		0.56			0.000		0.000		0.000
7H-Dibenzo[c,g]carbazole		1.00			0.000		0.000		0.000
Dibenzo[a,e]pyrene		1.00			0.000		0.000		0.000
Dibenzo[a,h]pyrene		10.00			0.000		0.000		0.000
Dibenzo[a,i]pyrene		10.00			0.000		0.000		0.000
Dibenzo[a,l]pyrene		10.00			0.000		0.000		0.000
7,12 Dimethylbenz-anthracene		34.00			0.000		0.000		0.000
Indeno[1,2,3,-c,d]pyrene		0.10			0.000		0.000		0.000
3-Methylcholanthrene		3.00			0.000		0.000		0.000
5-Methylchrysene		1.00			0.000		0.000		0.000
Total B[a]P Equivalent* (mg/kg)**		2	3		0.000		0.000		0.000

Residential SRV (suitable for residential land use)

Industrial SRV (suitable for industrial land use)

Highlight value for "J" flagged data - sample concentration is above Method Detection Level but is below Reporting Limit

SRV = soil reference value

PAHs = polycyclic aromatic hydrocarbons

na = not available, there is no SRV available for this contaminant at this time.

B[a]P = benzo[a]pyrene

* **Reporting Limits**- insert reporting limits in this column from the lab analytical results reports (converting to mg/kg if necessary)

** **Quinloine** is a carcinogenic PAH that does not have a PEF value. Therefore, it is not included in the B[a]P equivalent calculation. It is included in the noncarcinogenic PAH section and evaluated separately.

*** **B[a]P Equivalent** - Each contaminant sample concentration is multiplied by it's Potency Equivalency Factor (PEF) to obtain a B[a]P equivalent concentration. All B[a]P equivalent concentrations are summed to calculate the total B[a]P equivalent concentration. For nondetect data, use the procedures outlined in Appendix B of "Managing Stormwater Sediment BMP Guidance For Municipalities".

APPENDIX D
MPCA Sediment Removal Guidance

Managing Stormwater Sediment Best Management Practice Guidance

Minnesota Pollution Control Agency

June 2015

Minnesota Pollution Control Agency

520 Lafayette Road North | Saint Paul, MN 55155-4194 |

651-296-6300 | 800-657-3864 | Or use your preferred relay service. | Info.pca@state.mn.us

Document number: wq-strm4-16

Table of Contents

Stormwater Sediment Best Management Practices

What's New?

- Land use category definitions have been revised.
- Minor changes have been made to the "Stormwater Sediment Spreadsheet" to make the spreadsheet easier to use when calculating benzo[a]pyrene (B[a]P) equivalents and comparing contaminant concentrations in stormwater sediment to soil reference values.
- Sediment sampling is required regardless of the volume of sediment to be excavated.
- General information about hydraulic dredging has been added.

This document provides guidance for stormwater collection and conveyance systems which have been designed, constructed, operated, and maintained for the purpose of providing treatment of stormwater. Stormwater collection and conveyance systems help protect infrastructure from flooding and they collect and concentrate pollutants to prevent them from reaching lakes, rivers, streams, wetlands, and other waters of the state where they could have a negative effect on water quality, aquatic animals, or human health. Managing contamination and pollutants in stormwater collection and conveyance systems should be expected and sampling is required prior to disposal, or beneficial use (e.g. fill, topsoil, or compost) to determine proper management.

This guidance document will help you think through important steps associated with sediment removal projects. These may include:

- Who is responsible for managing stormwater sediment
- Land use within a drainage area
- Sampling sediment and what laboratory analysis is required
- How to calculate BaP equivalents for carcinogenic polycyclic aromatic hydrocarbons (cPAHs)
- Management requirements for contaminated sediment;
- Where contaminated stormwater sediments are accepted for disposal

This document is intended to help those responsible for operation and maintenance of stormwater systems determine when sediment removal is needed, and what steps to consider during the course of managing a sediment removal project. This is guidance. It is not a comprehensive list of everything you may need to do when managing a sediment removal project.

Other considerations may also include:

- Proximity to high value resources or sensitive ecological features
- Landscape variations, and soil types
- Management of native or invasive species
- A wide range of other variables that may be encountered from one municipality to the next, or one project to the next

This guidance was developed with special assistance from the cities of Burnsville, Circle Pines, Maplewood, Roseville, St. Paul, White Bear Lake, and Woodbury, Minnesota.

Background

Action was taken during the 2009 Minnesota Legislative session which included funding to conduct research on stormwater pond sediment contamination and to help Minnesota cities clean-out contaminated stormwater ponds. (House File Number 1231 Passed by the Minnesota Legislature on May 18, 2009 and approved by Governor Tim Pawlenty on May 22, 2009.)

Research concluded that polycyclic aromatic hydrocarbons (PAHs) are often responsible for the greatest contamination problems in stormwater pond sediment (Crane et al. 2010). Research conducted on stormwater pond sediments in the Minneapolis-St. Paul, Minnesota metropolitan area showed that PAHs are the primary contaminants of concern affecting disposal decisions (Polta et al. 2006; Crane et al. 2010). PAHs persist in the environment and pose a risk to animals, plants, and people at elevated concentrations. These contaminants are formed by the incomplete combustion of organic materials, such as wood, oil, and coal, as well as occurring naturally in crude oil and coal (Crane et al. 2010).

Coal tar-based sealants are a major source of PAHs in urban sediments where these products are used in the surrounding watershed (Mahler et al. 2012). The Minnesota Pollution Control Agency's (MPCA) research (Crane 2014) determined that coal tar-based sealants were the most important source of PAHs (67.1%), followed by vehicle emissions (cars and trucks) (29.5%) and pine wood combustion (3.4%).

The Legislation also provided funding for municipalities who pass ordinances banning or restricting the use of coal tar-based sealants. Twenty-nine municipalities passed such ordinances before legislation in the spring of 2013 banned coal tar-based sealants state wide effective January 1, 2014 (Minnesota Statutes section 116.202).

The 2009 Legislation also directed the MPCA to develop stormwater best management practices (BMPs) to avoid or mitigate impacts of PAH contamination from coal tar-based sealants. The MPCA provides guidance for the operation and maintenance of constructed stormwater collection systems. BMPs can be found in the Minnesota Stormwater Manual at this location http://stormwater.pca.state.mn.us/index.php/Main_Page.

Stormwater collection and conveyance systems are commonly referred to as stormwater ponds, stormwater control devices, wet detention basins, or National Urban Runoff Program (NURP) ponds.

This document provides guidance for sediment removal projects from stormwater ponds that have been designed, constructed, operated and maintained for the purpose of providing treatment of stormwater.

Sediment removal from lakes, rivers, streams, and wetlands may be subject to additional requirements such as a permit from the Department of Natural Resources (DNR) to allow work below the ordinary high water level. Permit determinations are guided by DNR hydrologists based on geographical location. A list of DNR hydrologists by area is available on the DNR web site at http://files.dnr.state.mn.us/waters/area_hydros.pdf.

Sediment may also be generated in other stormwater collection devices such as rain gardens, infiltration swales, sumps, traps, pipes, and/or other conveyance structures. This guidance may be adapted for other situations to determine representative contaminant concentrations. The analytical component outlined in Appendix A may be applied to other sediment sampling situations, but the MPCA does not have specific sampling guidance at this time for those situations and it is not necessary to follow this guidance for other types of sediment removal projects. The sampling guidance provided in Appendix A is strictly for sampling sediment from stormwater ponds that have been designed, constructed, operated, and maintained for the purpose of providing treatment of stormwater.

Sediment disposal costs

The high cost to manage contaminated stormwater sediment has brought operation and maintenance of stormwater ponds into the public spotlight. Unregulated sediment is characterized as sediment that does not have contamination exceeding the residential soil reference values. Unregulated sediment may be managed locally and without disposal restrictions. Disposal costs for stormwater sediment removal projects with contamination exceeding the industrial soil reference values is regulated as a solid waste and the cost for disposal can be as much as three times more expensive than unregulated sediment depending on the type and level of contamination. The high cost to manage contaminated sediment emphasizes the importance of source control to reduce the loading of contamination into stormwater ponds.

Sediment removal process

Inventory and maintenance needs.

Evaluating and testing sediment.

Engineering, contracting, and work plans.

Excavating sediment.

Site restoration.

Records and documentation to keep on file.

1. Inventory and maintenance needs

Assessing need and planning sediment removal projects includes a number of steps that range from estimating lost capacity to notifying neighbors about plans to maintain the stormwater collection system. For municipalities who are managing dozens, or sometimes hundreds of stormwater ponds, starting with an inventory and a maintenance prioritization process is recommended.

Some municipalities find it helpful to develop a flowchart or other prioritization scheme to triage and track priority sediment removal projects. Topics of importance may include:

- Have priorities been identified by city inspections – sediment level, lost capacity, other needs?
- Accessibility. Does the city already have access via parkland, easement, or outlot? Are there access points for machinery and trucks?
- What are the sediment analysis results? Can the city afford to remove and manage the sediment?
- Is the downstream lake or sub-watershed a priority?
- What is the expected cost/benefit from the project?
- Can a stormwater pond be expanded, or redesigned to provide greater benefit?
- Is surveying needed to assess lost capacity and depth of excavation?
- How will you measure or estimate the volume of cubic yards of sediment to be removed?
- Have sediment deltas and inlet/outlet structures been identified/located?
- Are communications with other stakeholders important/public relations?
- Are visual inspections, notes, checklists, or photos to track maintenance projects needed?

The first phase of work identifies need and determines if a sediment removal project is even necessary. This may include a preliminary survey to gage sediment depth and provide a rough estimate of the number of cubic yards of sediment to be removed. This assessment and planning will help guide work plan development and contracting if a sediment removal project is deemed necessary.

2. Evaluating and testing sediment

Sediment samples are collected and compared to MPCA's Remediation Division soil reference values (SRVs) to determine where excavated sediment may be beneficially used or disposed. This affects work plan development, including contract specifications for bidding projects and is an important part of the management process.

- Guidance for *collecting samples and testing sediment* are summarized in Appendix A.
- Guidance *comparing contaminant analytical data (concentrations) to SRVs and* calculating *B[a]P equivalents* are summarized in Appendix B.

There are two sets of SRVs based on the following Remediation soil land use categories:

Residential land includes lawn surrounding single family housing and newly developed single family residences, multi-family housing, condominiums, playgrounds, sports fields, beaches, produce gardens, long-term care facilities, correctional housing, hospitals, campgrounds, child care centers, churches, schools, wildlife areas, local/state/national forests, and public or private erodible trails are included in this category.

Industrial land includes lawns, yards, and landscaping that surround hotels, office buildings, retail stores, shopping centers, and restaurants and industrial property, public utility facilities, rail and freight facilities, storage facilities, warehouses, office buildings and manufacturing facilities.

The analytical results and calculation of B[a]P equivalents are compared to the MPCA's Remediation Divisions SRV values to determine management or treatment options.

Management options include:

Use of excavated sediment as unregulated fill. Contaminant concentrations from the list of analytes, including cPAHs expressed as B[a]P equivalents and any other site-specific contaminants are all below the Residential SRVs. The excavated sediment is unregulated fill and does not require any special management.

Determination of excavated soil as regulated solid waste. One or more of the required list of analytes, including cPAHs expressed as B[a]P equivalents and any other site-specific contaminants exceed the Residential SRVs but do not exceed the Industrial SRVs. The excavated sediment requires special management and cannot be used as unregulated fill. Excavated sediment can be managed in accordance with the MPCA's BMPs for the Off-Site Use of Unregulated Fill available at: http://www.pca.state.mn.us/index.php/view-document.html?gid=13503.

Excavated sediment that is not considered unregulated fill is most commonly guided to a solid waste landfill. Depending on the types and concentrations of contaminants; sediment may need to be disposed of at a Municipal Solid Waste (MSW) landfill that has an industrial solid waste management plan. This means contaminated sediment must go to a MSW landfill that has a liner and a leachate collection system.

MSW landfills in Minnesota that can accept contaminated sediment are listed at this webpage:

http://www.pca.state.mn.us/veiz806 or, the list can be accessed directly at this link: http://www.pca.state.mn.us/index.php/view-document.html?gid=12806.

Some additional landfills that are permitted to accept industrial waste, and which may also accept contaminated stormwater sediments, include:

1. Voyageur Industrial Landfill in Cannon Falls, Minnesota
2. Vonco II Landfill in Becker, Minnesota
3. Vonco V Landfill in Duluth, Minnesota
4. Shamrock Environmental Landfill in Cloquet, Minnesota
5. Dem-Con Landfill in Shakopee, Minnesota
6. Veolia E S Rolling Hills Landfill in Buffalo, Minnesota
7. SKB Rosemount Industrial Waste Facility in Rosemount, Minnesota

Guidance for analytical data comparing contaminants to SRVs and calculating B[a]P equivalents are summarized in Appendix B. At this time testing sediment for metals other than copper and arsenic is not required. However, contractors who remove and/or transport sediment, or facilities that beneficially re-use or dispose of sediment may require test results for heavy metal concentrations. This may be an important variable as sediment removal projects are planned and samples are collected and compared. It is recommended that you consult with contractors and contact disposal or re-use facilities to ensure they will be able to accept your waste and to determine what additional sampling requirements (if any) may be required by the facility.

3. Engineering, contracting, and work plans

Work plan development includes a wide range of logistics including, but not limited to:

- Notification of residents and neighbors;
- How to access the site and what machinery will be needed to remove sediment.
- Define how sediment will be removed, measured, and paid for.
- Testing or analysis requirements for the destination disposal or treatment facility.
- Plans for erosion control.
- Tree removal, environmental impact, depth to ground water, and risks associated with the displacement of wildlife or invasive species.
- Lack of design and/or construction documentation (no "as-built" records).
- Estimating water draw-down needs and the amount of time and oversight needed to drain the stormwater collection system.
- What permits (if any) may be required by your local watershed district, county, or the MDNR. The MPCA does not require a permit or notification for routine maintenance of stormwater ponds, but cities are advised to keep records and documentation of their sediment removal projects as outlined in this guidance and as required by the Municipal Separate Storm Sewer Systems (MS4) Permit.
- Defining appropriate BMPs for dewatering (e.g., rock riprap, sand bags, plastic sheeting, or other accepted energy dissipation measures), such that the discharge does not adversely affect the receiving water or downstream landowners.
- Ensuring that water from pumping or draw-down activities is discharged in a manner that does not cause nuisance conditions, erosion in receiving channels, or erosion on down-slope properties. This also includes inundation of wetlands causing significant and/or adverse impact. The general rule of thumb is "keep it clear".
- How sediment will be transported and a process to track the volume of sediment removed.

- Defining logistics, administrative, and engineering requirements, surveys, dewatering processes, site access and easements, rock entrance and off-site tracking needs, coordination with adjacent cities, and/or watershed districts and the Minnesota Department of Transportation.

4. Excavating sediment

Sediment excavation projects can take place during the winter or summer.

Benefits to sediment removal projects in the winter include:

- Winter excavations greatly reduce the risk that rain may cause flooding and erosion of dewatered ponds, or turbid runoff conditions.
- Access with trucks and heavy machinery is easier in the winter when soil surrounding stormwater ponds freezes solid.
- Adjacent residents and neighbors have windows closed and this means less noise, less dust, less odor, and fewer disturbances overall.
- Water can be pumped down so remaining water can freeze solid. Pumping should be discontinued before the bottom of the pond is disturbed and sediment is stirred up making the water turbid. Remaining water should be allowed to freeze solid trapping any suspended sediment in ice. The ice can then be skimmed off with a bulldozer so it can be piled within the pond. This keeps turbid water in the basin after snow and ice melt during spring thaw.

Winter excavation projects also have a few drawbacks. They include:

- Shorter working days
- Problems associated with working in freezing conditions and sub-zero weather
- The use of lights after dark to extend the work day

Sediment removal can begin once snow and ice have been skimmed off and piled within the pond.

Once sediment is removed, final grading should achieve a natural (gradual) slope for all banks. Ice and snow that has been stockpiled in the pond should be evenly distributed throughout the basin once sediment has been removed. This will allow water and remaining sediment to be retained in the pond. Temporary stabilization of slopes and banks should ensure control of erosion and prevent site run-off during spring snowmelt and the first rain events of the season. Clean-up and removal of temporary infrastructure should be done working your way out of the site. Once equipment and temporary infrastructure (such as transport roads and rock entrances) is removed, it will be cost prohibitive and essentially impossible to make additional corrections.

Summer excavations include the risk of unexpected rain fall events that can complicate a conventional sediment removal project and sometimes delay the project for days and increase the risk to receiving waters down-stream. Small projects (less than one acre) may be completed in one day or less and risks associated with unexpected rain fall events can be minimized or avoided altogether. Small projects don't require a permit, but safeguards and best management practices are still required to ensure negative down-stream impacts to receiving waters are prevented. Large projects that will disturb one or more acres upland are required to have a Construction Stormwater Permit to ensure best management practices are implemented as the scale of the project and potential risks to receiving waters increase.

One method of sediment removal that can be used during the summer months is called hydraulic dredging. This process utilizes a watercraft or floating dredging device with a large centrifugal pump to remove sediment. Saturated mud and sand (often referred to as muck) is removed from the stormwater pond and discharged into a large filter bag (or series of bags) upland. This process may allow sediment to be pumped hundreds and sometimes thousands of feet away from the pond depending on site conditions. Water that drains from the filter bag is channeled to a secondary treatment system with a flocculent that provides additional filtration before the water is returned to the stormwater pond. Benefits to hydraulic dredging include:

- Allows work to be performed during warm weather conditions.
- May be better suited for sites that are difficult to access with large trucks or large machinery.
- In many cases it will result in less disturbance for neighbors as the dredging operation is generally more quiet than operating various types of heavy machinery.
- Impacts to reptiles (turtles) and amphibians (frogs) may be less as they are not hibernating in the sediment and are able to move away from the slow moving dredge.
- Filter bags and treatment of the water that drains from them reduce fugitive dust and provide a secure way to store sediment while the sediment dries out.
- No need to bypass flows in the watershed which can be difficult if the watershed draining to the pond is large.
- Hydraulic dredging can take place even when there are significant groundwater inputs to the pond.
- Scheduling and costs are typically more predictable and are not likely to vary as they might with conventional excavation methods.
- Hydraulic dredging has a longer working season. Sediment removals via hydraulic dredging can be performed roughly eight months of the year depending on site conditions and seasonal variations from year to year.
- Hydraulic dredging projects are not impacted by rainfall and can continue operations during rainfall if desired.

Hydraulic dredging projects also have a few drawbacks. They include:

- Segregating specific areas of the pond by contaminate levels may be difficult or impossible.
- The necessary area needed for dewatering and storage may not be available depending on the specific sit.
- In drought years there may be too little water in the pond to effectively float and propel the dredge.
- Projects are typically more expensive than conventional excavation methods.
- Sediment pumped to filter bags must be handled a second time when the bags are opened and sediment is loaded into trucks for transportation off site.
- Grinding or mulching dense vegetation can be a messy and difficult process when large amounts of woody debris (logs, stumps) are encountered. Dense vegetation can slow down the dredging process and it may also increase time and cost.

Regardless of method; survey work is usually conducted to better estimate the amount of sediment to be removed and to identify the depths of excavation in order to restore desired capacity. If the removal volume is not defined by surveying then establishing a standard volume per truck and calculating the volume based on truck loads leaving the site can be used to track the volume in cubic yards.

Excavating or removing sediment from stormwater collection systems requires care to prevent turbid water and pollutants from impacting down-stream waters such as wetlands, streams, rivers, or lakes. This is just as true for winter sediment removal projects as it is for projects conducted during the summer months.

5. Site restoration and erosion control

Site restoration work should be conducted as soon as weather conditions permit and may include:

- Additional clean-up or maintenance of inlet and outlet structures.
- Additional site stabilization work including sediment and erosion control.
- Establishing plants, seed, sod, mulch, or vegetation to prevent erosion (above water line).
- Professional engineer sign-off on project completion.

Erosion control (temporary and permanent) are typically incorporated into plans and specifications for stormwater sediment removal projects. Permanent erosion-control features may include provisions for:

1. Vegetative buffer strips around the pond
2. Design of grassed waterways and overflow channels
3. Armoring of spillways and banks, or other features needed to prevent erosion for the life cycle of the stormwater collection and conveyance system

Temporary erosion control features may include provisions such as mulch, tackifiers, or erosion control blankets to prevent erosion until seeding takes root and vegetation becomes established. Erosion of banks, side slopes, safety benches, spillways, outfalls, channels, and adjacent upland areas disturbed by machinery are all priority areas during site restoration. These areas should be stabilized as quickly as possible to prevent erosion.

Areas susceptible to erosion should be inspected frequently following a sediment removal project. If erosion occurs the eroded areas should be restored as quickly as possible. If erosion persists action must be taken immediately to protect downstream receiving wasters with permanent erosion control. Permanent features may include:

- Bioengineering strategies
- Turf reinforcement mats
- Vegetated-concrete-block-armoring
- Properly sized riprap and filter materials

Vegetated buffer strips (25 feet or more) are recommended to surround the stormwater pond (whenever possible) to prevent erosion from the pond's immediate tributary. Establishing vegetation not only helps maintain the integrity of the pond, it also helps with the ponds overall appearance. Establishing vegetation is important, but care should be taken to prevent trees, shrubs, or brush from growing within 15 feet of the toe of the embankment, or 25 feet from the inlet and outlet structures. Roots can damage pipes and other infrastructure, but trees and shrubs can also clog inlets and outlets and prevent the stormwater pond from functioning properly.

6. Records and documentation to keep on file

It is important to keep good records about the operation and maintenance of stormwater collection systems. Good records will not only assist with an accurate inventory and triage of stormwater ponds, but they can also provide the basis for sound planning in the future. Important records and documentation for sediment removal projects may include:

- Inspection dates and frequency of inspections **(Required by MS4 Permit)**

- Description of maintenance and dates performed **(Required by MS4 Permit)**
- The unique ID# of the pond **(Required by MS4 Permit)**
- Employee training records **(Required by MS4 Permit)**
- Volume of sediment removed in cubic yards **(Required by MS4 Permit)**
- Evaluation, testing, and/or laboratory results **(Required by MS4 Permit)**
- Place of disposition/disposal **(Required by MS4 Permit)**
- "As Built" prints or plans if they exist
- The name and geographical location of the pond with reference to nearest cross roads
- Contractor information, shipping papers/manifests/contractual agreements
- Any other observations about the sediment removal, or work performed, that will help the city operate and maintain that site in the future

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Appendix A: Sediment Sampling and Analytical Technical Guidance

This technical guidance should be shared with staff or environmental consultants responsible for sampling sediments and interpreting the analytical results for the owner or responsible party. It is the responsibility of the owner or responsible party to either train their staff or select consultants who can perform these tasks.

What's New?

- MPCA now requires sediment sampling be conducted regardless of the volume of sediment to be excavated.
- Information regarding selection of a laboratory.

Sediment sampling

The US Environmental Protection Agency's (EPAs) report on "Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual" (USEPA 2001) provides guidance on sediment monitoring plans, collection of whole sediments, field sample processing, transport and storage of sediments, sediment manipulations, and quality assurance/quality control (QA/QC) issues. This report should be used as a resource by owners or responsible parties, and their consultants, for sampling and processing stormwater pond sediments. In particular, this user-friendly document provides pictures of sediment sampling equipment, flowcharts for making decisions, check lists, and boxes of important bulleted items.

Sediment characterization

Stormwater pond sediments are very complex, and chemical results can vary greatly within a few yards of each sample. This feature makes it more difficult to provide generic guidance for a broad suite of stormwater ponds. Stormwater ponds may also vary in size and shape, and some ponds may have multiple inlets and outlets. Finally, the type of land uses in the drainage areas of the ponds can influence contaminant concentrations in the pond sediments.

Based on the MPCA's 2009 stormwater pond study (Crane 2014), coal tar-based sealant sources comprised 67.1% of total PAHs in surface sediments of ponds located primarily in residential, commercial, and industrial land use areas. Watersheds where coal tar-based sealants are used on driveways and parking lots will have higher concentrations of PAHs in nearby stormwater pond sediments than those that use either asphalt-based sealants (which have much lower concentrations of PAHs), no sealant, or use other material such as concrete, permeable pavers, or gravel for driveways and parking lots. Even though a statewide ban on coal tar-based sealants went into effect January 1, 2014 in Minnesota, abraded coal tar-based sealant particles from existing driveways and parking lots will continue to wash off into stormwater collection and conveyance systems for years to come. As these parking lots and driveways are sealed with asphalt-based sealants in the future, and with the elimination of new applications of coal tar-based sealants, concentrations of PAHs contamination in sediment deposits is expected to be reduced over time.

The MPCA is requiring owners or responsible parties to sample sediments prior to their disposal to determine concentrations of 17 cPAHs, 10 noncarcinogenic PAHs, and the following metals: arsenic and copper. A list of the specific cPAHs and noncarcinogenic PAHs can be found in MPCA's "Summary of Stormwater Pond Sediment Testing Results" spreadsheet available on MPCA's website MS4 stormwater web page at: http://www.pca.state.mn.us/sbiza7c. Click on the "Permit" tab and scroll down to the bottom under the "Additional Items" heading. It is the responsibility of the owner or responsible party to evaluate the drainage area of each stormwater collection system to determine whether spills, improper disposal, or the potential for a release from commercial or industrial operations indicate that sampling for other contaminants are needed. For example, if sediment is being removed from a pond in an industrial park and there has been a release of contaminants known to accumulate in sediments (example, nickel from a metal plating facility), the owner or responsible party should include those contaminants on the list for sampling.

Analysis of sediment samples for particle size and total organic carbon (TOC) is optional, but this information may be useful for some beneficial reuse scenarios of the excavated sediment.

The analytical laboratory will provide guidance on how much sediment is needed for each analysis. Since it can sometimes take several months from the time field sampling is conducted to when the analytical results become available, the field sampling needs to be conducted early on in the process to provide timely assessments of management options. Sediment sampling for required analytical parameters needs to be conducted regardless of the volume of sediment to be excavated from the pond.

General guidance for characterizing sediment is as follows:

- Sampling should be to the planned depth of excavation or greater. The MPCA has provided previous guidance to collect sediment samples in two foot intervals (e.g., 0 – 2 ft, 2 - 4 ft), but it is up to the owner or responsible party to collect sediment samples that will cover the depth to be dredged. If it is easier in the field to collect two foot depth intervals, then by all means continue to do this. The important issue is to send a sediment sample to the analytical laboratory that is representative of the entire depth interval to be excavated. Since collecting sediment from two or more long (2 ft) cores may entail a large mass of sediment, it may be easier to slice the core from top to bottom and only analyze half of the slice; this slice can be combined with a deeper layer slice to provide one composite sample for the analytical laboratory to analyze. It is not acceptable to randomly scoop out bits of sediment from different portions of the sediment core to composite together since doing so may miss out on the historical record of sediments (and contaminants) deposited in different depth intervals.
- Core samplers are more appropriate to use to obtain cohesive sediment samples at a depth than grab samplers. Grab samplers can be used to collect surface samples if the sediment samples are too floccy (loose) with vegetative detritus (e.g., parts of cattail stalks/leaves) or are too sandy to be retained in a core sampler.
- Geopositional coordinates need to be collected at the location of each sample site.
- The number of samples to be collected depends on the surface area of the pond. [Note: this is a change in policy from previous MPCA guidance (Stollenwerk et al. 2011) that recommended the number of samples per the estimated volume of dredge material.] The goal is to collect sediment samples that are representative of the material that will be removed to maintain the functionality of the stormwater pond.
- Multiple samples need to be collected, particularly since some compounds may not be detected in all areas of the pond.
- For stormwater ponds with a surface area less than or equal to one acre, at least two stations need to be sampled for chemical analysis. Sample sites may either be selected randomly or by a transect from the main inlet to the outlet of the pond.

- For ponds greater than one acre and less than four acres, one sampling station should be located in each acre and portion of an acre of the pond. In some cases, multiple samples may need to be collected at the same station and composited together to provide an adequate mass of sediment for the analytical work. Sample sites may either be selected randomly or in a transect from the main inlet to outlet of the pond.
- For ponds larger than four acres, divide the pond into four sections (quadrants) as shown in Figure A-1. Select at least five sites (i.e., subsamples) within each quadrant using either the dice pattern shown in Figure A-1 or using a random sampling strategy. Sediment from each subsample needs to homogenized (mixed well) in a precleaned container (large 4 L Pyrex mixing cups work well; larger volumes can use precleaned buckets). An equal aliquot of sediment from each subsample is then composited together to form the sediment sample for that quadrant that is submitted to the analytical laboratory.
- For natural ponds larger than four acres that have an irregular shape, such as bays off the main pond, each bay should be sampled if it is targeted for dredging. Depending on the size of the bay, use the aforementioned guidance for developing a sampling plan.
- If more than 10 samples are collected for analysis (possibly from a study of multiple ponds during the same time period), a field replicate sample needs to be collected for every 10 samples (i.e., 10% of samples). A field replicate is collected in close proximity to the other sample and provides a measure of field precision.
- Remove any rocks, pebbles, trash, large invertebrates (like beetles), or large pieces of detritus from each subsample and composite sample.
- Overlying water needs to be decanted from the subsamples and composite sediment sample in the field prior to splitting the sample into the sample jars.
- Sediment samples from stormwater ponds can vary in their consistency. Some samples may be loose ("soupy") if they contain a lot of cattail or wetland plant detritus. In these cases, collect extra sediment to ensure the laboratory will have enough mass of sediment to conduct their analyses.
- Sediment samples need to be homogenized (mixed well) before splitting the sample into pre-cleaned jars for the PAH and metals analyses. Many laboratories will measure the percent moisture of the sediment samples to convert the results to dry weight measurements. In some cases, the laboratories may provide a separate sampling container for percent moisture, and it may be billed as a separate analysis. The analytical laboratory will provide pre-cleaned jars and sample labels for their clients.
    - It is important with PAHs to use amber, pesticide-grade, pre-cleaned glass jars with Teflon™-lined lids since PAHs may be degraded by sunlight. Use a permanent marker to fill out the sample label; it is helpful to wrap clear packing tape around the label to secure it on the jar since sometimes the labels can come loose while the sample jars are stored on ice during field sampling.
    - The laboratory will provide separate containers for metals.
- Store the sediment samples on ice in a cooler during field sampling. Sample tracking forms or chain-of-custody forms are helpful to use during field sampling to record observations about the sediment samples and to provide field sampling information (e.g., sample station, date, time, sampling equipment, analyses to be done). Most analytical laboratories will provide their clients with chain-of-custody forms.

Submit samples to analytical laboratories

At the end of each field sampling day, either transfer the samples directly to the analytical laboratory, which is preferred, or store them in an interim refrigerator or freezer (depending on the specifications of the laboratory) prior to submittal. Some laboratories may provide a courier pick-up service. When out-of-town laboratories are used, ship the samples on ice in sturdy coolers using an overnight courier; also use packing peanuts and consider wrapping each jar in bubble wrap.

The analytical laboratories will provide guidance on the holding times for samples based on the analytical parameter. Sediment samples can usually be frozen to extend the holding time, but care must be taken to only fill the sample jars two-thirds full to allow room for expansion while the sediment freezes.

To increase the success of the analytical work, follow these steps prior to submitting the sediment samples:

- Even with decanting overlying water during field sampling, the sample jars may contain a layer of water over the sediment. This water needs to be removed prior to analysis. Either the field sampler (if the samples are stored overnight at an interim facility) or the analytical laboratory needs to remove this overlying water. Laboratory staff will not automatically do this step, and the client needs to specify if they want this done. Use of a pre-cleaned, wide-bore pipette to remove overlying water is better than decanting the sample since it will not disturb the sediment as much in the jar. If the laboratory receives sediment samples that have a high water content, then there may not be enough mass of sediment available to do their analyses.
- Provide the analytical laboratory with recommendations on which sample(s) would make good candidate Matrix Spike/Matrix Spike Duplicate (MS/MSD) samples for the cPAH analysis. This is important since the laboratory receives a subsample of the field sample and does not have the field sampling observations the field sampling crew noted when the sample was collected. If guidance is not provided and the laboratory ends up selecting a sediment sample high in PAHs (as occurred with the MPCA's stormwater pond study), the results of the MS/MSD will not be as useful and the client will still be charged for this analysis. Good candidate samples would be expected to have lower concentrations of PAHs so that the spike level of the MS/MSD will be at least five times greater than the background sample. Avoid designating samples that have strong petroleum odors, have an oil sheen overlying the sediment, or are dark black and oily in appearance since these samples are likely to have high concentrations of PAHs or interferences.
- Provide a copy of the sample tracking form to the analytical laboratory when the samples are submitted or shipped to them.

How to Select an Analytical Laboratory:

Municipalities can access laboratory services through the Minnesota Department of Administration Cooperative Purchasing Venture (CPV) program. There is no charge to sign-up, and the CPV program is open to all municipalities. The CPV program allows municipalities to obtain laboratory services through state-negotiated contract prices. Municipalities who are not currently a CPV member, but would like to become one, may sign-up for this program at the Minnesota Department of Administration's website at: http://www.mmd.admin.state.mn.us/cpv2.htm. The Minnesota Department of Administration's website contains a comprehensive list of state-negotiated contracts. The following list is a sub-set specific to sampling and laboratory analysis.

S-792(5)	SAMPLING & LABORATORY ANALYSIS - ENVIRONMENTAL
L-377(5)	LAB ANALYSIS: AGE DATING OF YOUNG GROUNDWATER
L-369(5)	LAB ANALYSIS: CONTAMINANTS OF EMERGING CONCERN (CECs)
L-368(5)	LAB ANALYSIS: ENVIRONMENTAL ISOTOPE GEOCHEMISTRY
L-379(5)	LAB ANALYSIS-COLILERT®/ECOLI
L-347(5)	LABORATORY ANALYSIS - INVER. SAMP. PROC. & IDENT.

Laboratories that freeze dry the sediment samples prior to extraction and analysis for PAHs and metals, as well as other contaminants of potential concern, reduce or eliminate the problems of wet samples. These laboratories are also able to achieve lower detection limits and more quantitative determinations. Freeze drying of the sample also allows for complete homogenization of the sample matrix, which will result in improved precision. Although not a requirement, better results may be obtained using this preparation method.

Analytical methods

The primary analytical methods are provided below:

The extended list of PAHs, including 17 cPAHs (Table A-1) and noncarcinogenic PAHs, must be analyzed based on the most recent final version of EPA SW-846 Method 8270 by gas chromatography/mass spectrometry (GC/MS) with selective ion monitoring (SIM) as optional.

- Since sediments from stormwater ponds usually contain interfering compounds, it is required that the analytical laboratory run the sample extracts through clean-up columns, rather than just diluting the sample extract to reduce interfering compounds. An example clean-up process is to pass the sample extract through an alumina (and/or silica gel) column to isolate the hydrocarbon fraction. A layer of activated copper can be added to the bottom of the column or to the sample extract to remove any sulfur that may have been present in the samples. Refer to EPA SW-846 Method 8270D (section 11.2), and Method 3600C for guidance on appropriate cleanup techniques. When sample extracts are subjected to cleanup procedures, the associated batch quality control samples, i.e., method blank, laboratory control sample (LCS), MS/MSD etc., must also be subjected to the same cleanup procedures. Note that 14 cPAHs were detected in the MPCA's study of stormwater pond sediments (Crane in review), and either more cPAHs or a greater percentage of cPAHs may have been detected if clean-up columns had been used instead of diluting the sample extracts (Table A-2). These results, in addition to other factors described in Table A-2, were used to shorten the list of cPAHs from 25 to 17 compounds.
- The analytical laboratory must be asked to note J-flagged data that are in-between the method detection limit and the reporting limit.

- Metals, excluding mercury, should be analyzed by inductively coupled plasma—mass spectrometry (ICP—MS) using the most recent final version of EPA SW-846 Method 6020. Occasionally, confirmation of the metal may be needed using graphite furnace atomic absorption spectrophotometry.
- Mercury is analyzed by atomic absorption cold vapor spectrometry using EPA SW-7471.
- Percent moisture should be determined using reference method ASTM D2216 or as instructed by the sample preparation method.
- TOC, if needed, can be analyzed using the most recent final version of EPA SW-846 Method 9060.
- Particle size, if needed, can be analyzed multiple ways to determine percent sand, silt, and clay. If only the inorganic particle size fraction is needed, then the sediment samples will need to be pretreated to remove organic matter. If organic matter is included in the analysis, then the "apparent" (i.e., organic plus inorganic) particle size distribution will be determined.

QA/QC data quality indicators

The field sampling procedures and analytical methods include several QA/QC measures to ensure useable data are collected and measured. In particular, data quality indicators (DQIs) are qualitative and quantitative descriptors used in interpreting the degree of acceptability or utility of data. The principal DQIs are precision, bias, representativeness, comparability, and completeness; these terms are described further in Attachment 1. Establishing acceptance criteria for the DQIs sets quantitative goals for the quality of data generated in the analytical measurement process.

For cPAHs and noncarcinogenic PAHs by EPA Method 8270, the DQIs set by the MPCA are:

- Blanks: <five times the method detection limit (MDL); procedural blanks should be prepared with each analytical batch of 20 samples or less.
- Surrogate Recovery: 40-120% the recovery of the surrogate compounds are used to measure data quality in terms of accuracy (extraction efficiency).
- Laboratory Control Sample (LCS) and Matrix Spike (MS) Recovery: 40-120%; the percent recoveries of target analytes are calculated to measure data quality in terms of accuracy.
- MS/Matrix Spike Duplicate (MSD) Precision: relative percent difference (RPD) <30%; this is used to evaluate the data in terms of precision.
- Reporting Limit of 10-30 µg/kg dry weight for individual PAH compounds.

For metals (arsenic and copper):

- Blanks: <five times the MDL; procedural blanks should be prepared with each analytical batch of 20 samples or less.
- Precision (% RPD): <10%
- Accuracy: 85 – 115%
- Reporting Limit for metals: 0.10 mg/kg dry wt.

Electronic data requirements

- Electronic copies of the data should be obtained from the analytical laboratory in spreadsheet format (e.g., Microsoft Excel). Laboratories will normally report sample concentrations down to the reporting limit. Request that the laboratory also report sample concentrations down to the method detection limit to ensure B[a]P equivalents can be calculated appropriately (Appendix B).
- In the future, the MPCA may be interested in obtaining electronic copies of the analytical results for archiving it in the MPCA's database system. At the present time, though, the MPCA's database platform, EQuIS, is not set-up to accommodate sediment chemistry data.

References

Crane, J.L. in review. Source apportionment of PAHs, risk considerations, and management implications for urban stormwater pond sediments in Minnesota, USA. (This manuscript is undergoing final peer review at an environmental journal.)

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USEPA. 2001. Methods for collection, storage and manipulation of sediments for chemical and toxicological analyses: Technical manual. U.S. Environmental Protection Agency, Office of Water, Washington, DC. EPA-823-B-01-002 (http://water.epa.gov/polwaste/sediments/cs/collection.cfm).

USEPA "SW-846 Test Methods for Evaluating Solid Waste", Update IV of the Third Edition; Methods 6020, 8270.

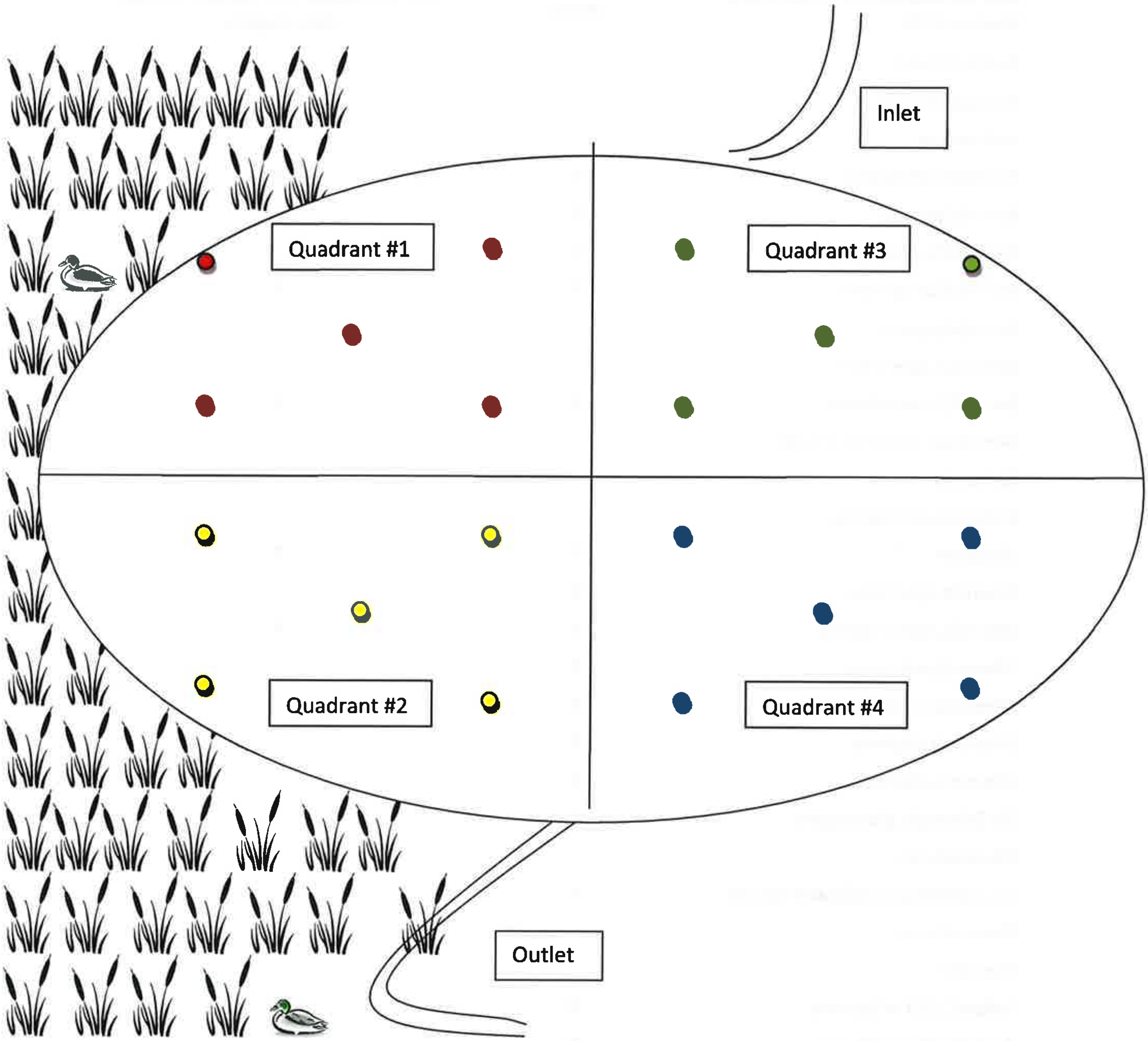

Figure A-1. Sediment sampling scheme for a stormwater pond greater than four acres in size.

Table A-1. List of PAHs to be Analyzed in Stormwater Pond Sediments

PAH Compounds Included in EPA Method 8270	cPAHs	U.S. EPA Group B2 Probable Human Carcinogens
Acenaphthene		
Acenaphthylene		
Anthracene		
Benzo[a]anthracene	X	X
Benzo[a]pyrene	X	X
Benzo[b]fluoranthene	X	
Benzo[j]fluoranthene	X	X
Benzo[e]pyrene		
Benzo[g,h,i]perylene		
Benzo[k]fluoranthene	X	X
Benzofluoranthenes (Total)		
Carbazole		
2-Chloronaphthalene		
Chrysene	X	X
Dibenz[a,h]acridine	X	
Dibenz[a,h]anthracene	X	X
Dibenzo[a,e]pyrene	X	
Dibenzo[a,h]pyrene	X	
Dibenzo[a,i]pyrene	X	
Dibenzo[a,l]pyrene	X	
7H-Dibenzo[c,g]carbazole	X	
Dibenzofuran		
7,12-Dimethylbenz[a]anthracene	X	
Fluoranthene		
Fluorene		
Indeno[1,2,3-cd]pyrene	X	X
3-Methylcholanthrene	X	
5-Methylchrysene	X	
1-Methylnaphthalene		
2-Methylnaphthalene		
Naphthalene		
Perylene		
Phenanthrene		
Pyrene		

Note: A combination of benzo[b]fluoranthene, benzo[j]fluoranthene, and/or benzo[k]fluoranthene frequently coelute together when sediments are analyzed

Table A-2. Percent of Detected cPAHs in a MPCA Study of Metro Area Stormwater Ponds (Crane in review)*

Parameter	# of Detects**	% Detected
Chrysene	44	73.3
Benzo[b&j]fluoranthene	42	70.0
Benzo[a]pyrene	41	68.3
Indeno[1,2,3-c,d]pyrene	38	63.3
Benzo[a]anthracene	34	56.7
Benzo[k]fluoranthene	34	56.7
Dibenzo[a,e]pyrene	33	55.0
Dibenzo[a,i]pyrene	32	53.3
Dibenzo[a,h]pyrene	23	38.3
Dibenzo[a,h]anthracene	15	25.0
Dibenz[a,h]acridine	10	16.7
3-Methylcholanthrene	4	6.7
Dibenzo[a,l]pyrene	4	6.7
5-Methylchrysene	1	1.7

* Sediment samples were analyzed without using clean-up columns. The reporting limits were elevated as a result of diluting the sample extracts to remove chemical interferences. A higher percentage of detected cPAHs probably would have been achieved if the sample extracts had been run through clean-up columns.

** Results exclude field replicate data; n = 60 samples.

The following cPAHs were not detected in any samples: 1,6-Dinitropyrene, 1,8-Dinitropyrene, 1-Nitropyrene, 2-Nitrofluorene, 4-Nitropyrene, 5-Nitroacenaphthene, 6-Nitrochrysene, 7,12-Dimethylbenz(a)anthracene, 7H-Dibenzo(c,g)carbazole, and Dibenz(a,j)acridine.

Note: the MPCA evaluated this list of 25 cPAHs to determine if some of these cPAHs could be dropped from the analytical list for stormwater pond sediments. As indicated in Appendix B, this list of 25 cPAHs was adopted from an air quality program at California EPA. However, not all of these atmospheric cPAHs in California may be of concern in stormwater pond sediments in Minnesota. The above data set was reviewed, in addition to the percentage of detected cPAHs in other sediment data sets available to the MPCA (including some other metro-area stormwater pond sediments and sites included under the MPCA's Remediation Program). Additional input to the MPCA's evaluation came from recommendations from the Minnesota Department of Health for cPAHs to analyze in stormwater pond sediments, as well as human health-based toxicity data, environmental fate information, the results of the MPCA's environmental forensic work to determine sources of PAHs in metro-area stormwater ponds (Crane in review), and commercial production information. All of this information was used to shorten the list of cPAHs from 25 to 17 compounds (Table A-1). As additional data become available, the MPCA will periodically assess whether further changes are needed to this list.

Attachment 1. Data quality indicators

This section is based on quality assurance/quality control (QA/QC) guidance provided by the U.S. Environmental Protection Agency (USEPA 2002). Data Quality Indicators (DQIs) are qualitative and quantitative descriptors used in interpreting the degree of acceptability or utility of data. The principal DQIs are precision, bias, representativeness, comparability, and completeness. Establishing acceptance criteria for the DQIs sets quantitative goals for the quality of data generated in the analytical measurement process.

Precision

Precision is a measure of agreement among replicate measurements of the same property, under prescribed similar conditions. This agreement is calculated as either the range (R) or as the standard deviation (s). It may also be expressed as a percentage of the mean of the measurements, such as relative percent difference (RPD) or relative standard deviation (RSD) (for three or more replicates).

Field precision is assessed through the collection and measurement of field replicates at a rate of one replicate per ten analytical samples. This allows intralaboratory precision information to be obtained on sample acquisition, handling, shipping, storage, preparation, and analysis. Both samples can be carried through the steps in the measurement process together to provide an estimate of short-term precision. An estimate of long-term precision can be obtained by separating the two samples and processing them at different times or by different people and/or analyzed using different instruments.

For duplicate measurements, relative percent difference (RPD) is calculated as follows:

$$RPD = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} \times 100\%$$

RPD = relative percent difference

D_1 = sample value

D_2 = duplicate sample value

$|D_1 - D_2|$ = absolute value of the sample minus the duplicate sample values

For three or more replicates:

$$RSD = (s/x) \times 100$$

RSD = relative standard deviation

s = standard deviation of three or more results

x = mean of three or more results

Standard deviation is defined as follows:

$$s = ((\Sigma(y_i - \text{mean } y)^2 \times 1/(n-1)))^{0.5}$$

s = standard deviation

y_i = measured value of the ith replicate

mean y = mean of replicate measurements

n = number of replicates

Bias

Bias is the systematic or persistent distortion of a measurement process that causes errors in one direction. Bias assessments for environmental measurements are made using personnel, equipment, and spiking materials or reference materials as independent as possible from those used in the calibration of the measurement system. When possible, bias assessments should be based on analysis of spiked samples rather than reference materials so that the effect of the matrix on recovery is incorporated into the assessment. A documented spiking protocol and consistency in following that protocol are important to obtaining meaningful data quality estimates. Spikes should be added at different concentration levels to cover the range of expected sample concentrations. The use of spiked surrogate compounds for GC/MS (SIM) procedures for PAH compounds are used to assess for bias.

Accuracy

Accuracy is a measure of the closeness of an individual measurement of the average of a number of measurements to the true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that result from sampling and analytical operations.

Accuracy in the field is assessed through the adherence to all sample handling, preservation, and holding times. In order to assure the accuracy of the analytical procedures, an environmental sample will be randomly selected from each sample shipment received at the laboratory, and spiked with a known amount of the analytes to be evaluated. In general, a sample spike will be included in every set of 20 samples tested on each instrument. The spike sample will then be analyzed. The increase in concentration of the analyte observed in the spiked sample, due to the addition of a known quantity of the analyte, compared to the reported value of the same analyte in the unspiked sample determines the percent recovery. The percent recovery for a spiked sample is calculated according to the following formula:

$\%R = 100\% \times (S\text{-}U)/C_{sa}$

%R = percent recovery

S = measured concentration in spiked sample

U = measured concentration in unspiked sample

C_{sa} = actual concentration of spike added

For situations where a standard reference material (SRM) is used in addition to a matrix spike:

$\%R = 100\% \times C_m/C_{srm}$

%R = percent recovery

C_m = measured concentration of SRM

C_{srm} = actual concentration of SRM

Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative term that should be evaluated to determine whether *in situ* and other measurements are made and physical samples collected in such a manner that the resulting data appropriately reflect the media and phenomenon measured or studied.

For field data, representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the field sampling plan is followed and that proper sampling techniques are used.

Representativeness in the laboratory is ensured by using the proper analytical procedures, meeting sample holding times, and analyzing and assessing laboratory duplicates for the chemistry samples.

Comparability

Comparability is the qualitative term that expresses the confidence that two data sets can contribute to a common analysis and interpolation. Comparability must be carefully evaluated to establish whether two data sets can be considered equivalent in regard to the measurement of a specific variable or groups of variables. In a laboratory analysis, the term comparability focuses on method type comparison, holding times, stability issues, and aspects of overall analytical quantitation.

There are a number of issues that can make two data sets comparable, and the presence of each of the following items enhances their comparability:

- Two data sets should contain the same set of variables of interest
- Units in which these variables were measured should be convertible to a common metric
- Similar analytical procedures and quality assurance should be used to collect data for both data sets
- Time measurements of certain characteristics (variables) should be similar for both data sets
- Measuring devices used for both data sets should have approximately similar detection levels
- Rules for excluding certain types of observations from both samples should be similar
- Samples within data sets should be selected in a similar manner
- Sampling frames from which the samples were selected should be similar
- Number of observations in both data sets should be of the same order or magnitude

These characteristics vary in importance depending on the final use of the data. The closer two data sets are with regard to these characteristics, the more appropriate it will be to compare them. Large differences between characteristics may be of only minor importance, depending on the decision that is to be made from the data.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Field completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. Field completeness for sampling stormwater ponds should be greater than 95%. Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. Laboratory completeness should be greater than 95% of the total number of samples submitted to the analytical laboratories.

The calculation for percent completeness is as follows:

$$\%C = 100\% \times (V/n)$$

%C = percent completeness

V = number of valid measurements

n = number of measurements planned

Reference

USEPA. 2002. Guidance for quality assurance project plans. U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC. EPA/240/R-02/009. (http://www.epa.gov/quality/qs-docs/g5-final.pdf).

Appendix B: Soil Reference Values and Benzo[a]pyrene Equivalents

Appendix B provides guidance for comparing contaminant concentrations from stormwater pond sediment to the MPCA's Remediation Division Soil Reference Values (SRVs) and instructions for calculating benzo[a]pyrene (B[a]P) equivalents for carcinogenic polycyclic aromatic hydrocarbons (cPAHs).

Comparing sediment contaminant concentrations to SRVs

Soil Reference Values (SRVs):

SRVs are risk based values derived to assess potential human health exposures from soil at a Remediation cleanup site using a reasonable maximum exposure (RME) scenario. RME scenarios are intended to protect an entire population without being overly conservative by using reasonable upper bound estimates for the most sensitive exposure parameters and central tendency estimates for less sensitive exposure parameters.

They are intended to evaluate both potential non-cancer and cancer risks associated with a contaminant present in soil. Two separate SRVs are calculated for each contaminant, one for non-cancer risk and one for cancer risk. The final SRV reported as the Residential or Industrial SRV is the lower of the two. In other words, it is the smallest concentration of the contaminant that could potentially pose either a non-cancer or cancer risk. For example, for contaminant "X", if the non-cancer SRV is 10 mg/kg and the cancer SRV is 5 mg/kg, then the final SRV is reported as 5 mg/kg.

Since stormwater sediment removed from the stormwater pond is being evaluated for use on dry land as soil, SRVs are an appropriate conservative risk based values to evaluate potential human health risks.

"Summary of Stormwater Pond Sediment Testing Results" Spreadsheet:

MPCA's stormwater program "Summary of Stormwater Pond Sediment Testing Results" spreadsheet allows users to compare stormwater pond sediment data to SRVs. The spreadsheet is available on MPCA's website MS4 stormwater web page at: http://www.pca.state.mn.us/sbiza7c. Click on the "Permit" tab and scroll down to the bottom under the "Additional Items" heading.

The spreadsheet will open to the "BaP equiv. calculation" tab used to compare the data to the SRVs. There are three sections where data can be entered:

- Metals
- Noncarcinogenic PAHs
- Carcinogenic PAHs/ BaP Equivalents

For metals and noncarcinogenic PAHs

1. Enter the chemicals reporting limit into column B, "Reporting Limit"
2. Enter the core location (sample) data (concentrations) in columns E through J, "Core Location #"
3. Compare the chemical data (concentrations) in columns E&f, G&H and I&J to the Residential and Industrial SRVs listed in columns C and D

For carcinogenic PAHs/B[a]P Equivalents when all cPAHs have been detected

1. Enter the chemicals reporting limit in column B, "Reporting Limit"

2. Enter the core location data (concentration) into columns E, G and I, "Core Location #"
3. The spreadsheet automatically calculates the BaP Equivalent concentration in columns F, H and J, "BaP Equiv. Conc."
4. Compare the "Total B[a]P equivalents Detected Data Only" in columns F, H and J, row 39, to the Residential and Industrial SRVs listed for B[a]P in columns C and D

Please see additional details regarding the calculation of B[a]P equivalents, including the use of data that contains samples where cPAHs were not detected (nondetects), in the next section.

Calculating B[a]P equivalents

Minnesota Department of Health Guidance

The Minnesota Department of Health (MDH) issued new guidance regarding the calculation of B[a]P equivalents in August, 2013 that was revised in October, 2014 (http://www.health.state.mn.us/divs/eh/risk/guidance/pahguidance.pdf). Several new cPAHs were added to the required list to be analyzed that currently do not have analytical methods for soil. At this time it is not feasible to adopt MDH's August, 2013 guidance for use with the Remediation Division's soil reference values (SRVs). MPCA will continue to use the potency equivalency factor (PEF) method previously recommended by MDH to evaluate human health risks from cPAHs until new analytical methods for soil are developed for the new cPAHs on the revised list.

MDH's previous recommendation was based on evaluating the 25 cPAHs that the California Environmental Protection Agency (Cal EPA) identified as being probable or possible human carcinogens (Cal EPA 1993, 2009; MDH 2001). Since toxicity data does not exist for all individual cPAHs, they are evaluated according to how potent they are in relation to a reference contaminant, B[a]P. Assuming B[a]P has a toxicity of one, other cPAHs are assigned a PEF to indicate how toxic they are in comparison to B[a]P. Table B-1 lists B[a]P PEFs for 17 cPAHs to be measured in stormwater pond sediments (see Appendix A, Table A-2 for additional explanation). This section only pertains to cPAHs, which are evaluated by using B[a]P equivalents. Noncarcinogenic PAHs are evaluated individually and are not included in the total B[a]P equivalent concentration.

Table B-1. B[a]P Potency Equivalency Factors (PEFs)

cPAH	PEF	cPAH	PEF
Benz[a]anthracene*	0.1	Dibenzo[a,e]pyrene	1
Benzo[b]fluoranthene	0.1	Dibenzo[a,h]pyrene	10
Benzo[j]fluoranthene	0.1	Dibenzo[a,i]pyrene	10
Benzo[k]fluoranthene	0.1	Dibenzo[a,l]pyrene	10
Benzo[a]pyrene	***1.0***	7,12-Dimethylbenzanthracene	34
Chrysene	0.01	Indeno[1,2,3-c,d]pyrene	0.1
Dibenz[a,h]acridine	0.1	3-Methylcholanthrene	3
Dibenz[a,h]anthracene	0.56	5-Methylchrysene	1
7H-Dibenzo[c,g]carbazole	1		

* A common synonym for this compound is Benzo[a]anthracene

** Benzo[a]pyrene is the reference contaminant

Site sediment concentrations of individual cPAHs are multiplied by the corresponding PEF value in Table B-1 to obtain an individual B[a]P equivalent concentration. These individual B[a]P equivalent concentrations are summed for all cPAHs to arrive at a total B[a]P equivalent concentration that is compared to the B[a]P SRV. For example, Table B-2 shows how the B[a]P equivalents were calculated for a hypothetical stormwater pond where all 17 cPAHs were detected in the sediment sample. The "Site Concentration" for each cPAH is entered into Column C. Each cPAH concentration is multiplied by the corresponding "Potency Equivalency Factor (PEF)"in Column B to arrive at the individual "BaP Equivalent" concentration in Column D. B[a]P equivalent concentrations are then summed to obtain the "Total BaP Equivalents" at the bottom of Column D.

Table B-2. Example – Calculating Total B[a]P Equivalents for Detected cPAH Data

A cPAH Contaminant	B Potency Equivalent Factor (PEF)	C Site Concentration mg/kg	D BaP Equivalent mg/kg
Benz[a]anthracene	0.1	2.190	0.219
Benzo[b]fluoranthene*	0.1	3.750	0.375
Benzo[j]fluoranthene*	0.1	0.000	0.000
Benzo[k]fluoranthene	0.1	1.320	0.132
Benzo[a]pyrene	1	2.270	2.270
Chrysene	0.01	2.790	0.028
Dibenz[a,h]acridine	0.1	0.219	0.022
Dibenz[a,h]anthracene	0.56	0.270	0.152
7H-Dibenzo[c,g]carbazole	1	0.160	0.160
Dibenzo[a,e]pyrene	1	0.828	0.828
Dibenzo[a,h]pyrene	10	0.419	4.190
Dibenzo[a,i]pyrene	10	0.391	3.910
Dibenzo[a,l]pyrene	10	0.150	1.500
7,12-Dimethylbenzanthracene	34	0.150	5.137
Indeno[1,2,3,-c,d]pyrene	0.1	1.350	0.135
3-Methylcholanthrene	3	0.170	0.512
5-Methylchrysene	1	0.160	0.160
		Total BaP Equivalents =	**19.730**

* In this example benzo[b]fluoranthene and benzo[j]fluoranthene coeluted. In other words, the combined concentration of both cPAHs was reported by the laboratory as 3.75 mg/kg benzo[b and j]fluoranthene. Since both contaminants have the same PEF value, 3.75 was entered for the sediment concentration of benzo[b]fluoranthene while the concentration of benzo[j]fluoranthene was entered as zero.

How to Handle Nondetect cPAH Data:

If the data contains cPAHs that were not detected (nondetects) use the instructions below for Kaplan Meier Statistics to calculate a B[a]P equivalent concentration.

Kaplan Meier Statistics

Step 1

- Determine the percentage of cPAH nondetects by dividing the number of nondetects by the total number of cPAHs sampled and then multiplying by 100. For example, if you sampled all 17 cPAHs and results indicated 10 nondetects, you would perform the following calculation to determine the percentage of nondetects: 10/17*100 = 58% nondetects.
  1. **If you have 80% or less nondetects, proceed to Step 2.**
  2. **If you have greater than 80% nondetects, proceed to step 3.**

Step 2 - 80% or Less Nondetects

- Use the "Summary of Stormwater Pond Sediment Testing Results" spreadsheet to calculate the potency equivalent factor (PEF) for each of the cPAHs analyzed. The spreadsheet is available on MPCA's website MS4 stormwater web page at: http://www.pca.state.mn.us/sbiza7c. Click on the "Permit" tab and scroll down to the bottom under the "Additional Items" heading.
  1. The spreadsheet will open to the "BaP equiv. calculation" tab.
  2. Under the "Carcinogenic PAH/B[a]P Equivalents Section, enter the site data (concentration) for any detected cPAH or the reporting limit for a nondetect cPAH in columns E, G and I, "Site Conc.", for each core location (sample).
  3. B[a]P equivalent concentration will automatically calculate and be displayed in the "BaP Equiv. Conc." columns F, H and J. The spreadsheet automatically multiples the "Potency Equiv. Factor (PEF)" in column C by the "Site Conc." In columns E, G and I.
  4. The "BaP Equiv. Conc." values from columns F, H and J are the values that need to be transferred to the Kaplan Meier spreadsheet.
- Use the "KMStats15" or Kaplan Meier Spreadsheet to calculate the "UCL95 (t)" or estimated 95th percent upper confidence limit of the mean BaP equivalent concentration. You will need to use a separate spreadsheet for each core location (sample).
  1. Order you cPAH data from highest to lowest concentration (for detects) or reporting limit (for nondetects) on the "Your Data Here" tab. When the concentration of a cPAH is below the reporting limit (usually reported as a <# on the laboratory report), use the reporting limit as the concentration.
     a. If you find it easier you can use a separate tab in the Kaplan Meier spreadsheet to order your data.
     b. List all the cPAH concentrations (for detects) or reporting limits (for nondetects) in the "Concentration" column.
     c. Order them highest to lowest.
     d. Combine those that are identical.
     e. Enter the number of times that exact **concentration** was reported for that sample under the "# Detects" column.
     f. Enter the number of times that exact **reporting limit** was reported for that sample under the "# Nondetects" column.
     g. It is possible to have a concentration and reporting limit that are the same value resulting in values under both the "# Detects" and "# Nondetects" columns.
     h. The last row entered always needs to be a detected concentration due to "Effron's Bias" as explained in the Kaplan Meier spreadsheet. Regardless of whether your last row is a detected or nondetected value, enter it as a detected value.

i. Multiply the "UCL95 (t)" value (estimated 95^{th}% upper confidence limit of the mean) BaP equivalent concentration by the number of individual cPAHs analyzed to calculate the Kaplan Meier BaP equivalent concentration. This Kaplan Meier BaP equivalent concentration should be compared to the BaP soil reference value (SRV) for the applicable soil land use category (Residential or Industrial). Enter the Kaplan Meier BaP equivalent concentration in the "Summary of Stormwater Pond Sediment Testing Results" spreadsheet, column F, H or J, row 40, "Total B[a]P Equivalent Kaplan Meier". This is the concentration that should be compared to the BaP soil reference value (SRV) for the applicable soil land use category (Residential or Industrial) in columns C and D.

NOTE: If the laboratory reports the three fluoranthenes (benzo[b]fluoranthene, benzo[j]fluoranthene and benzo[k]fluoranthene) as total fluoranthenes count this as one cPAH. If the laboratory reports two of the fluoranthenes (benzo[b]fluoranthene and benzo[j]fluoranthene) as benzo[b,j]fluoranthene, count this as one cPAH.

Step 3 – Greater than 80% Nondetects

- When a dataset has greater than 80% nondetects, Kaplan Meier is no better than stating the BaP equivalent concentration is somewhere between the BaP equivalent concentration calculated when replacing the nondetects with the full reporting limit and when replacing the nondetects with zeros.
  1. Determine if appropriate reporting limits have been used by comparing the reporting limits used for your samples (found in the laboratory report) to those listed in the Table B-3 below.
     a. If the reporting limit used by the laboratory for a cPAH is equal to or less than the reporting limit in the table, appropriate reporting limits were used for that cPAH. All cPAHs need to be checked. If all cPAHs have been analyzed using appropriate reporting limits, skip to number 2 below to calculate total BaP equivalents.
     b. If any of the cPAHs did not use an appropriate reporting limit, you cannot calculate BaP equivalents using the instructions in number 2 below. In this case, you will need to either re-analyze your samples for the cPAHs that did not have appropriate reporting limits or obtain new samples. The laboratory will be able to help you decide which one makes sense in your case.
        i. If the laboratory is able to re-run the sample and obtain a lower reporting limit, equal to or less than that in Table B1, it might be beneficial to run your sample again for that cPAH.
        ii. If the laboratory had to dilute your sample resulting in an increase in the reporting limit for a cPAH, you will probably need to obtain new samples.
  2. To calculate BaP equivalents follow these steps:
     a. Request the lab report for all sample values down to the method detection limit rather than the reporting limit. Normally the lab will provide data down to the reporting limit although they are able to obtain data down to the method detection limit in most cases.
     b. In the "Summary of Stormwater Pond Sediment Testing Results", under the "Site Concentration" column, enter either 1) sample concentration down to the method detection limit if the lab was able to provide this or 2) ½ the detection limit if the lab was not able to provide a concentration down to the method detection limit for each cPAH for each core location (sample).
     c. The B[a]P equivalent concentration will automatically calculate in the "BaP Equivalent Concentration" column. The spreadsheet automatically multiples the "Potency Equivalent Factor (PEF)" column by the "Site Concentration" column and enters it into the "BaP Equivalent Concentration" column.

d. After all of the site Concentrations ("Site Concentration") have been entered, the total BaP equivalent concentration is displayed under the "Total BaP Equivalents Detected Data Only", row 39, under columns F, H and J, "BaP Equiv. Concentration" For each core location (sample). The spreadsheet automatically sums all of the individual cPAH "BaP Equivalent Concentration" Values and enters it into the "Total BaP Equivalents Detected Data Only" tab cell under each core location (sample).

Table B-3. cAPH Reporting Limits

Carcinogenic PAH (cPAH)	Potency Equivalent Factor (PEF)	Appropriate Maximum Reporting Limit
Benz[a]anthracene	0.1	0.01
Benzo[b]fluoranthene	0.1	0.03
Benzo[j]fluoranthene	0.1	0.03
Benzo[k]fluoranthene	0.1	0.03
Benzo[a]pyrene	1	0.01
Chrysene	0.01	0.01
Dibenz[a,h]acridine	0.1	0.01
Dibenz[a,h]anthracene	0.56	0.01
7H-Dibenzo[c,g]carbazole	1	0.01
Dibenzo[a,e]pyrene	1	0.01
Dibenzo[a,h]pyrene	10	0.01
Dibenzo[a,i]pyrene	10	0.01
Dibenzo[a,l]pyrene	10	0.01
7,12-Dimethylbenzanthracene	34	0.01
Indeno[1,2,3,-c,d]pyrene	0.1	0.01
3-Methylcholanthrene	3	0.01
5-Methylchrysene	1	0.01

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