STORM WATER POLLUTION PREVENTION AND MANAGEMENT PROGRAM

FINAL DRAFT

NPDES PERMIT NUMBER DE 0051071
STATE PERMIT NUMBER WPCC 3063A / 96

PRINCIPAL PERMITTEES

NEW CASTLE COUNTY
DELAWARE DEPARTMENT OF TRANSPORTATION

CO-PERMITTEES

TOWN OF BELLEFONTE
TOWN OF ELSMERE
TOWN OF NEWPORT
CITY OF DELAWARE CITY
CITY OF NEW CASTLE

May 7, 2014

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PERMITTEE PERSONS OF RESPONSIBILITY

Principal Permittees

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Co-permittees

Town of Bellefonte David Brenner Municipal Designee 901A Rosedale Avenue Wilmington, DE 19809 302-761-9638	**City of Delaware City** Richard Cathcart City Manager 407 Clinton Street / PO Box 4159 Delaware City, DE 19706 302-834-4573
Town of Elsmere John S. Giles, Jr. Town Manager 11 Poplar Avenue Elsmere, DE 19805 302-998-2215	**City of New Castle** Jeffrey A. Bergstrom Code Official and Fire Marshal 900 Wilmington Road New Castle, DE 19720-3638 302-322-9813
Town of Newport Wendy A. King Town Manager 226 North James Street Newport, DE 19804 302-994-6403	

OUTSTANDING PERMIT ISSUES

Several issues regarding the Permit and its requirements became apparent as this SWPP & MP was being prepared. These were conveyed to DNREC during meetings and in various emails and are summarized below. The Permittees believe each of these need to be resolved before the final SWPP & MP can be submitted in August 2014.

Table 1 on page 25 of the permit

It is noted that neither Middletown nor Newark is included in this table. Middletown comprises about a quarter of the Appoquinimink River watershed, but just over half of its impervious area. Similarly, Newark comprises around 10 percent of the White Clay Creek and eight percent of the Christina River watersheds, but about 14 percent and 10 percent of their impervious areas respectively. Since preparation of Water Quality Improvement Plans as well as their implementation could be very costly, New Castle County and DelDOT believe these cities need to be included. However, since neither is a Co-permittee on the MS4 permit, the County and DelDOT do not have any leverage to get their participation and as of now, no formal communication requesting their participation has been issued. It is noted that the same situation applies to Townsend and Odessa in the Appoquinimink, but their areas are much smaller. It is further noted that representatives from DNREC SIRS recently expressed a similar concern about these municipal exclusions in the context of their efforts regarding PCBs. The Principal Permittees request a response from DNREC indicating how these municipalities will be addressed. Otherwise, WQIPs in the Appoquinimink and White Clay Creek will be incomplete.

Utilizing GIS tools, the Water Resources Agency at the University of Delaware took the watershed layer from DNREC and municipality boundaries from the Office of State Planning Coordination and merged them so that each sub-area (e.g., area of each town and watershed) could be analyzed and total areas calculated for each municipality. This exercise yielded results different from Table 1. More specifically, it was found that neither Wilmington nor Delaware City are within the delineated watershed of the Delaware River though they are both listed as responsible parties in the Table. Conversely, it was found that Delaware City is within the Red Lion Creek watershed though it is not listed as a responsible party in the Table. The Principal Permittees request that DNREC perform an independent analysis of these watersheds and municipal limits to confirm or disprove the assessments done by UDWRA.

Table A.1 in Appendix A

The Principal Permittees performed an independent determination of wasteload allocations in this table and were unable to verify certain values for both nutrients and bacteria. Specific concerns along with responses received to date from DNREC are as follows. The Principal Permittees believe that DNREC should reissue Table A.1 in its entirety once all values have been confirmed or corrected.

- Appoquinimink River – typo for total nitrogen confirmed. Values for bacteria still being evaluated.
- Army Creek – values for bacteria still being evaluated.
- Blackbird Creek – values for bacteria still being evaluated.
- Christina River Basin – lack of WLAs for the Brandywine, Red Clay Creek, and White Clay Creek confirmed.
- Delaware River – further inquiry regarding PCB loads pending.
- Dragon Run – values for bacteria still being evaluated.
- Naamans Creek – incorrect values for total nitrogen and total phosphorous confirmed.
- Red Lion Creek – values for bacteria still being evaluated.

It has also been noted that the Delaware Bay watershed is not included in the Table. The Principal Permittees request direction regarding how wasteload allocations can be addressed as specified on page 20 of the Permit in a watershed with no wasteload allocations (applies to C&D Canal East below too).

Table A.2 in Appendix A

The Principal Permittees also performed an independent determination of wasteload allocations in this table and were unable to verify certain values for both nutrients and bacteria. Specific concerns along with responses received to date from DNREC are as follows. The Principal Permittees believe that DNREC should reissue Table A.2 in its entirety once all values have been confirmed or corrected.

- Elk Creek – based on review of the Chesapeake WIP, it appears that the watershed called Elk River (ELKOH) coincides with both the Elk Creek as well as the Perch Creek as typically delineated by DNREC. This has been confirmed and it is understood that the allocations for Elk River per the WIP should be proportioned between Elk Creek and Perch Creek based on the size of each watershed. Perch Creek will need to be added to the Table.
- C&D Canal – it appears that the two watersheds called C&D Canal (C&DOH_MD and C&DOH_DE) in the WIP are collectively delineated as C&D Canal West by DNREC. This has been confirmed and it is understood that the Table should combine the allocations for C&DOH_MD and C&DOH_DE and represent it for C&D Canal West. It is further understood that C&D Canal East does not have a TMDL and therefore no allocations.
- Chester River – incorrect values total nitrogen and total phosphorous confirmed. Values for bacteria still being evaluated.

Correlation of watersheds in Table 1 with water bodies in 2012 303(d) list

The Principal Permittees have sought to correlate all the watersheds in New Castle County with waterbody IDs in the 2012 303(d) list. Most of these have been done but the following cannot be discerned:

- DE 100-01 – Cypress Branch which for the purposes of the SWPP & MP may be synonymous with the Chester River.
- DE 100-004 – Tributaries to the Elk River that may or may not include both Elk Creek and Perch Creek.
- DE 100-005 – Tributaries of Sassafras River that may or may not include the main stem.
- DE 090-001 – C&D Canal from the Maryland State line to the Delaware River appears to include both C&D Canal East and C&D Canal West.
- Bohemia Creek – cannot be found but is perhaps included in DE 100-004.

It is understood that DNREC is still evaluating these.

Stream Delistings

It is noted that numerous stream segments have been delisted for nitrogen and phosphorous in the 2012 303(d) list. A lesser number of segments have been delisted for bacteria. The Principal Permittees request clarification as to whether or not these delistings will reset or otherwise affect existing TMDLs. More specifically, if TMDLs were developed for impaired streams, do they still apply once impairments are no longer present? Similarly, if WLAs are assigned to enable streams to attain their designated uses, do WLAs still apply once those uses have been attained?

Annual Reporting

The Annual Reporting Template included as Appendix B of the Permit includes the following requirements regarding Stormwater Management during Construction:

> Statistics on how NPDES General Permit requirements have been met, in addition to requirements set by the Delaware Sediment and Stormwater Regulations.

The Principal Permittees request clarification regarding this requirement and specifics for the type of information DNREC will require for this Program Element.

DNREC's Division of Air

Page 12 of the Permit requires the Permittees to coordinate activities with DNREC's Division of Air. The Principal Permittees believe this requirement to be language from draft versions of the Permit issued years ago. Due to DNREC's reorganization since then, it does not appear that there is any reason to coordinate activities as specified in the SWPP & MP with the Division of Air. The Principal Permittees request specific areas where DNREC believes this coordination is warranted. Otherwise, there will be no such coordination.

TABLE OF ACRONYMS

BMP	Best Management Practice. Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants. BMPs also include treatment requirements, operating procedures and practices to control facility site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs can be applied before, during or after pollution generating activities to reduce or eliminate the introduction of pollutants into receiving waters.
CFR	Code of Federal Regulations.
DNREC	State of Delaware Department of Natural Resources and Environmental Control.
EIA	Effective impervious area. Square footage or other unit of area measurement that is directly connected to the drainage collection system and can include street surfaces, paved driveways, sidewalks connected to road curbing, rooftops which hydraulically connect to storm sewers, and parking lots.
EPA	United States Environmental Protection Agency.
IDD&E	Illicit discharge detection and elimination. An illicit discharge is any discharge to a municipal separate storm sewer that is not composed entirely of storm water (with certain exceptions).
IJA	Inter-jurisdictional agreement. Required by the Permit, IJA shall address roles and responsibilities of each Permittee by SWPP & MP element, monitoring responsibilities, reporting responsibilities, financial arrangements between Permittees, and communication / coordination between Permittees.
LID	Low impact development. LID is an approach to land development or re-development that works with nature to manage stormwater as close to its source as possible using principles such as preserving and recreating natural landscape features thereby minimizing imperviousness areas to create functional and appealing site drainage that treat stormwater as a resource.
MEP	Maximum Extent Practicable. Using measures that are capable of being done after taking into consideration cost, feasibility, existing technology, and logistics in light of overall facility operations and project purposes.
MS4	Municipal Separate Storm Sewer System. The MS4 is (1) a conveyance, or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) owned or operated by a public body having jurisdiction over drainage and the disposal of stormwater, which is: (2) designed or used for collecting or conveying storm water; (3) is not a combined sewer; and (4) which is not part of a publicly owned treatment works as defined at 40 C.F.R. § 122.2.

NPDES	National Pollutant Discharge Elimination System. EPA's program to control the discharge of pollutants to waters of the United States (see 40 CFR 122.2). The surface water quality program was authorized by Congress as part of the 1987 Clean Water Act.
SWPP & MP	Storm Water Pollution Prevention and Management Program.
TMDL	Total Maximum Daily Load. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still safely meet water quality standards.
WLA	Waste load allocation. Watershed pollutant sources are characterized as either point sources that receive a wasteload allocation or nonpoint sources that receive a load allocation. Point sources include all sources subject to regulation under the National Pollutant Discharge Elimination System (NPDES) permits, such as discharges from MS4s. Nonpoint sources include all remaining sources of the pollutant including anthropogenic (manmade) and natural background sources.

INTRODUCTION

General Background

NPDES permit DE 0051071 / State Permit WPCC 3063A/96 was issued by the Delaware Department of Natural Resources and Environmental Control (DNREC) on May 7, 2013 (effective date). This permit authorizes the Principal Permittees (New Castle County and the Delaware Department of Transportation or DelDOT) and the Co-permittees (towns of Bellefonte, Elsmere, and Newport and the cities of Delaware City, New Castle, and Wilmington) to discharge stormwater from their municipal separate storm sewer systems (MS4).

The Permit requires the Principal Permittees, in conjunction with the Co-permittees, to prepare a Stormwater Pollution Prevention and Management Plan (SWPP & MP) which describes how the quality of stormwater discharged from the MS4 will be controlled. This document is intended to fulfill the requirement for submission of the SWPP & MP final draft within twelve months of the effective date of the Permit. It will form the basis for the subsequent SWPP & MP final plan to be submitted by August 7, 2014. The Principal Permittees understand that the City of Wilmington is submitting its own SWPP & MP, as allowed in the introduction to Part II of the Permit, and therefore its activities are excluded in this SWPP & MP except where noted.

The SWPP & MP final draft herein includes an overview of each Permit element and monitoring requirement, a tabular indication of applicability to Principal Permittees and Co-permittees [*editing note – some programs still being discussed*], proposed best management practices once the SWPP & MP is implemented, measures and goals. As planning continues and program components evolve, the approaches, activities, measures, goals, and time frame for implementation may evolve and will be reflected in the final SWPP & MP.

Summary of Initial Activities

New Castle County, in coordination with DelDOT, conducted a public bidding process and awarded a contract to Duffield Associates, Inc. (Duffield Associates), to prepare the SWPP & MP and perform miscellaneous related tasks. Duffield Associates retained Gaadt Perspectives, LLC as a subconsultant. The Water Resources Agency (WRA) at the University of Delaware is assisting as part of their annual work plan to the County. New Castle County retained Water Words That Work under separate agreement to provide support regarding the Public Education / Public Involvement program element. DelDOT retained Versar to develop the wet weather monitoring plan, and KCI Technologies, Inc., under agreements with DelDOT, is providing support for development of that agency's IDD&E and street sweeping programs.

The Principal Permittees and contractors (including WRA) met on the following dates to discuss Permit requirements and approaches to address each component:

- June 25, 2013
- July 23, 2013
- August 27, 2013
- September 24, 2013
- October 22, 2013
- November 26, 2013
- December 17, 2013
- January 28, 2014
- February 25, 2014
- March 25, 2014
- April 15, 2014
- April 29, 2014

Meetings were also held with various DNREC employees and specifically the Surface Water Discharge Section, which oversees the NPDES program on August 14 and December 14, 2013. Meeting minutes are in Appendix A. A meeting specific to Industrial Stormwater was held with DNREC Surface Water Discharge Section (SWDS) on September 23, 2013, to review a draft of the Memorandum of Understanding between New Castle County and SWDS. This MOU has now been finalized and defines roles and responsibilities, processes for updating the list (or inventory) of "high risk" facilities, inspection procedures, and reporting.

A meeting was also held with DNREC Site Investigation and Remediation Section (SIRS) and Watershed Assessment Program on October 2, 2013, prior to beginning preparation of the Pollutant Minimization Plan for Polychlorinated Biphenyls (PMP for PCBs). A follow-up conference call relative to the PMP for PCBs was held with SIRS on March 12, 2014.

New Castle County's efforts to date have included representation from the Departments of Special Services and Land Use. In recognition that Permit compliance will necessitate the efforts of multiple departments or sections at DelDOT, the Department formed five tactical teams: Public Education and Involvement, Roadway and Facility Operations, Design and Construction, Post-Construction Stormwater Management, and Monitoring and Water Quality. The Monitoring and Water Quality team included representatives from New Castle County. Meetings were held with tactical teams on August 28, September 13 and 19, and October 8, 2013. Further meetings are intended as the SWPP & MP is being finalized and implemented.

Coordination with Co-permittees and Inter-jurisdictional Agreements

The development of inter-jurisdictional agreements was initiated with a kick-off meeting on September 10, 2013. In addition to the Principal Permittees, Co-permittees in attendance included representatives from the cities of Delaware City, New Castle, and Wilmington, and the town of Bellefonte. A separate meeting was held with Wilmington on October 8, 2013. Additional meetings were held on January 14 and April 8, 2014. Representatives from each Co-permittee were present at these latter meetings and minutes from all Co-permittee meetings are in Appendix B. Each Co-permittee provided input into this SWPP & MP final draft.

The inter-jurisdictional agreement covering the towns of Bellefonte, Elsmere, and Newport and the cities of New Castle and Delaware City is included in Appendix C1 [*to be included in Final Plan*]. Since the City of Wilmington chose to submit their own SWPP & MP, it was necessary to develop an IJA specific to Wilmington in addition to the IJA's developed for the other Co-permittees. This IJA is also included in Appendix C2 [*to be included in Final Plan*].

As was explained at the December 14, 2013 meeting with DNREC, there have been efforts in recent years by the Delaware Chapter of the American Public Works Association and the Delaware League of Local Governments as well as DelDOT to more clearly assign maintenance responsibilities for State roads in municipalities. Most of this authority is derived from longstanding practices between municipalities and DelDOT, pursuant to 17 Del.C. Section 134, a portion of which appears below:

> § 134. Authority in incorporated towns and cities; construction and maintenance of highways; local authority.
>
> (a) The Department shall have no power, authority or jurisdiction of the streets of any incorporated city or town, except as otherwise provided in this section, unless such power,

> authority and jurisdiction shall be voluntarily given and surrendered by such city or town to the Department and then only upon such terms as the Department shall prescribe.

The "terms" mentioned in this statute are expressed in the form of the agreements typically on a project by project basis. Those agreements reflect the negotiated understandings between DelDOT and the municipality as to what will be done on the project, how the right-of-way will be provided for, and by whom, and who will be responsible for maintenance thereafter.

There are hundreds of agreements Statewide and sometimes a single road may have multiple agreements within a single city or town. The issues are much broader than simply maintenance of pavement and drainage infrastructure and include other often expensive categories such as street lights. Known agreements covering roadways in Co-permittee cities and towns with the exception of Wilmington were obtained from DelDOT as part of the SWPP & MP preparation. These agreements vary significantly in their breadth and assignment of maintenance responsibilities.

GENERAL REQUIREMENTS OF PROGRAM

Overview

Inter-jurisdictional agreements (IJAs) define the relationships between Principal Permittees and Co-permittees and specify roles and responsibilities, including monitoring responsibilities, reporting responsibilities, financial arrangements (if any), and communications / coordination. Each Permittee's staff will receive appropriate training.

SWPP & MP Best Management Practices

Best Management Practice #GRP-1				
	New Castle County	**DelDOT**	**Co-permittees collectively**	**Co-permittees Independently**
Hold annual meeting and prepare meeting notes	X	X		X
Measure: Yes / No.				
Principal Permittee Goal: Organize annual meeting, prepare meeting notes, and include notes in Annual Reports. **Co-permittee Goal:** Attend annual meeting and review meeting notes.				

An annual meeting will be held in February or March each year for all Permittees to coordinate activities and review the SWPP & MP which will be revised or updated as appropriate. Meeting notes will be included in Annual Reports.

Permittee Coordination

The Principal Permittees will arrange the annual meeting, provide agenda, and prepare meeting notes. The Co-permittees will each provide at least one administrative staff member to attend the meeting and will review and comment on meeting notes within 20 business days.

Best Management Practice #GRP-2				
	New Castle County	DelDOT	Co-permittees collectively	Co-permittees Independently
Submit Annual Report	X	X		X
Measure: Yes / No.				
Principal Permittee Goal: Gather documentation and submit Annual Report by July 1 each year. **Co-permittee Goal:** Provide documentation as described herein.				

A comprehensive, system-wide annual report will be submitted to DNREC by July 1 each year. The report will include a narrative of activities regarding each BMP described herein, tabular summaries where appropriate of certain activities identified in Appendix B of Permit, and the MS4 Report Form included as Appendix C in the Permit. The annual report will be submitted electronically as a pdf file.

Permittee Coordination

The Principal Permittees will prepare and submit an annual report by July 1 each year as specified in the Permit. The Principal Permittees will prepare a reporting template in consultation with the Co-permittees prior to the 2015 annual meeting. Each year beginning in 2015, the Principal Permittees will coordinate with the Co-permittees, consolidate submitted documentation, and submit the annual report by July 1. The Co-permittees will submit information described herein in Microsoft Word or other word processing program as well as a digitally-scanned image (.pdf) of the MS4 Report Form by June 1 each year. See individual sections for further detail.

Best Management Practice #GRP-3				
	New Castle County	DelDOT	Co-permittees through IJA	Co-permittees Independently
Provide annual training	X	X		X
Measure: Number of employees trained each year.				
All Permittee Goal: Provide training to administrative and / or selected staff to include general watershed and stormwater quality awareness including NPDES MS4 Permit compliance each year. **All Permittee Goal**: Provide training to appropriate staff specific to the Permit elements for which they are responsible each year.				

All Permittees may utilize and leverage sources such as the Delaware Center for Transportation (T^2), Nonpoint Education for Municipal Officials (NEMO), DNREC's Sediment and Stormwater Program, and the Center for Watershed Protection. DelDOT is considering preparation of training modules which could be viewed by employees at work stations.

Proposed training includes the following:

- **New Castle County** – will provide training to selected staff on "big picture" topics such as general watershed and stormwater quality awareness. Additionally, specific annual training will be provided to selected staff responsible for one or more of the Permit program elements related to the type of work performed by the employee. The following groups may be targeted:
    - Land Use Engineering Staff – example topics may include general watershed planning, Delaware Sediment and Stormwater Regulations, BMP design, Permit compliance;
    - Land Use Construction Inspectors – example topics may include the Delaware Sediment and Stormwater Regulations, Certified Construction Reviewer (CCR), erosion and sediment controls;
    - Special Services Stormwater Staff – example topics may include regulatory issues, watershed issues, BMP inspection and maintenance, Permit compliance, IDD&E, industrial and high risk inspection; and
    - Special Services Construction and Maintenance Staff – example topics may include good housekeeping, spill prevention and control, snow and ice control, erosion and sediment control, pesticide use, and BMP maintenance.
- **DelDOT** – will provide annual training to selected staff to include general watershed and stormwater quality awareness, plus training specific to the Permit elements for which they are responsible. At a minimum, the following groups will be targeted:
    - Maintenance staff: good housekeeping; spill prevention and control; BMP maintenance; SOPs for sweeping, snow and ice control, mowing; E&S control; IDD&E; pesticide use;
    - Design and Planning staff: Meeting TMDLs, watershed planning, state stormwater regulations;
    - NPDES and Stormwater staff: Regulatory issues, watershed issues, Permit compliance;
    - Public Relations staff: Handling and tracking public comments and complaints; and
    - Construction staff: E&S control compliance with stormwater regulations.

Each Co-permittee will have at least one management or administrative employee (or designee in the case of Bellefonte) trained in "big picture" topics such as overall watershed management or TMDLs. All planned training activities for Co-permittees are summarized below:

Table 1 – Co-permittee training					
	"big picture" topics such as watershed management or TMDLs	IDD&E detection and corrective actions	Good housekeeping	Application of pesticides, herbicides, and fertilizers	Management of snow and ice
Bellefonte	X	N/A	N/A	Y	Y
Elsmere	X	X	X	X/Y	X
Newport	X	X	X	X	X
Delaware City	X	X	Y	Y	Y
New Castle	X	X	X	X	X

X = training will be provided to municipal employees
Y = training will be provided by contractor performing service

Permittee Coordination

The Principal Permittees and Co-permittees will each be individually responsible for their own training programs. The Principal Permittees will accommodate Co-permittees at training programs developed or hosted by New Castle County or DelDOT if appropriate and reasonable. Co-permittees will keep their own records and submit to the Principal Permittees annually for inclusion in the Annual Report.

PROGRAM ELEMENT #1 – PUBLIC EDUCATION / PUBLIC INVOLVEMENT

Reference

Part II, Section A.1. – page 10 of 45.

Overview

Program designed to increase the knowledge of target communities regarding MS4s, impacts of urban runoff on receiving waters and potential BMP solutions for the target audience; change the behavior of target communities; and decrease the discharge of pollutants to the MS4 by engaging the public.

SWPP & MP Best Management Practices

Best Management Practice #PEI-1				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Public Review and Comment	X	X	X	X
Measure: Yes / No.				
All Permittee Goal: Public review and comment on draft SWPP & MP.				

The Permit requires the Permittees to develop and implement a process for public review of and comment on the draft SWPP & MP. The Permittees will utilize DelDOT's "Virtual Workshop" to enable public review and comment on the draft SWPP & MP. A narrated presentation along with the Permit, Permit Fact Sheet, and draft SWPP & MP will be on the Virtual Workshop web site by mid-June and a 30-day public comment will follow. This online tool will allow the Permittees to efficiently promote the plan and manage incoming comments from County residents.

Best Management Practice #PEI-2				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Targeted Behaviors	X	X	X	X
Measure: Varies – see complete plan in Appendix D.				
All Permittee Goal: Varies – see complete plan in Appendix D.				

Multiple BMPs are planned under this more general BMP heading. See complete plan in Appendix D for detailed descriptions.

- BMP #PEI-2a: Miscellaneous communications such as maintaining and updating websites, distribution of press releases, etc.
- BMP #PEI-2b: Public reporting of the presence of illicit discharges or improper disposal of materials, including floatables, into the MS4 (cross reference with BMP #IDDE-3.
- BMP #PEI-2c: The proper management and disposal of used motor vehicle fluids and household hazardous wastes.
- BMP #PEI-2d: The proper management and disposal of grass clippings, leaf litter and domestic animal wastes.
- BMP #PEI-2e: The proper use of water to limit excess pollutants from non-storm-water water discharges from activities such as washing cars and lawn irrigation, from entering the MS4.
- BMP #PEI-2f: The proper use, application, and disposal of pesticides, herbicides, and fertilizers by commercial and private applicators and distributors (cross reference with BMP #GH-5.
- BMP #PEI-2g: Public participation events, such as stream clean-ups, drain stenciling, etc.
- BMP #PEI-2h: The proper maintenance of BMPs directed toward private and commercial property owners, and state or municipal entities responsible for maintenance.
- BMP #PEI-2i: Opportunities for residential installation of LID practices, and the use of Green Technology BMPs that reduce runoff and mimic natural hydrology.
- BMP #PEI-2j: Hold two workshops each year.

Permittee Coordination

The Principal Permittees will:

- Hold two public workshops each year;
- Conduct two public education surveys;
- Update their websites on a semi-annual basis to include:
  - The NPDES Permit;
  - SWPP & MP and subsequent annual reports;
  - Illicit discharge reporting / complaint numbers; and
  - Public education events.
- Coordinate with information technology counterparts of the Co-permittees;
- Have and publicize phone number(s) and / or other tools for the public to submit reports of illicit discharges or dumping, complaints, and comments on the Permit programs; and
- Attain 205,400 impressions each year. See below.

The Principal Permittees and Co-permittees may:

- Communicate with their residents by producing email newsletters, maintaining social media accounts, and operating public access cable channels; and
- Continue to include information regarding illicit discharges, household hazardous waste, and chemical management in their published or web-based annual calendar, with utility bills, at public events, and on their websites.

The Co-permittees will:

- Provide links to the Principal Permittees' websites on their respective websites as well as summarize their participation in the larger Phase I Permit, explain their role, and summarize watershed concerns that are related to jurisdictional concerns;
- Provide at least one administrative or maintenance staff member to attend each public workshop;
- Record and report the number of impressions they have attained by June 1 each year. The minimum number of impressions for each Co-permittee will be based on a ratio of their population to the population of New Castle County as a whole minus populations of the cities of Newark and Middletown (covered by other NPDES permits) and the towns of Arden, Ardentown, Ardencroft, Odessa, and Townsend (non-permitted) per the 2010 census. This adjusted population is 483,282. Co-permittee populations, ratios and impressions are indicated below:

  - Bellefonte 1,193 or 0.25% 625 impressions;
  - Delaware City 1,695 or 0.35% 875 impressions;
  - Elsmere 6,131 or 1.27% 3,175 impressions;
  - New Castle 5,285 or 1.09% 2,725 impressions; and
  - Newport 1,055 or 0.22% 550 impressions.

The City of Wilmington will be responsible for the remaining 36,650 impressions under a separate agreement with the Principal Permittees.

PROGRAM ELEMENT #2 – ILLICIT DISCHARGE DETECTION AND ELIMINATION

Reference

Part II, Section A.2. – page 11 of 45.

Overview

Effectively prohibit the discharge of materials other than storm water to the MS4.

SWPP & MP Best Management Practices

Best Management Practice #IDDE-1				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Develop statute or ordinance that effectively prohibits the discharge of pollutants other than stormwater to the MS4	*	N/A		X
Measure: Yes / No.				
Principal Permittee Goal: DelDOT updates its MOU with DNREC for enforcement. **Co-permittee Goal:** Bellefonte, Newport, and New Castle develop statute or ordinance by May 2015.				

* - Ordinance already exists

New Castle County already has regulations that effectively prohibit the discharge of materials other than stormwater to the MS4. This is available in New Castle County Code Section 12.08.001. – Prohibitions, and specifically notes it is a prohibition to discharge, or cause to allow to be discharged, sewage, industrial wastes, or other wastes into the storm sewer system; connect, or cause or allow to be connected, any sanitary sewer to the storm sewer system; and discharge stormwater associated with industrial activity into the storm sewer system, or any component thereof, without State or County approval.

DelDOT does not have statutory authority to enact such an ordinance but does maintain a policy that requires permits from anyone seeking to tie into its system. Also, DelDOT is in the process of updating its Memorandum of Understanding (MOU) with DNREC for enforcement.

Elsmere and Delaware City already have adequate provisions for addressing IDD&E in their codes. Section 190-2 of Elsmere's Code defines illegal discharge and illicit connections, Section 190-7 lists prohibitions of illegal discharges and illicit connections, Section 190-8 allows the Town to suspend access to the MS4 to persons in violation of the chapter, and Section 190-13 requires persons responsible for a facility or operation to notify the Town as soon as they have information regarding spills. Furthermore, Section 190-10 of Elsmere's Code details the monitoring of discharges associated with industrial activity including construction sites. Chapter 31 of Delaware City's Code

regulates the contribution of pollutants to the MS4, prohibits illicit connections and discharges, and establishes legal authority to carry out inspections, surveillance, and monitoring. It also requires notification of spills and includes provisions to suspend access to the MS4.

Bellefonte, Newport, and New Castle will adopt appropriate language that prohibits the discharge of non-stormwater into the collection system by the end of year 2 of the Permit term.

Permittee Coordination

The Principal Permittees and Co-permittees will each be individually responsible for development of their own statute or ordinance.

Best Management Practice #IDDE-2				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Implement IDD&E Program	X	X		X
Measure: Yes / No. **Principal Permittee Goal:** DelDOT updates Subdivision Manual by end of year 2 of the permit term.				
Measure: Number of illicit discharges reported and description of how incident was addressed. Results reported each year. **All Permittee Goal:** Establish procedure to receive and track reports of illicit discharges and follow up actions.				

All Permittees detect illicit discharges and improper disposal into the MS4 including a system to prioritize and investigate complaints / reports or monitoring information that indicates potential illicit discharges including a spill or illegal dumping. IDD&E includes a program to limit infiltration from sanitary sewers into the MS4 (not included as a Permit requirement but listed in the Annual Report Template (Appendix B of Permit)). All Permittees require or will require appropriate corrective action, either the elimination of the illicit discharge(s) or obtaining an NPDES permit for continuation of the discharge. These efforts will continue and will be reported each year.

The cornerstone of DelDOT's IDD&E program is the evaluation and screening of outfalls described in BMP #IDDE-4. When illicit discharges are detected, field crews from DelDOT's contractor create a Memorandum to DelDOT that includes information regarding how the discharge was reported (evaluation, screening, or miscellaneous report), field screening observations and lab results. The memo is updated with the dates, times, and details of every activity related to the illicit discharge until it is eliminated or removed. A record is kept of all correspondence and field visits for each potential illicit discharge, and tracking forms are updated when any new information is received. The Department's IDD&E Plan is included in Appendix E.

Also, DelDOT is in the process of updating its Subdivision Manual and revised sections will include a prohibition of all connections to its MS4 without prior written consent.

New Castle County already provides Delaware Solid Waste Authority (DSWA) recycling containers at its Reads Way government center as well as in many of its parks. DelDOT coordinates with DSWA by encouraging recycling and promote hazardous waste collections and obtaining required approvals or permits for disposal of trash and solid wastes at landfill or transfer stations. Elsmere has used motor oil drop off locations at its public works yard and co-sponsors a hazardous wastes drop off event with DSWA each fall. Delaware City holds these drop off events twice a year and also includes drop offs for drugs. All Permittees will provide a link to the DSWA web site on their web sites.

DelDOT will coordinate activities with DNREC's Division of Waste and Hazardous Substances as follows:

- Coordinate with the Emergency Prevention and Response Section to report spills and advertise their 24-hour emergency response hotline;
- Submit reports of chronic dump sites to the TrashStoppers Program (http://www.dnrec.delaware.gov/dwhs/Enforcement/Pages/TrashStoppers.aspx);
- Encourage recycling and promote hazardous waste collections (Solid and Hazardous Waste Management Section);
- Abide by MOU for enforcement of our IDDE program; and
- Coordinate with SIRS on the PMP for PCBs (Monitoring Element #1).

Programs regarding IDD&E public information are included in BMP #2b under Public Education / Public Involvement (Program Element #1). Programs to reduce the discharge of floatables are described in BMP #GH-7 under Good Housekeeping measures (Program Element #5).

Permittee Coordination

The Principal Permittees and Co-permittees will each be individually responsible for implementation of an IDD&E program. The Co-permittees will provide a summary of illicit discharges and descriptions of how incidents were addressed, a report on illicit discharge detection and elimination public information or other measures taken, and a summary of their program to limit infiltration from sanitary sewers to the MS4 to the Principal Permittees by June 1 each year.

Best Management Practice #IDDE-3				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Provide publicly-listed, water quality citizen complaints / reports telephone number (cross reference with BMP #PEI-2b)	X	X	X	
Measure: Yes / No.				
Goal: Principal Permittees maintain publicly-listed, water quality citizen complaints / reports telephone number(s) 24 hours a day. Co-permittees publicize the number(s).				

The Principal Permittees will be utilizing the existing resident and motorist call-in and email infrastructure at DelDOT's Transportation Management Center (TMC) for the water quality complaints / reports telephone number using either the existing number and / or email addresses or by creating a new number and / or email address. Once contact is made with TMC, operators will determine the following:

- If the subject is an emergency, the complainant will be referred to 911 or DNREC's emergency number;
- If the subject is not an MS4 pollution issue, the complaint is referred to the appropriate agency or authority; and
- If the subject is an MS4 pollution issue, the operator will collect the address or location, details regarding material dumped or spilled, date and time, and complainant contact information.

All information will be entered into a database. For MS4 pollution issues, TMC will contact DelDOT or DelDOT's contractor. When TMC receives a call or email regarding a potential MS4 pollution issue, TMC will forward the information via email to DelDOT and / or DelDOT's contractor who will evaluate the information to determine ownership of the MS4 and the appropriate actions to investigate the potential MS4 pollution issue.

Procedures set forth in this document for Illicit Discharge Detection and Elimination will be followed. The initial actions will include coordinating with the owner of the MS4 and assigning a field team to investigate the issue. In each case, an IDD&E Tracking Form will be initiated and completed for documentation.

Permittee Coordination

The Principal Permittees will provide a publicly-listed, water quality citizen complaints / reports telephone number. The Co-permittees will assure this number is available to their residents.

Best Management Practice #IDDE-4				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Evaluate and screen outfalls	X	X	X	X
Measure: Outfalls evaluated and screened each year.				
All Permittee Goal: All Permittees collectively evaluate 20% of outfalls each year. Number of screenings will be dependent on results of evaluations.				

There will be two primary components: evaluations, which will be a desktop exercise, and screening, which will occur in the field. The evaluations will be comprehensive irrespective of municipal boundaries and DelDOT will make information available to all Permittees. Approximately 20% of the outfalls in New Castle County will be evaluated each year such that all outfalls are evaluated by

the end of the Permit term. The outfalls to be targeted for subsequent screening each year will be selected as follows:

- All outfalls encountered during routine MS4 inventory and inspection activities will be screened;
- All reports/complaints of spills or dumping will be investigated and the relevant portions of the MS4 screened; and
- On a watershed by watershed basis, the entire MS4 will be evaluated to target outfalls for field screening that have high potential for illicit discharges or connections. Following the methods recommended in the EPA's IDDE manual (*Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*, Brown et al., 2004), all outfalls within a watershed will be assessed based on available GIS data, including, but not limited to:
    - Past dry weather flow or detection of contaminants;
    - Past discharge complaints and reports;
    - Age of development;
    - Density or aging septic systems;
    - Aging or failing sewer infrastructure; and
    - Density and age of industrial activities.

    All outfalls targeted through this assessment (and their connecting conveyances) will be investigated in the field for dry weather flow. See IDD&E Program in Appendix E.

Permittee Coordination

DelDOT's contractor will evaluate and screen outfalls located within the boundaries of Co-permittee cities and towns. DelDOT will provide reports and / or information resulting from the evaluations or screening to the Co-permittees.

Once mapping is completed (see Program Element #8), evaluations and screening by DelDOT's contractor will be performed at each location where a storm sewer crosses a municipal boundary (either into or out of) and maintenance responsibility therefore changes.

This BMP does not apply to Bellefonte as the Town has no outfalls.

PROGRAM ELEMENT #3 – STORMWATER MANAGEMENT DURING CONSTRUCTION

Reference

Part II, Section A.3. – page 14 of 45.

Overview

Reduce the discharge of pollutants from active construction sites. Address both sediment and pollutants other than sediment discharged during construction.

SWPP & MP Best Management Practices

Best Management Practice #SMDC-1				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Continue to implement Delaware's Sediment and Stormwater Regulations	X	X		X
Measure: Plans received, total inspections conducted, total number of sites, and enforcement actions taken. **Measure:** Statistics on how NPDES General Permit requirements have been met, in addition to requirements set by the Delaware Sediment and Stormwater Regulations (see Outstanding Permit Issues on page iv of this SWPP & MP).				
All Permittee Goal: New Castle County, DelDOT, and the New Castle Conservation District maintain delegated agency status through Permit term and document plan review, approval processes and inspection of construction activities for each required site.				

New Castle County, DelDOT, and the New Castle Conservation District are all delegated agencies under DNREC's Sediment and Stormwater Program. The New Castle Conservation District has this responsibility for the Co-permittees. Agreements specifying services and responsibilities between the Co-permittees and the Conservation District are being developed. All three entities' delegated agency status expires in June 2015 and each will seek re-delegation. Through this delegated authority, these agencies will continue to implement Delaware's Sediment and Stormwater Regulations (DSSR) and enforce respective programs. This will include the following:

- Require Erosion and Sediment Control Plans for any and all land disturbances unless exempted under the Delaware Sediment and Stormwater Regulations (DSSR);
- Require procedures for site plan review of construction plans that consider potential water quality impacts. DelDOT has a stormwater plan review and checklist that design engineers use during their plan development that will be revised in year 2 to include DSSR changes;
- Require the use of appropriate erosion and sediment control devices in accordance with the DSSR;

- Inspect all active private and public approved construction sites to ensure the erosion and sediment controls are properly installed in accordance with the requirements of the DSSR. This provision is or will be implemented by the New Castle Conservation District in Co-permittee cities and towns; and
- Assure construction sites have the appropriate level of oversight, inspection, and enforcement. Require post-construction verification documents, including construction checklists and as-built plans; be submitted for all permanent stormwater management BMPs to ensure proper installation in accordance with the requirements of the DSSR. This provision is or will be implemented by the New Castle Conservation District in Co-permittee cities and towns.

Agreements between the Co-permittees and the New Castle Conservation District that specify responsibilities of each party and provide assurances that the DSSR is being adequately applied and enforced in each municipality are being developed. Absent an agreement or agreements or if the New Castle Conservation District loses its delegated status, the Co-permittees will be responsible for implementing an equivalent program.

Permittee Coordination

The Principal Permittees and Co-permittees will each be individually responsible for ensuring the implementation of the Delaware Sediment and Stormwater Regulations within their jurisdictions. The Co-permittees will provide a summary of activities including number of plans reviewed, total inspections conducted, total number of sites, and enforcement actions taken to the Principal Permittees by June 1 each year.

Best Management Practice #SMDC-2				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Develop regulatory mechanism for enforcing Stormwater Management During Construction requirements	*	**		X
Measure: Yes / No.				
Co-permittee Goal: Each Co-permittee develops regulatory mechanism by the end of year 3 of the Permit term for enforcing Stormwater Management During Construction requirements.				

* - New Castle County already has a regulatory enforcement mechanism
** - DelDOT addresses the discharge of pollutants from active construction sites through its contracts and Standard Specifications for Road and Bridge Construction

Existing codes in the Co-permittee cities and towns refer to the DSSR in varying degrees. However, none of them include the specificity mandated by the Permit. Each Co-permittee will perform a review of current code language and will adopt new ordinances or revise code sections by the end of year 3 of the Permit term, as appropriate, to include the following:

- Review and approval of Sediment and Stormwater Plans in accordance with the standards of the current Delaware Sediment and Stormwater Regulations (DSSR);
- Use and maintenance of structural and nonstructural controls and BMPs during time when construction is underway;
- Inspection of construction sites, notification to operators, and enforcement of control measures;
- Requirements for operators to control wastes such as discarded construction or building materials; and
- Inspections to ensure that BMPs are properly constructed and installed per the requirements of the DSSR.

Permittee Coordination

The Principal Permittees and Co-permittees will each be individually responsible for the development of appropriate regulatory enforcement mechanisms.

PROGRAM ELEMENT #4 – POST CONSTRUCTION STORMWATER MANAGEMENT

Reference

Part II, Section A.4. – page 15 of 45.

Overview

Reduce the discharge of pollutants and reduce the quantity of water leaving post-development construction sites for new development.

SWPP & MP Best Management Practices

Best Management Practice #PCSM-1				
	New Castle County	DelDOT	Co-permittees through IJA	Co-permittees Independently
Inspect privately-owned stormwater management structures	X	N/A		X
Measure: Total number of BMPs and number of maintenance inspections conducted each year.				
All Permittee Goal: All privately-owned stormwater management structures are inspected each year.				

New Castle County inspects all privately-owned stormwater management facilities in its stormwater database whether installed before or after 1991 a minimum of once per year. The County issues an inspection report to the responsible party. The inventory is revised frequently and therefore is not being included with this SWPP & MP.

New Castle County assures that Operation and Maintenance Plans (O&M plans) for residential and commercial / industrial BMPs are submitted along with the as-built plans to the Department of Land Use as part of the reviewing process. Funds for maintenance are deposited into an escrow account at this time as well. O&M plans are due to the HOAs at the time that their private open space is turned over to them and are reviewed and approved prior to the recordation of the plan. O&M plans are implemented by the developer as soon as stormwater management features are installed. The County Department of Special Services utilizes the O&M plans annually as part of their inspection process to assure they are being followed.

Agreements between the Co-permittees and the New Castle Conservation District that specify responsibilities of each party and provide assurances that privately-owned stormwater management structures are inspected annually in each municipality are being developed.

Permittee Coordination

The Principal Permittees and Co-permittees will each be individually responsible for inspections of privately-owned stormwater management structures within their jurisdictions. The Co-permittees will provide the total number of BMPs and the number of maintenance inspections conducted to the Principal Permittees by June 1 each year. The Co-permittees will share whatever electronic information they have regarding their stormwater BMPs with the Principal Permittees.

Best Management Practice #PCSM-2				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Inspect and maintain publically-owned stormwater management structures	X	X		X
Measure: Total number of BMPs and number of maintenance inspections conducted each year.				
All Permittee Goal: All publically-owned stormwater management structures are inspected annually or within one year of repair. **Principal Permittee Goal:** DelDOT revises and updates the existing operation and maintenance manual by the end of year 2 of the Permit term.				

All Permittees follow maintenance schedules / plans to ensure the repair and restoration of publically-owned stormwater management systems. Maintenance activities will be scheduled and prioritized based on the possible impacts on surface water quality, hazards to public safety, and availability of funds.

New Castle County and DelDOT each inspect and maintain the stormwater BMPs in their databases which are periodically updated. Maintenance on the County's BMPs is either contracted or performed by the Construction Support group.

Inspections on DelDOT BMPs occur on an annual basis, except in instances after BMP repair, in which case, BMPs shall be inspected within one year of repair. When deficiencies are noted, BMP work orders are created. Preventative and corrective maintenance of BMPs is completed per the DelDOT BMP Maintenance Plan. Depending on the type and quantity of work needed, the work is completed by DelDOT personnel or completed by contractors. These efforts will continue. DelDOT will revise and update the existing operation and maintenance manual by the end of year 2 of the permit term.

Agreements between the Co-permittees and the New Castle Conservation District that specify responsibilities of each party and provide assurances that publicly-owned stormwater management structures are inspected annually in each municipality are being developed. The Co-permittees will share whatever electronic information they have regarding their BMPs with the Principal Permittees.

Elsmere maintains one conveyance channel at the rear of Dover Avenue. Its maintenance is included in the Town's landscape maintenance contract and it will continue to be maintained in this manner.

The remaining Co-permittees are unaware of any other publicly-owned stormwater management structures within their jurisdictions.

Permittee Coordination

The Principal Permittees and Co-permittees will each be individually responsible for inspections and maintenance of publicly-owned stormwater management structures within their jurisdictions. The Co-permittees will provide the total number of BMPs and the number of maintenance inspections conducted to the Principal Permittees by June 1 each year.

Best Management Practice #PCSM-3				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Update BMP databases (cross reference with Permit Element #8)	X	X		X
Measure: Yes / No.				
Principal Permittee Goal: Provide updated maps and databases to DNREC each year. **Co-permittee Goal:** Furnish updates to Principal Permittees annually.				

New Castle County and DelDOT will maintain BMP databases. New BMPs will be added to the existing BMP databases as facilities are constructed and accepted for maintenance. The current inventories include geospatial location and basic characteristics of individual stormwater BMPs.

Permittee Coordination

The Principal Permittees and Co-permittees will each be individually responsible for maintaining BMP databases. The Co-permittees will furnish BMP updates annually to the Principal Permittees.

Best Management Practice #PCSM-4				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Develop regulatory mechanism for enforcing Post Construction Stormwater Management requirements	*	N/A		X
Measure: Yes / No.				
Co-permittee Goal: Develop regulatory mechanism by the end of year 3 of the permit term.				

* - Ordinance already exists

New Castle County already has regulatory authority to address post construction stormwater quantity and quality. DelDOT addresses stormwater quantity and quality through its contracts and Standard Specifications for Road and Bridge Construction.

Each Co-permittee will perform a review of current code language and will adopt new ordinances or revise code sections by the end of year 3 of the permit term as appropriate that will address post-construction stormwater quantity and quality and limiting the discharge of pollutants via stormwater runoff.

Permittee Coordination

The Principal Permittees and Co-permittees will each be individually responsible for the development of appropriate regulatory enforcement mechanisms.

PROGRAM ELEMENT #5 – GOOD HOUSEKEEPING

Reference

Part II, Section A.5. – page 16 of 45.

Overview

Prevent and / or reduce discharges of pollutants associated with the Permittees' operations, including maintenance facilities, roadways and rights-of-way (not applicable to New Castle County), and parks or other lands owned by the Permittees.

SWPP & MP Best Management Practices

Best Management Practice #GH-1				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Update inventory of facilities owned or operated by Permittees that maintain coverage under a NPDES industrial stormwater general permit or have the potential to contribute polluted discharges as a result of stormwater	X	X		X
Measure: Yes / No.				
All Permittee Goal: Provide annual updates to inventory in years 2 through 5.				

Inventories of facilities owned and operated by the Principal Permittees and Co-permittees, are included as Appendix F [*to be included in Final Plan*]. Only those facilities that either maintain coverage under the NPDES industrial stormwater general permit program or have the potential to contribute polluted discharges as a result of stormwater are included. Each facility on the list will be inspected annually (see BMP #GH-3).

New Castle County is in the process of developing standards regarding athletic fields, roads in parks, trash cans or carry out policies in parks, etc., and intends to submit these in the final SWPP & MP.

Permittee Coordination

Principal Permittees and Co-permittees will each be individually responsible for maintaining the inventory and inspecting the facilities each year. The Co-permittees will provide an updated inventory of facilities, inspection schedule of facilities, and summary of control measures taken to the Principal Permittees by June 1 each year.

Best Management Practice #GH-2				
	New Castle County	DelDOT	Co-permittees through IJA	Co-permittees Independently
Prepare facility guidelines or checklists	N/A	N/A		X
Measure: Number of guidelines or checklists prepared.				
Co-Permittee Goal: 100 percent of facilities on inventory have either Pollution Prevention Plans (PPPs) or site-specific guidelines or checklists developed by the end of year 3 of the permit term.				

New Castle County and DelDOT have already developed Pollution Prevention Plans (PPPs) for all of their facilities which require them based on SIC codes. Guidelines or checklists will be developed by the Principal Permittees and Co-permittees by the end of year 3 of the permit term for other facilities included on the inventory that are owned and operated by permittees and have the potential to contribute polluted discharges as a result of stormwater.

Once plans are prepared, the facilities will be inspected as described in BMP #GH-3.

Permittee Coordination

Principal Permittees and Co-permittees will each be individually responsible for preparing Pollution Prevention Plans for their facilities.

Best Management Practice #GH – 3				
	New Castle County	DelDOT	Co-permittees through IJA	Co-permittees Independently
Follow Stormwater Pollution Prevention Plans or guidelines / checklists	X	X		X
Measure: Number of annual inspection reports kept on file including summary of control measures taken to minimize impacts of discharges.				
All Permittee Goal: Each facility on inventory inspected annually. **All Permittee Goal:** 100 percent of Stormwater Pollution Prevention Plans or guidelines / checklists are followed.				

Stormwater Pollution Prevention Plans (SWPPPs) exist for New Castle County's Base D maintenance facility and Middletown – Odessa – Townsend "Water Farm" as well as for all of DelDOT's

maintenance yards. Provisions in PPPs including wet and dry weather screening, spill documentation, monitoring and record-keeping are implemented annually. These plans will continue to be followed.

DelDOT's Stormwater Pollution Prevention Program (SWPPP) covers all maintenance facilities that require NPDES general permit for industrial facilities coverage and provides the maintenance yards with the tools to reduce pollutants contained in stormwater discharges and comply with the requirements of Delaware's "Regulations Governing Storm Water Discharges Associated with Industrial Activity." The program includes a written plan, timeline for plan implementation, inspection schedules, training and monitoring requirements, and proper storage and housekeeping measures. Each SWPPP has a pollution prevention team with designated responsibilities to carry out the plan. DelDOT vehicle washing program is included in Appendix G.

Permittee Coordination

Principal Permittees and Co-permittees will each be individually responsible for following Pollution Prevention Plans for their facilities.

Best Management Practice #GH-4				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Perform street sweeping	N/A	X		X
Measure: Number of lane-miles swept and tons of debris and sediment collected. **Optional measure**: Estimates of pounds total nitrogen and total phosphorous removed.				
Principal Permittee Goal: DelDOT sweeps all curb miles identified in Table X. **Co-permittee Goal:** Provide documentation as described below.				

New Castle County does not own any public roads so this BMP is not applicable to them.

DelDOT used a combination of literature review, research and modeling to develop a scientifically defensible sweeping plan for state-maintained roadways in New Castle County. The plan focuses the sweeping effort on interstates and expressways, curbed roadways with closed drainage systems, and targeted pollutant hot-spot areas (high-traffic and commercial/industrial areas). This approach can be shown to maximize pollutant reductions and still be both fiscally and operationally feasible (see Appendix H for full report).

The street sweeping regime to be implemented by DelDOT is as follows:

Table 2 – DelDOT Street Sweeping		
Roadway Type	**Annual Frequency**	**Target Annual Curb Miles**
Interstates/Expressways	8	3,019
ADT>30K or Industrial/Commercial Land Use	8	2,318
Local, curbed roads	1	1,857
Other Arterials	3	1,304
Additional Sweeping, by Work Order	as needed	variable
Totals		**≥ 8,498**

Because additional equipment and/or staff may be needed to fully implement the plan in all Maintenance Districts, DelDOT's sweeping efforts will be transitioned in phases from the previous 4:2:1 plan of the first Phase I Permit to the new regime, with a goal of full implementation by year 3 of the Permit.

Compliance with the plan will be tracked and verified through DelDOT's Maximo work order system, or other equivalent tools. Total miles swept and pounds of street sweeping waste collected in each watershed in the County will be reported annually to DNREC for estimations of pollutant removal.

Sweeping residuals will be staged at DelDOT maintenance facilities and segregated from other waste materials. Good housekeeping practices related to storage and disposal of street sweeping wastes will be followed at DelDOT maintenance facilities. Because of the potential for contamination, delivery of street sweeping wastes to landfills requires prior approval from DSWA under their Special Solid Waste Policy. DelDOT has arranged with DSWA for blanket approval for delivery of street sweeping wastes which is renewed each year. The Policy describes in detail information to be included in the request and analyses to be done (TCLP, ignitability, corrosivity, reactivity, BTEX, PCBs, solids content). The request is sent to the landfill manager, and if approved, he / she sends an approval letter. A copy of that approval letter must be presented with every load by the delivery truck driver, or else the truck will be turned away.

Co-permittees will continue with their current programs as follows and potentially utilize DelDOT's optimization approach described above:

- **Bellefonte** – does not sweep streets as the streets are maintained by DelDOT
- **Elsmere** – sweeps streets as often as possible between March and December with less frequency in January and February. Monthly and annual logs are kept of tonnage collected. The Town will continue to track this information.
- **Newport** – owns a street sweeper which is mostly used on a reactive basis. The Town will begin tracking volume of street sweepings collected.
- **Delaware City** – sweeps all streets with an emphasis on those with curb and gutter at least twice a year through the use of a contractor. The City will begin tracking volume of street sweepings collected. The City also keeps a log of catch basin inspections including how often each is visited and the results of actions.
- **New Castle** – sweeps streets an average once every two weeks and collected material is conveyed to a landfill. The City will begin tracking volume of street sweepings collected.

The Co-permittees intend to submit DelDOT's analytical results to DSWA as representative of their street sweepings as part of their own application for disposal at landfills.

Permittee Coordination

DelDOT and Co-permittees will each be individually responsible for street sweeping programs within their jurisdictions. The Co-permittees will provide a summary of street sweeping operations to the Principal Permittees by June 1 each year.

Best Management Practice #GH-5				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Reduce contribution of pollutants associated with the application, storage and disposal of pesticides, herbicides, and fertilizers (cross reference with BMP #PEI-2f)	X	X		X
Measure: Yes / No.				
Principal Permittee Goal: New Castle County and DelDOT follow existing regulations and report usage annually. **Co-permittee Goal:** Provide documentation as described below.				

DelDOT's program includes providing pesticide data annually by type, quantity and unit of measure; management of NPDES herbicide application on BMPs through contract or in-house staff; use of IPM measures that incorporate non-chemical solutions; and assessing locations for opportunities to implement alternative practices for non-herbicide methods of maintenance. Delaware Livable Lawns seeks to mitigate the effects of pesticides, herbicides, and fertilizers applied to private lawns and landscaping.

DelDOT will also continue studying alternative vegetation management strategies for guardrails seeking to find ways to reduce the use of pesticides without compromising safety and aesthetics. Treatments being evaluated include several types of weed control barriers, chemicals, low-growth vegetation, and hand cutting of existing vegetation. They are being compared based on effectiveness, ease of implementation, aesthetics, cost and longevity.

Fertilizer application rates on New Castle County properties are made following soil sample results and applications of pesticides, herbicides, and fertilizers are made per the directions on the product label or per approved procedures. New Castle County employees applying pesticides, herbicides, and fertilizers are certified. A Nutrient Management Plan exists for the Equestrian operation at Carousel Park. The County's Standard Operating Procedure (SOP) for Herbicide Application is included in Appendix I1 and the SOP for Fertilizer Application is included in Appendix I2. New Castle County contractors for these applications must be licensed and certified, and they are required to contact the County prior to the application of any herbicides.

Co-permittees will continue with their current programs and enhance as appropriate as follows:

- **Bellefonte –** maintains just one property through a contractor and it is less than one tenth of an acre in size. The Town is not aware of any pesticide, herbicide, or fertilizer use at this location.
- **Elsmere –** typically uses pesticides, herbicides, and fertilizers only to control weeds along curbs and these applications are made per manufacturer's recommendations. The Town will begin tracking gallons (or other measure) used. The Town maintains parkland and the median in Kirkwood Highway through contractors and there are restrictions in those contacts which limit the amount of pesticides, herbicides, and fertilizers applied.
- **Newport –** uses a negligible amount of pesticides, herbicides, and fertilizers in the maintenance of its open spaces. The Town will begin tracking gallons (or other measure) used.
- **Delaware City –** does not use pesticides, herbicides, and fertilizers but does use Roundup for spot control of weeds. The City will begin tracking gallons (or other measure) used.
- **New Castle –** uses a negligible amount of pesticides, herbicides, and fertilizers in the maintenance of its open spaces. The City will begin tracking gallons (or other measure) used.

Permittee Coordination

Principal Permittees and Co-permittees will each be individually responsible for the reduction of pollutants associated with the application, storage and disposal of pesticides, herbicides, and fertilizers within their jurisdictions. The Co-permittees will provide a summary of their pesticide, herbicide, and fertilizer program to the Principal Permittees by June 1 each year.

Best Management Practice #GH-6				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Manage snow and ice including salt storage practices and alternative deicing practices	X	X		X
Measure: Yes / No.				
Principal Permittee Goal: New Castle County continues to follow its Winter Storm Operations / Snow Removal Plan. **Principal Permittee Goal:** DelDOT continues to follow its Statewide Salt Best Management Practices for DelDOT Maintenance Yards and updates Plan by end of Year 2. **Co-permittee Goal:** Provide documentation as described below.				

New Castle County Special Services Department performs snow and ice removal and winter storm operations at all County facilities. It includes personnel assignments, mobilization, training, equipment preparation, and salt usage. The County's Winter Storm Operations / Snow Removal Plan is included in Appendix J.

DelDOT implements advanced snow fighting practices that include ground speed spreader controls, anti-icing, pre-wetting, and plow balance valves. DelDOT inspects all salt spreading equipment before winter each year and calibrates equipment. Salt usage is documented and the feasibility of using alternative materials assessed. Good housekeeping practices related to storage and movement of salt at maintenance facilities are followed. DelDOT's Statewide Salt Best Management Practices for DelDOT Maintenance Yards is included in Appendix K. This Plan will be updated by the end of Year 2 of the Permit term.

Co-permittees will continue with their current programs and enhance as appropriate as follows:

- **Bellefonte –** contracts for snow and ice control and will begin tracking use of salt on an annual basis.
- **Elsmere –** calibrates equipment and quantifies its salt usage each year. The Town will begin tracking use of salt on an annual basis.
- **Newport –** will begin calibrating equipment and tracking use of salt on an annual basis.
- **Delaware City –** contracts snow plowing and will ensure its contract includes provisions for equipment calibration and annual reporting of salt usage.
- **New Castle –** will begin calibrating equipment and tracking use of salt on an annual basis.

Salt storage is addressed by BMPs #GH1 through GH-3.

Permittee Coordination

Principal Permittees and Co-permittees will each be individually responsible for the management of snow and ice including salt storage practices and alternative deicing practices within their jurisdictions. The Co-permittees will provide a summary of their snow and ice program to the Principal Permittees by June 1 each year.

Best Management Practice #GH-7				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Control litter on streets and highways including the proper disposal of collected material	N/A	X		X
Measure: Bags of trash collected by volunteers and tons of trash collected by DelDOT employees. **Measure:** Number of illegal dumps identified and reported each year.				
Principal Permittee Goal: Adopt-a-Highway coverage of all available routes by DelDOT **Co-permittee Goal:** Implement program as described below.				

New Castle County does not maintain any public roads. DelDOT will control litter on roadways through implementation of the following elements:

- Adopt-a-Highway program;
- Sponsor-a-Highway program;
- Use of Department of Corrections highway cleanup crews;
- Street sweeping;
- Maintenance work orders; and
- Public education programs.

The Co-permittees will address this requirement through their public education campaigns (see Program Element #1) and other mechanisms such as community service programs.

Permittee Coordination

Principal Permittees and Co-permittees will each be individually responsible for the control of litter on streets and highways within their jurisdictions. The Co-permittees will provide a summary of their litter control program to the Principal Permittees by June 1 each year.

PROGRAM ELEMENT #6 – INDUSTRIAL STORMWATER

Reference

Part II, Section A.6. – page 17 of 45.

Overview

Inspect and assist the Department [DNREC] with inspecting facilities considered by the Department to be "high risk".

SWPP & MP Best Management Practices

Best Management Practice #IS-1				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Inspect "high risk" facilities	X	N/A	X	
Measure: Inspections performed each year. Education materials distributed (if provisions of Delaware's Regulations Governing the Control of Water Pollution are delegated).				
All Permittee Goal: 36 inspections performed each year per MOU between New Castle County and DNREC.				

New Castle County will inspect high risk facilities in accordance with the MOU between the DNREC, Surface Water Discharges Section and New Castle County dated December 16, 2013. Compliance with the MOU shall comprise compliance with this section of the Permit. The MOU is included in Appendix L. The County has been provided with a list of 36 industrial sites throughout the County from DNREC.

New Castle County will report on the amount of education material distributed annually if provisions of Delaware's Regulations Governing the Control of Water Pollution are delegated if provisions of Delaware's Regulations Governing the Control of Water Pollution are delegated.

Permittee Coordination

New Castle County will perform site inspections for those locations within the municipal boundaries of Co-permittee cities and towns. The Co-permittees will provide a summary of educational items distributed to the Principal Permittees by June 1 each year if provisions of Delaware's Regulations Governing the Control of Water Pollution are delegated.

Best Management Practice #IS-2				
	New Castle County	DelDOT	Co-permittees through IJA	Co-permittees Independently
Update inventory of "high-risk" facilities	X	N/A		X
Measure: Yes / No. **Measure:** Number of new facilities identified and reported.				
All Permittee Goal: None.				

All permittees (with the exception of DelDOT) will notify DNREC if they discover industrial facilities within their jurisdictions that they believe should be included in the inventory of industrial facilities. All Permittees will provide an inventory of sites directly to DNREC each year by February 1.

Permittee Coordination

New Castle County and the Co-permittees will each be individually responsible for providing an inventory of sites directly to DNREC each year by February 1, and for notifying DNREC if they discover industrial facilities within their jurisdictions they believe should be included in the inventory.

PROGRAM ELEMENT #7 – WATERSHED PRIORITY LIST

Reference

Part II, Section A.7. – page 18 of 45.

Overview

Preparation of priority list of watersheds and development of two Water Quality Improvement Plans (WQIPs) will facilitate focused efforts that account for specific characteristics in each watershed.

Note Outstanding Permit Issues on pages ii and iii of this SWPP & MP.

SWPP & MP Best Management Practices

Best Management Practice #WPL-1				
	New Castle County	DelDOT	Co-permittees through IJA	Co-permittees Independently
Develop Watershed Priority List	X	X	X	
Measure: Yes / No.				
All Permittee Goal: Develop list.				

The Principal Permittees, in coordination with the Co-permittees, are using a weighted matrix approach to help inform decisions regarding the ranking of watersheds for Water Quality Improvement Plan development. The matrix along with categorical descriptions is included in Appendix M.

The 21 watersheds in New Castle County have been categorized as "Restoration" and "Preservation" depending on the ratio of 3% Effective Impervious Area (EIA) to total drainage area or each. Even though the Permit has the same requirement for all watersheds, a 3% decrease in untreated EIA, the Principal Permittees believe that developed watersheds or those with a higher percentage of EIA compared to total catchment area will warrant more of a restoration approach. Conversely, preservation activities will be more important in watersheds with less development and a lower percentage of EIA compared to total catchment area. These ratios as well as categorical assignments are also in Appendix M.

Each criterion in the matrix will receive a score of 1 through 5. These "weights" may vary between restoration and preservation watersheds. Criteria considered more important or relevant will be weighted a 4 or 5 while less significant criteria will be weighted a 1 or 2. Each watershed will then receive a score for each criterion (see below). These score will be multiplied by the weight and then each of these calculations will be summed across all criteria to derive the total technical score for the watershed. Higher scores will be given a priority over lower scores. The relative costs to prepare and

then implement each WQIP are also shown in the matrix. The Permittees will evaluate the technical scores along with relative costs to develop final ranking. It is anticipated that one restoration watershed and one preservation watershed will be selected for WQIP preparation by Year 4 of the Permit as required such that a range of plan development types are attained and resources are better balanced.

The overall objective of the Principal Permittees regarding the WQIP program is to focus efforts on streams that have achieved or are near achieving TMDLs and water quality standards (see Outstanding Permit Issues on pages ii and iii of this SWPP & MP). Therefore the following criteria are being used in the matrix:

- 305(b) report and 303(d) list – numerous stream segments were removed for both nutrients and bacteria from the State's 2012 303(d) list. Streams with all segments removed will score a 4 or 5; streams with some segments removed score 3; streams with no segments removed score 1;
- STORET analysis – the Principal Permittees are preparing an in-depth analysis of historical nutrient and bacteria trends using data from DNREC's STORET stream monitoring stations (see BMP #WLA-1). Streams with water quality values trending near DNREC standards score highly; streams not trending near standards score lower depending on spread;
- Percent load reductions – streams with low load reductions per Table A.1 or Table A.2 of the Permit (see Outstanding Permit Issues on page ___ of this SWPP & MP) score highly; streams with high load reductions score lower;
- Existing impervious cover / EIA – streams with higher amounts of imperviousness score more highly than streams with lower amounts. The Principal Permittees believe higher amounts of impervious will provide more opportunities to reduce EIA;
- Planned DelDOT roadways / projects – similarly, streams in areas with numerous planned projects score more highly than those with fewer projects as there will be more opportunities to reduce EIA;
- Projected growth – watersheds in higher growth areas will score more highly than lower growth areas as there will be more potential for redevelopment and retrofit opportunities;
- Public or quasi-public open space – watersheds with greater amounts of open areas including DelDOT excess rights-of-way will score more highly than watersheds with lesser amounts of open areas as there will be more availability for placement of retrofits;
- ERES waters – the weight of this criterion is still being evaluated;
- Drinking water sources – the weight of this criterion is still being evaluated;
- Flood prone areas – the weight of this criterion is still being evaluated; and
- Areas with SSO / CSO impacts – the weight of this criterion is still being evaluated.

The Watershed Priority List will be reviewed and revised as appropriate each year at the annual meeting (see BMP #GRP-1) and adjusted cooperatively between the Principal Permittees and Co-permittees (see BMPs #WPL-2 and WPL-3).

Permittee Coordination

The Principal Permittees led the Watershed Priority List preparation in consultation with the Co-permittees.

Best Management Practice #WPL-2				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Develop first Water Quality Improvement Plan (WQIP)	X	X	X	
Measure: Yes / No.				
Goal: Principal Permittees and Co-permittees (as appropriate) develop first WQIP.				

The Water Quality Improvement Plan for the _____ watershed will be prepared and submitted by the end of Year 4 of the Permit term. Implementation will occur six months following approval by DNREC.

Load reductions resulting from structural BMPs implemented between 1998 (2006 for watersheds draining to the Chesapeake Bay) and the present will be computed and applied against land use loadings to demonstrate effects of existing efforts.

Permittee Coordination

The Principal Permittees and Co-permittees will develop a cost share agreement for this WQIP prior to its initiation. The Co-permittees will provide mapping as appropriate (see BMP #MAP-1).

Best Management Practice #WPL-3				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Develop second Water Quality Improvement Plan (WQIP)	X	X	X	
Measure: None.				
Goal: Principal Permittees and Co-permittees (as appropriate) develop second WQIP.				

The Water Quality Improvement Plan for the _____ watershed will be prepared and submitted by the end of Year 4 of the Permit term. Implementation will occur six months following approval by DNREC.

Load reductions resulting from structural BMPs implemented between 1998 (2006 for watersheds draining to the Chesapeake Bay) and the present will be computed and applied against land use loadings to demonstrate effects of existing efforts.

Permittee Coordination

The Principal Permittees and Co-permittees will develop a cost share agreement for this WQIP prior to its initiation. The Co-permittees will provide mapping as appropriate (see BMP #MAP-1).

PROGRAM ELEMENT #8 – MAPPING

Reference

Part II, Section A.8. – page 19 of 45

Overview

Annual updates to mapping will assure availability of current data for use in other tasks.

SWPP & MP Best Management Practices

Best Management Practice #MAP-1				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Update maps and databases	X	X		X
Measure: Yes / No.				
Principal Permittee Goal: Principal Permittees provide updated maps and databases to DNREC each year. **Co-permittee Goal:** Co-permittees furnish any updates to Principal Permittees.				

As new subdivisions or developments are approved and constructed, New Castle County's Department of Land Use will notify the Department of Special Services of new outfalls and provide information including locations, pipe size and material, drainage area, and runoff curve number. DelDOT's database will be similarly updated. Maps and GIS shape files will be furnished to DNREC annually. Hard copy maps will not be provided.

Permittee Coordination

The Co-permittees will provide the Principal Permittees with mapping of inlets, pipes, outfalls, and stormwater management structures within their municipalities prior to or soon after initiation of Water Quality Improvement Plan preparation (see BMPs #WPL-2 and WPL-3), if applicable, or by the end of the Permit term, whichever is sooner. Mapping will be in digital format such as GIS, AutoCAD, or Google Earth files. In lieu of mapping, coordinates (latitude and longitude or Delaware State Plane) will be provided for each structure with the exception of pipes. The Principal Permittees will append the County-wide database with locations of those that are the responsibility of the Co-permittees and submit as part of the annual mapping submittal.

MONITORING ELEMENT #1 – POLLUTION MINIMIZATION PLAN (PMP) FOR POLYCHLORINATED BIPHENYLS (PCBS)

Reference

Part II, Section b.1. – page 19 of 45.

Overview

The Pollutant Minimization Plan will provide DNREC with additional information and resources to address PCBs.

SWPP & MP Best Management Practices

Best Management Practice #PCB-1				
	New Castle County	DelDOT	Co-permittees through IJA	Co-permittees Independently
Develop Pollution Minimization Plan (PMP) for Polychlorinated Biphenyls (PCBs)	X	X	X	

A Pollution Minimization Plan (PMP) for polychlorinated biphenyls (PCBs) is being prepared on behalf of the Principal and Co-permittees. A draft is included in Appendix N. The purpose of the PMP for PCBs is to address the potential conveyance of PCBs in the Delaware River Watershed from the MS4 located in New Castle County. The PMP was established in general accordance with the elements described in Part II. B.1. of the Permit.

In addition to meeting the requirements of the Permit, the PMP is also intended to provide the PCB analytic data collected for this PMP to DNREC as a supplement to their ongoing water quality management efforts with respect to toxic substances, known as the Watershed Approach to Toxics Assessment and Restoration (WATAR). As required by the Federal Clean Water Act Section 303(d) and as part of the WATAR, DNREC has assembled a list of impaired waterbody segments within Delaware targeted for the establishment of TMDL values for PCBs. For the purposes of the PMP, only those impaired waterbody segments within New Castle County that drain to the Delaware River and that have been indicated to be impacted by PCBs will be considered. In addition, an updated list of known and/or probable PCB sources specific to areas of the County that fall within the jurisdiction of the permit and drain to the MS4 will be generated as part of the PMP. Using the PMP-specific list, it is anticipated that the applicable PCB sources will be mapped relative to the locations of the impaired waterbody segments targeted by DNREC's WATAR.

The sampling and analytic approach of the PMP includes two phases; the first is a desktop review phase, and the second is a focused, sampling and analysis phase. The goal of the first phase is to select the outfalls that will be targeted for sampling and analysis during the second phase. Utilizing the data compiled as part of the desktop review, the second phase will target "outfalls" or specific

points where conveyance of MS4 storm water discharges directly into impaired water segments identified and listed in the WATAR that are applicable to the PMP.

With respect to the WATAR and assuming detections of PCB congeners are reported, data could be used in direct comparison with PCB congener data collected by DNREC from the impaired waterbody segment, supporting future source trackdown efforts. Storm water samples will be collected from targeted outfalls during a significant storm event and submitted to an environmental laboratory for analysis of PCB congeners. One sample will be collected per outfall, with up to 10 outfall water samples collected from any one WATAR-listed impaired waterbody segment. Sampling and analytic testing will occur annually and generally follow the implementation schedule presented in the DNREC WATAR.

After compiling data acquired from the initial and second phases, the baseline loading calculations, and information regarding source identification / trackdown, a plan for continuing assessment and/or a plan of action to control the discharge of PCBs can be designed by the Permittees, DNREC, and other appropriate agencies. As required by the permit, reporting shall occur annually as part of the permittees' Annual Storm Water Report and should provide evidence of implementation of this PMP.

Permittee Coordination

The Principal Permittees will lead the development of the PMP for PCBs. No further coordination between the Principal Permittees and Co-permittees is planned or necessitated.

Best Management Practice #PCB-2				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Monitor for PCBs	X	X	X	

Monitoring for PCBs will be determined as part of the Sampling and Analysis Plan to be developed following DNREC approval of the PMP for PCBs.

Permittee Coordination

Coordination between and among all Permittees is still being discussed.

MONITORING ELEMENT #2 – TOTAL MAXIMUM DAILY LOADS (TMDL) WASTE LOAD ALLOCATIONS (WLA) AND APPLICABLE WATER QUALITY STANDARDS

Reference

Part II, Section B.2. – page 20 of 45.

Overview

Permittees shall address TMDL wasteload allocations, in addition to applicable water quality standards, through the iterative implementation of programmatic BMPs that will prevent, reduce, or remove the targeted pollutants.

See Outstanding Permit Issues on pages ii and iii of this SWPP & MP.

SWPP & MP Best Management Practices

Best Management Practice #WLA-1				
	New Castle County	DelDOT	Co-permittees through IJA	Co-permittees Independently
Review existing water quality data	X	X	X	

WRA at the University of Delaware is reviewing previously prepared water quality data including the work performed in 1996 in support of the initial NPDES Permit application that included monitoring at 13 stations throughout the County. Furthermore, years of data from dozens of in-stream monitoring stations are available from EPA's STORET (STOrage and RETrieval) Data Warehouse. WRA is performing evaluation of these data using Seasonal Kendall methodologies. A Seasonal Kendall test is widely recommended for water quality trend evaluations as it compares the relationship between points at separate time periods or seasons and determines if there is a trend. The STORET summary is in Appendix O [*to be included in Final Plan*].

Permittee Coordination

The Principal Permittees led the review of existing water quality data. No further coordination between the Principal Permittees and Co-permittees is planned or necessitated.

Best Management Practice #WLA-2				
	New Castle County	DelDOT	Co-permittees through IJA	Co-permittees Independently
Determine load reductions resulting from existing and proposed programmatic BMPs	X	X	X	

The Permit states that the Permittees "shall address the TMDL WLAs for stormwater associated with the MS4, in addition to applicable water quality standards through the iterative implementation of programmatic BMPs that will prevent, reduce, or remove the targeted pollutants. This will be accomplished for all watersheds located within the MS4 Permit area by implementing all components within the SWPP&MP and, for certain priority watersheds pursuant to Section III below, by developing and implementing a Water Quality Improvement Plan."

DNREC's Watershed Assessment Section is in the process of developing an online BMP database intended to allow the Department to report and track BMPs in the Chesapeake Bay watershed. A Beta version was made available early in 2014 and comments and suggestions were provided by the Principal Permittees' consultant. It is the Principal Permittees understanding that once implemented, users will be able to enter data regardless of whether or not the BMP is located in the Chesapeake Bay watershed or not. The Principal Permittees will continue to monitor the development of this tool and may utilize it at some point in the future. It is noted that the DNREC tool utilizes the menu of BMPs developed by the Chesapeake Assessment Scenario Tool (CAST).

CAST includes over 40 urban BMPs. However, a majority of these are structural BMPs such as bioretention / rain gardens, bioswales, detention ponds, stormwater retrofits, permeable pavement, infiltration practices, vegetated channels, and wet ponds. These are better addressed while Water Quality Improvement Plans (WQIPs) are being prepared. Similarly, other BMPs are in regards to land transitions like impervious urban surface reductions. These BMPs clearly fall under the Permit-required effective impervious area reductions mandated through WQIPs and likewise are better addressed when those plans are prepared.

There are, however, some BMPs in the CAST model which could be considered more programmatic in nature. These include erosion and sediment control measures, nutrient management plans, and street sweeping. The Principal Permittees will begin tracking each of these. For example, sizes and locations by watershed of active construction sites will be evaluated annually as will nutrient management plans. Furthermore, DelDOT will document street sweeping by watershed and will provide estimated reporting per Table 2 in BMP #GH-4 each year.

The Principal Permittees will develop a framework for quantifying loads from land uses and load reductions from structural BMPs in conjunction with the wet weather monitoring plan (Monitoring Element #3). This framework will be refined as Water Quality Improvement Plans (WQIPs) are being prepared. The first priority will be in the watershed chosen for the 1st WQIP and the second priority will be in the watershed chosen for the 2nd WQIP. Remaining spreadsheets or models will then be addressed Countywide.

Permittee Coordination

The Principal Permittees will determine load reductions resulting from existing and proposed programmatic BMPs within Co-permittee cities and towns. Co-permittees will provide documentation and information as described herein to assist in that effort.

Best Management Practice #WLA-3				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Submit GIS layer for all urbanized / impervious areas within the coverage area by year four of Permit term	X	X	X	

GIS layers for all urbanized / impervious areas within the coverage area will be submitted by year four of Permit term. The first priority will be impervious areas in the watershed chosen for the 1st WQIP and the second priority will be impervious areas in the watershed chosen for the 2nd WQIP. Remaining impervious areas will then be addressed Countywide with GIS layers submitted by year four of the Permit term. Mapping of urbanized / impervious areas within Co-permittee cities and towns will be covered by inter-jurisdictional agreements.

Permittee Coordination

The Principal Permittees will prepare maps of urbanized / impervious areas within Co-permittee cities and towns. The Co-permittees will be responsible for ground truthing the mapping.

MONITORING ELEMENT #3 – WET WEATHER MONITORING PLAN

Reference

Part II, Section B.3. – page 21 of 45.

Overview

Wet weather monitoring will enable the Permittees to analyze expected pollutant load reductions. The plan will demonstrate progress toward achieving applicable water quality standards.

SWPP & MP Best Management Practices

Best Management Practice #WWMP-1				
	New Castle County	DelDOT	Co-permittees through IJA	Co-permittees Independently
Develop monitoring program	X	X	X	

The Permit requires that the Permittees conduct monitoring as part of the SWPP&MP, including sampling and analysis to be used to demonstrate load reductions. The complete Program is included in Appendix P [*to be included in Final Plan*]. The Principal Permittees intend to address each of the subcomponents of this wet-weather monitoring by using new sampling and literature review to inform modeling and watershed planning as follows:

Table 3 – Wet Weather Monitoring Program Summary	
Permit requirement	**Methodology**
Use existing data on BMP performance	literature review
Establish regular monitoring stations	NEW SAMPLING
Calculating load reductions on future development	modeling
Demonstrate any progress toward achieving applicable water quality standards	modeling
Analysis of BMP performance standards data in tandem with water quality monitoring data to quantify expected pollutant load reductions and provide indicator of anticipated progress	analysis
Develop and implement a statistically based wet-weather outfall monitoring	NEW SAMPLING
Assess effectiveness and adequacy of BMP implementation toward meeting TMDLs	modeling
Estimate annual cumulative loadings from the MS4	modeling
Estimate event mean concentration and seasonal pollutants from major outfalls	NEW SAMPLING
Identify and prioritize portions of MS4 requiring additional controls	watershed planning
If additional or modified BMPs are determined to be necessary, modify SWPP & MP to include expected additional load reductions with new BMPs and modifications	modeling

The methods for sampling storm events are well established but costly, requiring a careful balance between the number of stations and the number of samples per station. To achieve this balance, the final monitoring plan will include: (1) robust statistical design of monitoring stations; (2) representative sampling of the outfalls covered in the Permit; and (3) seasonal sampling of storm events.

Monitoring sites will be chosen primarily in watersheds selected for Water Quality Improvement Plan (WQIP) development. Wet-weather monitoring is challenging at anything other than the site scale. By focusing both restoration activities and monitoring stations in smaller subwatersheds, the probability of detecting significant changes in water quality and stream health is greatly increased. Representative outfall sites will be monitored that can be extrapolated through statistical inference. This will entail a component of replication and randomization in the monitoring design. Storms will be sampled at different times of the year to evaluate seasonal variations. A minimum of five outfall sites will be monitored at any given time during the Permit term.

The Permittees also will, when feasible, use or leverage data from monitoring programs conducted by other agencies or groups in New Castle County. Examples of this may include:

- Locating wet-weather monitoring sites close to long-term monitoring stations such as those operated by USGS and DNREC;
- Using results of in-stream sampling programs for water quality, habitat, geomorphology, an biology; and

- Using data from bacterial source tracking in areas where sampling reveal high bacterial concentrations.

The Principal Permittees will provide further detail of the monitoring plan in the final SWPP&MP submittal.

Permittee Coordination

The Principal Permittees will lead the preparation of the Wet Weather Monitoring Program. No further coordination between the Principal Permittees and Co-permittees is planned or necessitated.

Best Management Practice #WWMP-2				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Implement wet weather monitoring in "targeted" watersheds and Countywide	X	X	X	

To be determined after monitoring program approach described above is completed.

Permittee Coordination

The Principal Permittees will lead the implementation of wet weather monitoring. Coordination between the Principal Permittees and Co-permittees is still being discussed.

Best Management Practice #WWMP-3				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Continue research of BMPs	N/A	X	N/A	N/A

DelDOT may, as appropriate, include additional monitoring or studies that will:

- Evaluate new or innovative BMP technologies for feasibility of use by Permittees;
- Provide data needed for modeling or calculation of pollutant loads/reductions; and
- Assess the effectiveness, maintenance requirements or costs of new or existing BMPs.

Permittee Coordination

There is no coordination planned or necessitated by this BMP.

MONITORING ELEMENT #4 – DRY WEATHER MONITORING PLAN

Dry weather screening is addressed in the Illicit Discharge Detection and Elimination section.

MONITORING ELEMENT #5 – IN-STREAM MONITORING

The Permit allows State 305(b) reports to be used as a substitute for in-stream monitoring. The wet-weather monitoring plan proposed in Monitoring Element #3 includes a limited amount of in-stream monitoring. Additional in-stream monitoring may be proposed as part of WQIPs.

APPENDIX A

DNREC MEETING MINUTES

August 14 and December 13, 2013

New Castle County / DelDOT SWPP & MP

August 14, 2013 Meeting with DNREC

In attendance: Sandra Goodrow – DNREC Surface Water Discharge Section
John Schneider – DNREC Watershed Assessment Section
Hassan Mirsajadi – DNREC Watershed Assessment Section
David Wolanski – DNREC Watershed Assessment Section
Randy Greer – DNREC Sediment and Stormwater Program
Jamie Rutherford – DNREC Sediment and Stormwater Program (left at 11:00
Elaine Webb – DNREC Sediment and Stormwater Program (left at 11:00)
Mike Harris – New Castle County Department of Special Services
Ellie Mortazavi – New Castle County Department of Special Services
Marianne Walch – DelDOT Stormwater Quality Program
LaTonya Gilliam – DelDOT Stormwater Quality Program
Jerry Kauffman – U of D Water Resources Agency
Martha Narvaez – U of D Water Resources Agency
Andrew Homsey – U of D Water Resources Agency
Mark Southerland – Versar Incorporated
Mark Neimeister – Duffield Associates
David Athey – Duffield Associates (recording)

Questions Regarding Permit and Wasteload Allocations

- Annual updates of BMP GIS data layers will be submitted with annual reports.
- No decisions were made regarding the use of non-structural BMPs based on equivalency. Mr. Athey will provide Ms. Goodrow with a paper produced by the Maryland Department of the Environment that explains a rationale for conversion. Mr. Greer noted that various urban stormwater workgroups associated with the Chesapeake Bay Program are working on related methodologies.
- Potential discrepancies in permit Table A.1. will be discussed offline by Mr. Athey and Ms. Goodrow. How any resulting revisions, if any, would be documented was not decided but all agreed documentation would be advisable. The permit may be revised regardless if Middletown again becomes covered under it. Mr. Athey noted the information presented to date was for nutrients only and assessments regarding bacteria would occur.
- The lack of wasteload allocations in TMDLs for many Co-permittees and non-permittees for WQIPs was discussed but no resolution was reached. This issue may get brought up again once WQIPs are developed.
- Ms. Gilliam expressed concern that DelDOT designers believe they need to be meeting TMDL requirements for individual projects while the permit includes language that the Department "address" TMDLs. Mr. Greer stated that the new Sediment & Stormwater Regulations are based on a runoff reduction standard and at the time they become effective, there will be no requirement to meet a specific TMDL on a project-by-project basis. The Department will be tracking progress toward meeting TMDLs on a watershed-wide basis for probably two to three years. If after that time it appears that any one sector such as new development is not meeting those goals, then the Department will take an adaptive management approach, which could include changes to regulations to establish specific nutrient and/or sediment reductions. Ms. Gilliam will provide an example DURMM spreadsheet as an example and requested documentation from DNREC stating that if DelDOT meets the Delaware Sediment and

Stormwater Regulations, it also satisfies the Post Construction Stormwater Management permit requirements of working towards meeting the TMDLs. Mr. Schneider noted that the County could use the permit as an opportunity to "raise the bar" on regulations for new developments. Ms. Gilliam noted that a decision on how DelDOT perceives the TMDL requirements will need to be documented.

Review of 2012 305(b) Report and 303(d) List

- Mr. Wolanski stated that stream segments delisted in the 2012 305(b) report and 303(d) list would have no bearing on TMDLs. Upon further discussion, Mr. Schneider said that if every segment of a currently listed stream were to be delisted, then the TMDL for that stream would become void. Mr. Greer opined that significant nutrient loading reductions may be demonstrable due to agricultural land conversions that have occurred since TMDLs were completed in the 1990s. Mr. Schneider thought that reductions could be demonstrated in DNREC's Nutrient Protocol model.
- There were no significant discussions regarding differences between DNREC water quality standards for nutrients and TMDL / WLA benchmarks over the years.
- Specifics regarding processes for further delistings or rescinding of TMDLs and WLAs were not discussed but generalities regarding shared data and evaluations were addressed.

Review of Existing Monitoring Data

- Mr. Kauffman gave an overview of previously prepared reports. Most notable is the work performed in 1996 in support of the initial permit application that included monitoring at 13 stations throughout the County that appeared to characterize the various representative land use practices. In 2010 WRA performed a trend analysis using STORET data and is intending to update using data obtained since then. Multiple other data sets exist. Ms. Walch noted that DelDOT has a significant amount of data from its BMP monitoring program. Mr. Kauffman stated that for any BMPs built in a Water Resource Protection Area (WRPA) there are water quality data available associated with its stormwater / groundwater monitoring plan.

Clarity on Objectives of Wet Weather Monitoring Program

- There was much discussion regarding how monitoring performed as a permit condition could compliment existing data and reports. Mr. Athey questioned the appropriateness of using monitoring data to assess the effectiveness of non-structural BMPs and thought monitoring may be better used to evaluate structural BMPs which would be specified as part of WQIPs. Ms. Goodrow stated that monitoring would be required to characterize loadings from major outfalls (those 36 inches in diameter or greater). Several attendees noted that loadings from various land uses have been widely reported and therefore the costs for monitoring may be better spent on project implementation. In response it was suggested that monitoring may be needed to prioritize projects.
- Ms. Walch said that monitoring had been done on five sites as part of the prior permit with the data used for event mean concentration calculation. She did not believe this approach yielded good results. Mr. Southerland suggested that multiple samples from five sites carefully chosen as representative could yield viable data that could be extrapolated.
- Ms. Goodrow stated that pre and post monitoring was required in response to Mr. Homsey's question. Mr. Wolanski said that comparison with the 1996 data may not yield favorable results, in other words could show upward trends.

- Mr. Schneider suggested that a watershed-based approach that supplements existing data and enables the identification of "low hanging fruit" may be best. Mr. Athey stated there are two general approaches that could be used to prioritize efforts: focus on watersheds near the TMDL "tipping point" or focus on those far from compliance. Mr. Greer thought that using stream restoration work as an equivalent would be most appropriate in watersheds with many existing BMPs. Mr. Schneider stressed the importance of bacteria source tracking. Mr. Kauffman noted that the Pike Creek Watershed has bacteria source tracking data.
- Ms. Walch said there were approximately 8,000 outfalls in their database and roughly 1,000 of these can be classified as "major".

General Approaches for Proposed Monitoring Program

- Many of the aspects of monitoring were addressed in the previous discussion. Mr. Southerland discussed the context for proposed monitoring and how it could or should supplement existing data. He thought one of the biggest challenges was determining the appropriate number of sites.

Modeling Challenges

- Mr. Athey referred to the previously prepared Pike Creek Pilot WQIP that exemplified the difficulties of modeling. HSPF models used for the TMDLs are very complex and data sets not always readily available. Replicating loadings from TMDL using other models is very difficult. Mr. Mirsajadi said that other models have been used before. As long as reduction levels or percentages are demonstrated (as opposed to actual loads), use of other models should be acceptable. Mr. Schneider thought that baseline assessment was important and septic elimination projects would be beneficial. Mr. Greer said calibration was needed.

Potential DNREC Assistance

- Mr. Athey stated that Duffield had already reached out to DNREC SIRS and received information relative to PCBs. A meeting would be scheduled in September.
- Mr. Homsey is developing a GIS layer for stream segments based on NHD criteria. However, this would likely not be available within the timeline of the SWPP & MP report guidelines.
- A brief discussion was held regarding the joint efforts of Kent County and DNREC regarding wastewater discharge and Murderkill TMDLs. Possibilities exist for a similar opportunity in New Castle County regarding the Appoquinimink but no decisions or commitments were made.

- A follow up meeting was not scheduled at this time.

New Castle County / DelDOT SWPP & MP

December 13, 2013 Meeting with DNREC

In attendance: Sandra Goodrow – DNREC Surface Water Discharge Section
Jennifer Roushey – DNREC Surface Water Discharge Section
Randy Greer – DNREC Sediment and Stormwater Program
Elaine Webb – DNREC Sediment and Stormwater Program
Mike Harris – New Castle County Department of Special Services
Ellie Mortazavi – New Castle County Department of Special Services
Mike Clendaniel – New Castle County Department of Land Use
Randy Cole – DelDOT Stormwater Quality Program
Marianne Walch – DelDOT Stormwater Quality Program
LaTonya Gilliam – DelDOT Stormwater Quality Program
Martha Narvaez – U of D Water Resources Agency
Andrew Homsey – U of D Water Resources Agency
Mark Southerland – Versar Incorporated
John Gaadt – Gaadt Perspectives
Mark Neimeister – Duffield Associates
David Athey – Duffield Associates (recording)

SWPP & MP Outline

Discussions regarding DNREC's preliminary comments on the SWPP & MP Outline dated December 4, 2013 included:

- Dr. Goodrow stated that the Outline had been forwarded to EPA but comments from the Agency are not expected. Per the Permit, the Agency does not formally review until submittal of the Final SWPP & MP.
- Comment #1 – Mr. Athey stated that John Giles from Elsmere had been very engaged in preparation of the Outline and that he had met separately with Wendy King from Newport. There are no concerns with either participating or being in compliance with the Permit at this time.
- Comment #2 – Mr. Athey explained that there have been efforts in recent years by the Delaware Chapter of the American Public Works Association and the Delaware League of Local Governments as well as DelDOT to more clearly identify maintenance responsibilities for State roads in municipalities. Also, the subject is broader than just stormwater components of roadways and includes paying for street lights. Mr. Cole noted that there are hundreds of agreements Statewide and sometimes a single road may have multiple agreements within a single city or town. The Permittees will do what they can to more clearly identify these responsibilities but wanted DNREC to understand the complexity of the situation. Dr. Goodrow indicated that clarity is also needed regarding HOA responsibilities when applicable.
- Comment #3 and #4 – Acknowledged.
- Comment #5 – Dr. Walch said that the DelDOT personnel in attendance would be meeting with their Public Relations staff the following week to discuss the virtual workshop.
- Comment #6 – Acknowledged.
- Comment #7 – New Castle County and DelDOT concurred that there may be opportunities to tie public education and involvement programs (Permit Element #1) with IDD&E programs (Permit Element #2) but did not agree to perform inspections of commercial facilities other than those

covered by separate NPDES permits. Dr. Goodrow mentioned that the Permit states an ordinance reducing the discharge of pollutants in stormwater runoff from all commercial and industrial areas be promulgated. New Castle County and the Co-permittees can choose to limit that to those facilities that drain to the MS4 or could choose to be inclusive of all commercial facilities within their boundaries. Mr. Harris questioned the applicability of commercial facilities that do not drain into the MS4 which led to a discussion regarding Residual Designated Authority (RDA) as that could be used in areas that are not well covered by existing ordinances. It was noted that there are examples of RDA being used in EPA Region III that have resulted in some facilities now having permits but RDA has not yet been used in Delaware. In response to the question about the origin of the "7% of County residents…" statement in the Outline, Mr. Athey quoted from an interim report from Water Words That Work that cited their sources including the U.S. Census, various database, and Facebook and LinkedIn.

- Comment #8 – New Castle County agreed to review its ordinance but again questioned the applicability of DNREC's advisement to cover commercial facilities that do not have separate NPDES permits. Dr. Goodrow reiterated that that is a Permit requirement. Regarding the Co-permittees, Dr. Goodrow said she believed that not having ordinances that should already be in effect in place until May of 2015 as was stated in the Outline is too long a time period.
- Comment #9 – DelDOT will provide more specificity regarding screening and evaluations in the SWPP & MP final draft. There appears to be a lack of agreement on reliance on desktop (evaluations) and field (screening) tasks. DelDOT has already begun the desktop exercises of its outfalls such that 20% will be evaluated the first year and all will be evaluated by the end of the Permit term. The number that will ultimately be screened will be a subset of those evaluated. Dr. Goodrow expressed concern that this approach could be considered "backsliding" and that the IDD&E conditions in the first permit still apply to this permit. Mr. Cole stated that this interpretation would be news to him and Dr. Walch provided historical context of the permit and that EPA is aware of what "evaluations" means. Mr. Athey asked Dr. Goodrow to clarify this aspect of the permit with EPA. *Note following the meeting Mr. Athey contacted Dr. Goodrow and said that a more formal request for interpretation would be provided by DelDOT.* Dr. Goodrow stated that volunteers (or "stream waders") could be used to identify unmapped or running outfalls but agreed that the use of volunteers would not be appropriate for the purposes of water quality sampling. Mr. Athey replied it is possible that unmapped outfalls exist in the County but if they do, it was probably only a handful and questioned how much effort should be expended on a task with limited benefit.
- Comment #10 – Acknowledged.
- Comment #11 – The comment regarding the New Castle Conservation District's role and how the Co-permittees would plan should the NCCD lose its delegation status was acknowledged. Also, the delegated status of all three delegated agencies is through June 30, 2015 and was misstated in the Outline.
- Comment #12 – Mr. Athey asked for clarification since most County and DelDOT facilities already have SWPPPs that would include SOPs. Dr. Goodrow said the comment was addressed more to the Co-permittees but it could be applicable to some County or DelDOT facilities such as park and ride lots that do not have SWPPPs. Regarding catch basin cleaning, DelDOT stated that there are roughly 300 of these structures in New Castle County but approximately 50,000 inlets. While cleaning 300 catch basins may be reasonable, cleaning 50,000 inlets was not. Furthermore, the 50,000 inlets are inspected on a periodic basis and if cleaning or other maintenance is needed, the Department addresses it through maintenance work orders. DelDOT has already provided a description of its program in annual reports and will include a summary in the SWPP & MP final draft. Dr. Goodrow stated that this comment may also be more applicable to the Co-permittees and suggested SOPs may need to be developed if currently nonexistent.

- Comment #13 – Dr. Goodrow suggested approaches to structural litter control programs such as limiting the throat sizes on inlets. Ms. Gilliam replied that this was not feasible. Mr. Athey stated that DelDOT does have non-structural litter control programs in place such as Adopt-a-Highway. Dr. Goodrow questioned how the Co-permittees were addressing this topic.
- Comment #14 – Acknowledged.
- Comment #15 – New Castle County will consider Permit requirements that may not be addressed in the MOU. Mr. Athey asked for a clarification of DNREC's responsibilities regarding industrial stormwater. Ms. Roushey advised that the Department is aware it does not have permit coverage for 100 percent of the industrial facilities in the State that should be covered and asked for the cooperation of and coordination with all Permittees in identifying unpermitted facilities. Regarding Elsmere and New Castle, it was noted by DNREC that the inventory of sites is not limited to high risk or SARA sites only.
- Comment #16 – Mr. Athey stated that one common mapping / database of all stormwater-related infrastructure components would be ideal but doing so was easier said than done. He referred to the discussions regarding Comment #2.
- Comment #17 – DelDOT did not disagree that some in stream monitoring may be useful at some point in the Permit term but did commit to doing so. The applicability of doing so should be considered / discussed in the wet weather monitoring plan and WQIP level.
- Comment #18 – Acknowledged.

Effective Impervious Area (EIA) and Water Quality Improvement Plans (WQIPs)

- Mr. Neimeister summarized the proposed methodology to establish baseline effective impervious areas (EIAs) per the memo that had previously been distributed. Dr. Goodrow said the methodology looked good for watershed prioritization but thought the computations would need to be "ground truthed" or calibrated at the WQIP level. Ms. Gilliam said that research suggests that calibrations of EIA computations do not change values by any significant amount. Mr. Athey stated that limited funds may be better spent on projects as opposed to calibrations. Mr. Goodrow said DNREC would consider research to support these positions if defendable.
- Mr. Athey asked if impervious lands covered by industrial permits could be subtracted out when computing EIA. Dr. Goodrow responded that probably it could but withheld final decision. Mr. Southerland said that Maryland is also evaluating how to handle lands covered by industrial NPDES permits. Mr. Greer said the impervious cover layer created from the 2007 land use coverage was very good.
- Regarding the Permit requirement of a 3% reduction in EIA, Mr. Greer said that for years the Department has sought standards based on minimizing hydrologic impacts and therefore places high priority on runoff reduction (infiltration) and reuse (harvesting) practices. He believes that stream restorations can be used as an equivalent practice but was less sure about other nonstructural practices.
- Mr. Athey asked about the use of DURMM on a watershed scale and Mr. Greer agreed it was not intended for that use. His suggested approach is to use the process outlined in Mr. Neimeister's memo and find those areas connected to first order streams.
- Ms. Gilliam asked about stream restoration credits in DURMM and Mr. Greer said they are still looking into it.
- Mr. Athey summarized by stating it appears DNREC prefers the use of runoff reduction or reuse BMPs to meet the 3% goal but does not preclude the use of non-infiltrating BMPs. Mr. Greer generally agreed with the statement but said that disconnection is also a good option and partial runoff reduction BMPs should also be considered.

- Regarding the use of non-structural BMPs as EIA equivalencies, Mr. Greer said he would defer to the Chesapeake Bay Program and the TMDL model (not CAST) is being updated. Mr. Southerland said the Maryland MDE equivalency document, upon which multiple programs in Maryland are based, is being finalized. Mr. Athey stressed that retrofit situations are much different than new construction. Soil conditions may negate the use of infiltration BMPs and while land development plans can be scaled back to meet regulatory requirements, land availability without condemnations could limit options. He stressed that many "tools in the toolbox" will be needed in order to prepare WQIPs. Mr. Greer said that WQIPs should look for the "low hanging fruit" and again emphasized the use of disconnections. The use of equivalency was not resolved but all agreed to keep an eye on industry standards moving forward.

Miscellaneous Permit-Related Issues

- Mr. Athey noted that while two WQIPs will be completed by year 4 of the permit, which is also when an evaluation of the SWPP & MP is needed (Part IV of Permit), it is unlikely that any structural BMPs resulting from those WQIPs will be in place by then. Therefore the monitoring program will only be able to be used to evaluate the effectiveness of programmatic BMPs which may or may not yield tangible results. Dr. Goodrow recognized the timing issue of the SWPP & MP evaluation but noted that monitoring will also help establish a baseline for future permits. Dr. Walch noted monitoring may not be limited to just water quality sampling. Mr. Southerland reiterated that monitoring would be most applicable at the WQIP level.
- Dr. Goodrow suggested that urbanized area be used as one of the criteria in watershed prioritization. Dr. Walch asked how urbanized clusters would apply.
- Mr. Athey said he had searched for a formal EPA definition of "outfall" and could not find one. Dr. Goodrow said DNREC did not have one either. Mr. Athey specifically asked about pipe or pipes which convey flow into as well as out from stormwater management facilities and whether that was one outfall or two. Mr. Greer thought outfall was the ultimate point of discharge. Ms. Gilliam asked about an enclosed system that crosses a municipal boundary. Ms. Roushey said those types of situations should be covered by IJAs. All agreed that every situation is different and good judgment is needed.
- Mr. Athey will contact Dr. Goodrow offline to address the discrepancies with Table A.1 of Permit.
- Mr. Athey will contact John Schneider and his group regarding potential future stream delistings from 303(d) list. Dr. Goodrow noted that streams really don't get delisted but listed differently. Mr. Athey believes that data supports the potential that some streams may have already reached their TMDLs and therefore the wasteload allocations may no longer be applicable. Jerry Kauffman at UDWRA has been analyzing historical data and Mr. Athey wants to assure the parameters Mr. Kauffman is using are most appropriate.
- Mr. Athey and Dr. Goodrow agreed that there is not a readily identifiable reporting format in the CASQA document referenced in the Permit. Dr. Goodrow suggested that the overall theory of the document be used for reporting.

Other Topics not on Agenda

- Mr. Athey asked Ms. Narvaez to summarize the Christina Basin Clean Water Education Initiative. This new committee is somewhat an offshoot of the Christina Basin Tributary Action Team and is seeking to bring together different entities (with permits and without) to leverage resources towards a common public education goal. Mr. Athey asked if multiple permittees would each get "credit" if they combined their resources on a specific product or project. Dr. Goodrow said that would be reasonable but did not offer a formal opinion.

- Dr. Goodrow asked about progress on the PMP for PCBs. Mr. Athey replied that there had been no further action following the meeting with Todd Keyser and Rick Greene in October other than describing the approach in the Outline. Dr. Goodrow reminded everyone that PCBs needed to be included in the monitoring program.
- Mr. Athey will schedule a meeting in late March or early April in case it is needed.

APPENDIX B

CO-PERMITTEE MEETING MINUTES

September 10, 2013 and
January 14 and April 8, 2014

Countywide NPDES MS4 Permit

September 10, 2013 Meeting

In attendance: Dick Cathcart – Delaware City
Kathy Clifton – Delaware City
Jeff Bergstrom – New Castle
David Brenner – Bellefonte
Mary Neutz – Wilmington
Kevin Donnelly – New Castle Conservation District
Jon Husband – New Castle County Department of Special Services
Mike Harris – New Castle County Department of Special Services
Ellie Mortazavi – New Castle County Department of Special Services
Doug Hokuf – New Castle County Department of Land Use
Randy Cole – DelDOT Stormwater Quality Program
Marianne Walch – DelDOT Stormwater Quality Program
LaTonya Gilliam – DelDOT Stormwater Quality Program
John Gaadt – Gaadt Perspectives
David Athey – Duffield Associates (recording)

Brief introductions were made and Mr. Athey gave a synopsis of the NPDES program. Mr. Harris noted that the new permit is structured differently than the old permit. The Principal Permittees (New Castle County and DelDOT) are required to submit the Stormwater Pollution Prevention and Management Plan (SWPP & MP) but the Co-permittees (cities and towns) are required to comply with permit conditions. The relationship among Principal Permittees and Co-permittees will be defined in the inter-jurisdictional agreements.

New Permit versus Old Permit

- Middletown, Odessa, and Townsend as well as the three Ardens have been dropped from inclusion in the permit. Middletown apparently is negotiating with DNREC on a separate permit but may seek coverage under the County permit instead.
- There are much more stringent requirements for:
  - Annual reporting to be much more goal based with numeric accounting. Appendix B was referred to for details.
  - Public education and involvement will necessitate 250,000 impressions per year, statistically valid surveys no later than the 18 and 42 month points, and public review of SWPP & MP. DelDOT will set up a virtual workshop for the review.
  - Good housekeeping and industrial stormwater will include an inventory of facilities, measurable street sweeping, and nutrient management plans and certifications to better control application of pesticides, herbicides, and fertilizers.
- There are new requirements for / to:
  - Watershed Priority List and Water Quality Improvement Plans (WQIPs) will require developing schedules for the development of 21plans total with two prepared during permit term.
  - Pollutant Minimization Plan (PMP) for PCBs aspects are not clear yet. A meeting is scheduled with DNREC for early October.

- The requirement to "address" wasteload allocations and water quality standards will be based on modeling and monitoring and include accounting for reductions from BMPs.

Requirements of All Permittees

- Compliance with permit conditions relating to discharges from those portions of the MS4 that the permittee operates or maintains
- Compliance with the annual reporting requirements specified in Part V.F
- Collection of representative wet weather monitoring data required by Part II.B.3, according to such agreements as may be established between or among permittees
- Developing a plan of action should inter-jurisdictional agreements allocating responsibility between or among permittees be dissolved or in default

Ms. Neutz said the City of Wilmington will be moving towards its own wet weather integrated permit within the next five years which would combine its CSO and non-CSO programs. The city is currently developing its own SWPP&MP integrated wet weather plan. She thought an application for permit coverage would be submitted sometime during the term of the New Castle County / DelDOT permit and the City would continue coordinating with the permittees in the meantime.

Opportunities for Joint Collaboration

- Preparation of Stormwater Pollution Prevention and Management Plan (SWPP & MP)
  - The outline of the Plan is due within 6 months of permit issuance (November 7) with the final draft plan due within 12 months (May 7, 2014). DNREC will have three months for review and the final Plan submitted by the 15th month (August 2014). DNREC will again review along with EPA and the plan will be implemented by the 18th month (November 2104).
- Public education / Public involvement
  - Collaboration on plan development was discussed as was the need for two workshops each year and the two public education surveys.
  - Mr. Cathcart questioned how costs might be shared. Mr. Harris responded that that had not been determined and was open to discussion. Possible approaches include using a ratio of population, the number of outfalls, or a percent of watershed area as a basis. Mr. Cathcart noted Delaware City has a newsletter and water quality messages could be included in future publications. Mr. Bergstrom said similar opportunities are available in New Castle. Ms. Neutz suggested that current efforts be referred to as a starting point (available in the 2012 annual report). Mr. Brenner said that Bellefonte operates without any paid staff and therefore their participation will be more difficult. Everyone noted that the municipal fiscal budgeting process appears to somewhat correspond with the plan preparation schedule and it will be important to coordinate components of plan implementation and costs with the development of annual budgets.
- Illicit discharge detection and elimination
  - Coordination with other government entities could be accomplished by the Principal Permittees and it probably does not make sense for each permittee to have its own water quality phone number.
  - Dry weather screening might be best accomplished by joint participation due to economies of scale.

- BMP inventories and mapping and current status of Co-permittee efforts
  - Mr. Harris noted that DNREC wants mapping of all outfalls as well. Ms. Walch indicated that Sandra Goodrow at DNREC has agreed that an electronic file submission in lieu of hundreds of maps would be acceptable. DelDOT indicated it is willing to share its shape files with each municipality but these files will only show DelDOT outfalls and not those owned by municipalities. It was suggested that the plan outline indicate that a table of outfalls will be prepared.
  - Mr. Brenner said he was not aware of there being any outfalls in Bellefonte. Ms. Gilliam gave her interpretation of EPA regulations that an "outfall" could mean where a drainage system crosses a municipal line. Mr. Athey said he would investigate.
  - It became apparent that there will probably be some gaps in map development. A time line for closing these will be included in the SWPP & MP.
- Stormwater Management During Construction and Post Construction Stormwater Management
  - Mr. Donnelly said the Conservation District reviews Sediment and Stormwater Plans but does not perform any inspections once structures are constructed.
- Watershed Priority List
  - Table 1 was reviewed and the need for coordination among Principal Permittees and Co-permittees briefly discussed. This topic will be addressed further in the future as WQIPs are being planned.
- Pollution Minimization Plan for PCBs
  - Requirements for this program element will likely be clearer after the meeting with DNREC in October.
- TMDL wasteload allocations and applicable water quality standards
  - A brief explanation of wasteload allocations and how load reductions will be accounted for was provided.
- Wet weather monitoring plan
  - All understood this could be an expensive part of the program.
- Annual training
  - Opportunities to share in some training may be possible. These may include in-house training by the Principal Permitees that might be germane, DNREC training programs, EPA training programs, etc.

Coordination Issues

- Annual reporting
  - Mr. Athey will develop a template to help guide reporting and data sharing.
- Processes / format for data sharing
  - All attendees pledged their cooperation.
- Quantifying efforts and distributing "credit" for collaborative efforts
  - It was generally agreed that if the Principal Permittees took the lead on certain program elements, they would be able to share in the credit for efforts made by Co-permittees.
- Inter-jurisdictional agreements
  - The agreements will probably take the form of either individual agreements for each Co-permittee or a single master agreement with some sort of attachment with check boxes for specification. A schedule for development was not agreed upon although agreement drafts must be in place by May 2014 with agreements executed by August 2014.

It was decided that the Principal Permittees would develop the outline of the SWPP & MP and distribute for comments. It was also decided that Mr. Athey would distribute a table of major permit requirements with preliminary designations whether they would be handled collectively by all permittees or individually.

Miscellaneous

- Co-permittees will be invited to the regularly schedule Principal Permittees meeting on October 22. A follow up meeting specific to Co-permittees was not scheduled but will probably occur soon after the New Year.

Countywide NPDES MS4 Permit

January 14, 2014 Co-Permittees Meeting

In attendance: David Brenner – Bellefonte
Dick Cathcart – Delaware City
Kathy Clifton – Delaware City
John Giles – Elsmere
Wendy King – Newport
Kevin Donnelly – New Castle Conservation District
Mike Harris – New Castle County Department of Special Services
Ellie Mortazavi – New Castle County Department of Special Services
Doug Hokuf – New Castle County Department of Land Use
Mike Clendaniel – New Castle County Department of Land Use
Randy Cole – DelDOT Stormwater Quality Program
Marianne Walch – DelDOT Stormwater Quality Program
John Gaadt – Gaadt Perspectives
David Athey – Duffield Associates (recording)

Mr. Athey began the meeting by noting Jeff Bergstrom from New Castle was out of town and unable to attend but he and Mr. Bergstrom had met the previous week.

Review of DNREC December 4, 2013 Comments and December 13, 2013 Meeting

- Comment #1: Towns of Elsmere and Newport – The Principal Permittees informed DNREC that both towns are engaged in the SWPP & MP preparation and there are no concerns at this time.
- Comment #2: Mr. Athey summarized the conversation he and the Principal Permittees had with DNREC regarding past efforts by APWA and DLLG regarding clarifying maintenance responsibilities in municipal agreements. Mr. Cole delivered a disk from Helen Banks at DelDOT that contained pdfs of those agreements found to date in Co-permittee cities and towns other than Wilmington. Current efforts regarding street sweeping were discussed.
- Comment #4: The Principal Permittees will offer training opportunities to the Co-permittees but the Co-permittees will ultimately be responsible for assuring this permit condition is met and tracking will be part of record keeping though not listed in Appendix B of the Permit.
- Comment #6: The Co-permittee will need to include relevant information on their web sites and not just links to the Principal Permitttees' web sites.
- Comment #7: Discussed under Comment #15 below.
  Comment #8: Per DNREC, IDD&E ordinances should already be in place and in any event, the Department believes the May 2015 time frame proposed in the SWPP & MP Outline is too long a time frame.
- Comment #9: Mr. Athey explained the difference between evaluations and screening and that either could occur in two general instances: 1) outfalls to surface waters and 2) pipes crossing municipal borders. DelDOT offered to perform this task if reimbursed for surface water outfalls but Co-permittees would be responsible for remediation costs. DelDOT also offered to perform this work with costs potentially split for outfalls crossing municipal boundaries but some questioned if this arrangement would be more trouble than it is worth. In any event, remediation costs would borne by responsible party. Though estimates of

these costs were not offered, Mr. Giles and Ms. King expressed significant concern about including items such as these in their budgets. Mr. Cathcart stated he did not have staff to perform some of these tasks. Options for seeking assistance from the State were discussed.

- Comment #11: The role of the New Castle Conservation District regarding implementation of the Delaware Sediment and Stormwater Regulations (and compliance with Permit Element #3) is understood by all but it appears formal agreements do not exist. NCCD is not set up to perform inspection of post-construction basins and BMPs and Mr. Donnelly stated he has sought meetings with DNREC to resolve resource issues. It seems highly unlikely that any of the delegated agencies will lose their delegation so development of alternative plans is not considered a necessary task.
- Comment #12: The need for an inventory of municipal facilities and preparation of PPPs and SOPs was discussed. The Co-permittees questioned how they can comply with this requirement and Mr. Harris authorized Mr. Athey to meet with each individually to not only clarify Good Housekeeping activities but other aspects of the Permit as well. All Permittees believed that an inlet cleaning program was not economically viable though DelDOT may look into a catch basin cleaning program.
- Comment #13: None of the Permittees believed that a structural litter control program was economically viable.
- Comment #14: This was discussed along with Comment #12 above. The need for record-keeping by the Co-permmittees was stressed.
- Comment #15: Mr. Harris summarized the Memorandum of Understanding (MOU) that the County is developing with DNREC and inquired if Co-permittees would want County personnel performing inspections in their cities or towns should that be offered. This was unresolved but cooperation between the County and Co-permittees seems likely.
- Comment #16: The need for a compiled map of all drainage features was discussed. Ms. Clifton gave Mr. Athey a hard copy of an outfall map. Some cities and towns do not have digital mapping available.
- Comment #17: DelDOT offered to perform wet weather monitoring if reimbursed by Co-permittees in a similar arrangement to IDD&E evaluations and screening. Funding was again brought up as a major concern.
- Comment #18: Goals are still being developed.

Other Potential Joint Collaboration Activities

- Public education and involvement: The Principal Permittees will perform tasks including hosting of public workshops, preparation of two surveys, etc., with no cost reimbursement from the Co-permittees.
- Watershed Priority List and development of WQIPs: The list is currently being developed by the Principal Permittees and will be shared with Co-permittees each year. Cost share for WQIP development and implementation will be done on a case by case basis.
- Pollutant Minimization Plan (PMP) for PCBs: This activity is still being discussed and will probably be proposed to be handled like the wet-weather monitoring program.

Coordination Issues and Miscellaneous

- Annual meeting: All agreed that this meeting and / or future meetings will satisfy the Permit requirements for an annual meeting and a separate meeting is not needed.

- Program costs: Mr. Athey was asked to research approximate costs for various program elements.
- Inter-jurisdictional agreements: A draft has been prepared and will be distributed following the Principal Permittees' next monthly meeting on January 28. Mr. Athey reiterated that while the SWPP & MP final draft must be submitted by May 7, the IJA does not need to be formalized until August 7.
- Future meeting date(s). Mr. Athey will schedule meetings with each Co-permittee as soon as possible. The Co-permittees may meet separately as a group in mid-February and a meeting to also include the Principal Permittees will be scheduled for the end of February or early March.

Countywide NPDES MS4 Permit

April 8, 2014 Co-Permittees Meeting

In attendance: David Brenner – Bellefonte
Dick Cathcart – Delaware City
Kathy Clifton – Delaware City
John Giles – Elsmere
Wendy King – Newport
Jeff Bergstrom – New Castle
Mary Neutz - Wilmington
Kevin Donnelly – New Castle Conservation District
Mike Harris – New Castle County Department of Special Services
Ellie Mortazavi – New Castle County Department of Special Services
Randy Cole – DelDOT Stormwater Quality Program
John Gaadt – Gaadt Perspectives
David Athey – Duffield Associates (recording)

Mr. Athey thanked Mr. Bergstrom for hosting the meeting.

The purpose of the meeting was to review the draft SWPP & MP final draft. Among the items discussed were the following:

- Co-pernmittees will provide at least one administrative staff member at future annual meetings.
- The Principal Permittees will make available a template for annual reporting.
- Co-permittees will each be responsible for their own training programs but the Principal Permittees will assist when possible in instances such as modules. Co-permittees will provide training for appropriate staff in areas such as IDD&E, good housekeeping, and snow and ice removal.
- The Principal Permittees will take the lead in Public Education and Involvement but the Co-permittees will each be responsible for impressions based on the ratio of their population to the population of the County as a whole.
- Requirements for Illicit Discharge Detection and Elimination program were discussed. Elsmere and Delaware City already have appropriate IDD&E language in their codes. Bellefonte, Newport, and New Castle will need to develop.
- DelDOT will provide outfall evaluations in cities and towns at no cost but may seek reimbursements to cover the costs of screening. Co-permittees will need to provide follow up activities if illicit discharges are found.
- The New Castle Conservation District is coordinating with the Co-permittees in the development of master agreements to govern Stormwater Management During Construction and Post Construction Stormwater Management. Each Co-permittee will develop regulatory enforcement mechanisms.
- An inventory of facilities owned or operated by all Permittees that have the potential to contribute polluted discharges as a result of stormwater is being developed.

- Co-permittees will evaluate DelDOT's propsoed street sweeping program for use in their municipalities. Disposal of sweeping in landfills was discussed. Ms. Neutz offered to make an inquiry to DSWA.
- Initiatives to reduce the application of pesticides, herbicides, and fertilizers were discussed as were programs to minimize salt application.
- New Castle County will inspect industrial facilities in Co-permittee jurisdictions if locations are included in the inventory negotiated with DNREC.
- Development of the Watershed Priority List is still on-going. Significant concern over the costs of plan preparation and implementation was expressed by all Permittees.
- Development of the Pollutant Minimization Plan (PMP) for PCBs is on-going. The Principal Permittees will likely take the lead on this requirement of the Permit.
- Development of the Wet Weather Monitoring Program continues. The Principal Permittees will likely take the lead. Cost reimbursements are still being discussed.

Revisions will be made to the draft of the SWPP & MP final draft and redistributed to Co-permittees for further review and comment.

A future meeting date was not set but will be established after submittal of the SWPP & MP final draft. Details regarding the inter-jurisdictional agreements will be further discussed at that time.

APPENDIX C1

INTER-JURISDICTIONAL AGREEMENT FOR CO-PERMITTEES

(to be included in Final Plan)

APPENDIX C2

INTER-JURISDICTIONAL AGREEMENT FOR WILMINGTON

(To be included in Final Plan)

APPENDIX D

PUBLIC EDUCATION AND INVOLVEMENT PLAN

PROGRAM ELEMENT #1 – PUBLIC EDUCATION / PUBLIC INVOLVEMENT

Reference

Part II, Section A.1. – page 10 of 45.

Overview

Increase the knowledge of target communities regarding MS4s, impacts of urban runoff on receiving waters, and potential BMP solutions for the target audience; change the behavior of target communities; and decrease the discharge of pollutants to the MS4 by engaging the public.

SWPP & MP Best Management Practices

Best Management Practice #PEI-1				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Public Review and Comment	X	X	X	X
Measure: Yes / No.				
All Permittee Goal: Public review and comment on draft SWPP & MP.				

The permit requires the Permittees to develop and implement process for public review of and comment on draft SWPP & MP. The Permittees will utilize DelDOT's "Virtual Workshop" to enable public review and comment on the draft SWPP & MP. This online tool will allow the Permittees to efficiently promote the plan and manage incoming comment from County residents.

Best Management Practice #PEI-2				
	New Castle County	**DelDOT**	**Co-permittees through IJA**	**Co-permittees Independently**
Targeted Behaviors	X	X	X	X
Measure: Varies – see below.				
All Permittee Goal: Varies – see below.				

The Permit language calls on the Permittees to focus their efforts in eight areas:

- Public reporting of the presence of illicit discharges or improper disposal of materials, including floatables, into the MS4;
- The proper management and disposal of used motor vehicle fluids and household hazardous wastes;
- The proper management and disposal of grass clippings, leaf litter and domestic animal wastes;
- The proper use of water to limit excess pollutants from non-storm-water water discharges from activities such as washing cars and lawn irrigation, from entering the MS;
- The proper use, application, and disposal of pesticides, herbicides, and fertilizers by commercial and private applicators and distributors;
- Public participation events, such as stream clean-ups, drain stenciling, etc.;
- The proper maintenance of BMPs directed toward private and commercial property owners, and state or municipal entities responsible for maintenance; and.
- Opportunities for residential installation of LID practices, and the use of Green Technology BMPs that reduce runoff and mimic natural hydrology.

The following is an outline of how the Permittees are preparing to meet these requirements.

BMP #PEI-2a: All Targeted Behaviors

Over the term of the Permit, the Principal Permittees and their partners will undertake the following activities:

Maintain and Update Comprehensive Websites

The Principal Permittee's websites currently include information as follows:

- New Castle County – information for home owner associations such as general material about maintenance of ponds, registration for inclusion in the County's database which qualifies home owner associations (HOAs) for financial assistance for major repairs, and links to other web pages for additional information. The web site can be accessed at: http://www2.nccde.org/specialservices/Stormwater/default.aspx;
- DelDOT – numerous links such as the NPDES program and permit documents, monitoring programs, public education documents, and locations where inventorying is or will soon be conducted. Numerous white papers and copies of presentations are also available. The website can be accessed at: http://www.deldot.gov/stormwater/; and
- The Principal Permittees' websites will be updated on a periodic basis and will include the NPDES permit, SWPP & MP and subsequent annual reports, illicit discharge reporting / complain numbers, and public education events.

The Co-permittees will provide links from their own websites to appropriate locations on the New Castle County and DelDOT websites as well as summarize their participation and explain their role in the larger Phase I permit.

Press Releases

New Castle County and DelDOT will distribute press releases on behalf of all Permittees for the term of the Permit. Press releases will be used to promote workshops and educational events, remind residents about hazardous waste disposal opportunities, to announce opportunities to receive technical and financial assistance to implement various best practices, etc.

Official Channels

The Principal Permittees produce email newsletters, maintain social media accounts and have other communications methods at their disposal. The Permittees will use all of these channels as appropriate.

BMP #PEI-2b: Public reporting of the presence of illicit discharges or improper disposal of materials, including floatables, into the MS4

New Castle County and DelDOT will establish a new "It's A Crime Hotline" and encourage residents to report illicit discharges via phone, text message, or smartphone app.

Twice during the permit period, the Principal Permittees will run extensive promotional efforts to alert residents to the existence of the hotline. The advertising content will educate residents about a range of illegal and polluting behaviors, all concluding with a call to action – report crimes to the hotline.

- The first campaign is tentatively planned to straddle the 2014 and 2015 fiscal years and will attempt to generate at least 500,000 impressions.

- The second campaign is tentatively planned to straddle the 2017 & 2018 fiscal years and will attempt to generate at least 500,000 impressions.

Following each promotional campaign, the Principal Permittees will survey county residents to measure their awareness of what does and doesn't belong in storm drains, and how to report it when they observe somebody else illicitly discharging into the MS4.

In the event that the first attempt in 2014/2015 does not produce a statistically valid increase in public awareness, the partners will reevaluate the program for potential improvements for the second attempt in 2017/2018.

BMP #PEI-2c: The proper management and disposal of used motor vehicle fluids and household hazardous wastes

This BMP covers two distinct audiences. The target audience for motor vehicle fluid disposal is those who perform work on their own automobiles (a small portion of New Castle County residents do this). The target audience for household hazardous wastes, in contrast, is all residents.

Motor Vehicle Fluids

New Castle County, DelDOT and the Co-permittees will compile a list of all public and private locations accepting used motor oil for recycling and make this information available online. The website will use a modern mapping feature to allow visitors to quickly load directions into their smart phones and navigate easily to the drop off site.

Twice during the permit period, the Principal Permittees will run promotional campaigns to alert county residents who change their own oil to this website. The Principal Permittees intend to use the following techniques:

- Advertising: Promote the recycling center webpage with Facebook ads aimed at users tagged as "auto mechanics"
- Public Relations: Circulate press releases to appropriate journalists in the area
- Direct Messages: Announce the hotline in county emails and on the county cable access channel.
- Word of Mouth: When individuals drop of their used motor oil for recycling, they will tell others who share their hobby

The Principal Permittees intend to measure the effectiveness of the website and promotional efforts as follows:

- Visit the website. Use Google Analytics web tracking software to track how many people visit the website
- Online "pop up" survey. Install a simple three-question popup survey onto this page to ask visitors how they heard about the page and related questions.

Household Hazardous Wastes

Working in cooperation with the Delaware Solid Waste Authority, New Castle County, DelDOT and the Co-permittees may create a county specific list of household hazardous waste events and drop off locations and make this information available online.

Twice during the permit period, the Principal Permittees may run promotional campaigns to alert county residents to the webpage and encourage them to bookmark it and subscribe for updates. The Principal Permittees may use the following techniques:

- Advertising: Promote the webpage with Facebook ads aimed at all residents
- Public Relations: Once the web page launches, circulate press releases to appropriate journalists in the area
- Direct Messages: Announce the hotline in county emails and on the county cable access channel.
- Word of Mouth: When individuals drop of their household hazardous wastes, they will tell others

The Principal Permittees intend to measure the effectiveness of the website and promotional efforts as follows:

- Web Visitors. Use Google Analytics web tracking software to track how many people visit the website
- Email Reminder Signups. Offer each resident the opportunity to sign up for free "reminder" emails to receive notification of drop-off events near them
- Popup Survey. Post a simple, three question "pop up" survey on the site to gather basic information from visitors

BMP #PEI-2d: The proper management and disposal of grass clippings, leaf litter and domestic animal wastes

Since a ban was instituted on the placement of yard wastes in refuse, multiple resources have become available to educate home owners on the best ways to dispose of yard wastes. The Principal

Permittees will develop strategies to disseminate this information more effectively. Similarly, there are several pet waste programs in existence and the Principal Permittees will develop approaches such that these programs have greater impact.

The Delaware Department of Transportation funds the "Livable Lawns" initiative, an educational program that works with homeowners and landscaping contractors to reduce the application of pesticides and fertilizer to lawns in New Castle County.

The Permittees will continue exploring options to expand the scope of the Livable Lawn initiative to cover grass clippings and leaf litter. In addition, the Permittees will continue exploring options to work with local nonprofit organizations to expand their existing "pet waste" efforts.

BMP #PEI-2e: The proper use of water to limit excess pollutants from non-storm-water water discharges from activities such as washing cars and lawn irrigation, from entering the MS4

The Principal Permittees will seek to address the car washing activities from not-for-profit youth groups, such as scout troops and marching bands.

To help scout troops, marching bands, and other youth groups conduct their car wash fundraisers in a environmentally responsible manner, the Permittees will consider establishing a "loaner" storm drain stopper program and associated educational materials. The Permittees intend to use the following techniques to promote this program to schools, churches, and other likely car wash organizers:

- Advertising: Promote the webpage with Facebook ads aimed at residents under the age of 25
- Public Relations: Once the web page launches, circulate press releases to appropriate journalists in the area
- Direct Messages: Announce the webpage in county emails and on the county cable access channel.
- Word of Mouth: When volunteer groups wash cars using suggested best management practices, they will tell others about their experience.

The Principal Permittees will seek to measure the effectiveness of the website and promotional efforts as follows:

- Web Visitors. Use Google Analytics web tracking software to track how many people visit the website
- Loaner Requests. Tally the number of loaner requests the Principal Permittees receive, and invite those who request the storm drain stopper to share how they heard about the program
- Popup Survey. Post a simple, three question "pop up" survey on the site to gather basic information from visitors

The Permittees will continue exploring options to expand the scope of the Livable Lawn initiative to cover lawn irrigation.

BMP #PEI-2f: The proper use, application, and disposal of pesticides, herbicides, and fertilizers by commercial and private applicators and distributors

The Principal Permittees will promote adoption of this BMP by advertising, mailings to existing contact lists, postings on web sites, coordinating with others to encourage participation, organizing workshops, and offering technical and financial assistance as appropriate. The Principal Permittees

will also continue to support ongoing initiatives, such as Delaware Livable Lawns, that encourage adoption of this BMP.

The Permittees will continue exploring options for continuing the work of the Livable Lawn initiative on these areas.

BMP #PEI-2g: Public participation events, such as stream clean-ups, drain stenciling, etc.

There are six organizations within New Castle County that currently organize public participation events:

- Delaware Nature Society
- Red Clay Valley Association
- Christina Conservancy
- Partnership for the Delaware Estuary
- Delaware Department of Transportation Adopt-A-Highway
- White Clay Creek Wild & Scenic Program

The Principal Permittees will offer to assist these ongoing efforts as follows:

- Posting announcements of upcoming events on the permittees' website
- Circulating announcements of upcoming events via permittees' official channels (email newsletter, public access channel, etc.)
- Displaying literature for these organizations on brochure racks at public facilities
- Providing in-kind or direct funding as budgets allow

In return for promotional and in-kind assistance, the Principal Permittees will ask these groups to provide the following information to include in future MS4 reports:

- Estimates on the number of participants at each event the permittees support
- Estimates on the advertising reach of promotional efforts for each event the permittees support

New Castle County has provided labor and equipment for the annual Christina River Cleanup in the past and will consider continuing support in the future. Elsmere and Bellefonte have also placed medallions on storm inlets and will replace as needed. The other Co-permittees will consider activities such as these in future years.

BMP #PEI-2h: The proper maintenance of BMPs directed toward private and commercial property owners, and state or municipal entities responsible for maintenance

The Principal Permittees currently conduct regular inspection programs and offer educational seminars to properties with BMPs in place.

BMP #PEI-2i: Opportunities for residential installation of LID practices, and the use of Green Technology BMPs that reduce runoff and mimic natural hydrology

The Permittees will continue exploring options to expand the scope of the Livable Lawn initiative to cover rain barrels, rain gardens, pervious patios, and related items.

BMP #PEI-2j: Holding two public workshops each year

The Principal Permittees will organize two workshops per year to promote the various best management practices.

Year	Workshop #1	Workshop #2
2013	Stormwater Management Maintenance and Inspections Program for Residential and Commercial facilities	BMP Maintenance for Residential (or Commercial) Property Owners/Managers
2014	Stormwater Management Maintenance and Inspections Program for Residential and Commercial facilities	BMP Maintenance for Residential (or Commercial) Property Owners/Managers Car washing best practices for not-for-profit youth groups
2015	Stormwater Management Maintenance and Inspections Program for Residential and Commercial facilities	BMP Maintenance for Residential (or Commercial) Property Owners/Managers
2016	Stormwater Management Maintenance and Inspections Program for Residential and Commercial facilities	BMP Maintenance for Residential (or Commercial) Property Owners/Managers Car washing best practices for not-for-profit youth groups
2017	Stormwater Management Maintenance and Inspections Program for Residential and Commercial facilities	BMP Maintenance for Residential (or Commercial) Property Owners/Managers Car washing best practices for not-for-profit youth groups

Measurable Goals

Goals are established as follows for number of impressions and the before and after surveys.

Impressions

BMP	Target Audience	Annual # of Impressions	Impression Method
#1 Illicit Discharges	• 546,076 County Residents • 422,117 Adults	250,000	• Web Advertisements • News Coverage • Official Government Channels • Open Air Advertising • DelDOT road signs

#2 Household Hazardous Waste	• 199,922 Households	10,000	• Web Advertisements • News Coverage • Official Government Channels •
#3 Yard and Pet Waste	• 149,327 Single Family Homes • 38,739 Households with Dogs • 90 Pet-Related Service and Retail Businesses	1,000	• Web Advertisements • News Coverage • Official Government Channels • Open Air Advertising • Phone Calls • Email • Direct Mail
#4 Water Discharge	• Unknown # of youth groups • 110,822 “green Thumbs”	1,000	• Web Advertisements • News Coverage • Official Government Channels • Open Air Advertising • Phone Calls • Email • Direct Mail
#5 Lawn Chemicals	• 110,822 “green Thumbs” • ~300 Lawn and Garden Service and Retail Businesses	500	• Web Advertisements • News Coverage • Official Government Channels • Open Air Advertising • Phone Calls • Email • Direct Mail
#6 Event Participation	• 546,076 County Residents • 422,117 Adults • ~9 nonprofit partners	1,000	• Web Advertisements • News Coverage • Official Government Channels • Open Air Advertising • Phone Calls • Email

			• Direct Mail
#7 Maintain Existing BMPs	• 286 homeowner associations • 666 commercial and industrial BMP owners	1,000	• Phone Calls • Email • Direct Mail
#8 Install Low Impact Development	• 55,309 Home Improvement Enthusiasts • 37,743 "Do It Yourself" Enthusiasts • ~300 Lawn and Garden Service and Retail Businesses	1,000	• Web Advertisements • News Coverage • Official Government Channels • Open Air Advertising • Phone Calls • Email • Direct Mail
Total:		265,500	

Before and After Surveys

The Principal Permittees intend to conduct one countywide "before and after" survey to evaluate the effectiveness of the "It's a Crime Hotline" effort, as well as multiple smaller scale surveys to evaluate the effectiveness of each targeted outreach effort individually.

BMP	**Target Audience**	**Baseline Survey method**	**Post Outreach Survey Method**
Public reporting of the presence of illicit discharges or improper disposal of materials, including floatables, into the MS4;	All adult residents	Random dial telephone survey to 400 residents (5% margin of error)	Random dial telephone survey to 400 residents (5% margin of error)
The proper management and disposal of used motor vehicle fluids and household hazardous wastes;	Those who repair their own cars All adult residents		Online "pop up" survey on appropriate county website
The proper management and disposal of grass clippings, leaf litter and domestic animal wastes;	Homeowners with single family homes and yards Pet owners	TBD	TBD

The proper use of water to limit excess pollutants from non-storm-water water discharges from activities such as washing cars and lawn irrigation, from entering the MS;	Homeowners with single family homes and yards	TBD	TBD
The proper use, application, and disposal of pesticides, herbicides, and fertilizers by commercial and private applicators and distributors;	Homeowners with single family homes and yards Commercial lawn care providers	TBD 2,500	TBD Evaluation Forms
Public participation events, such as stream clean-ups, drain stenciling, etc.;	All Adult Residents		Online and paper surveys at events
The proper maintenance of BMPs directed toward private and commercial property owners, and state or municipal entities responsible for maintenance; and.	Commercial and residential BMP owners	Pre-survey when promoting annual workshop	After-survey upon completion of the annual workshop
Opportunities for residential installation of LID practices, and the use of Green Technology BMPs that reduce runoff and mimic natural hydrology.	Homeowners with single family homes and yards Commercial lawn care providers	TBD	TBD

APPENDIX E

DELDOT IDD&E PROGRAM

DELAWARE DEPARTMENT OF TRANSPORTATION

OUTFALL SCREENING AND

ILLICIT DISCHARGE DETECTION AND ELIMINATION PLAN

On May 7, 2013, DNREC issued a new Phase I MS4 Permit to New Castle County, DelDOT and six municipal co-permittees for the discharge of storm water from/through the municipal separate storm sewer system (MS4) to all surface waters of the State that are located in New Castle County. As part of the permit-required Stormwater Pollution Prevention and Management Plan (SWPP&MP), DelDOT is required to develop an Illicit Discharge Detection and Elimination (IDDE) program.

SUMMARY

The IDDE Program must include a schedule and methodology to evaluate at least 20% of the DelDOT storm sewer system per year, using existing mapping and water quality data, in order to determine areas with high potential for illicit discharges and improper disposal. Dry weather screening and field inspection activities are required to be conducted in these targeted areas.

DelDOT's IDDE Program consists of three major components:

1. IDDE Outfall Evaluation**:** The IDDE Evaluation process has been developed to specifically meet the requirements of DelDOT's Phase I NPDES Permit, which states that 20% of DelDOT's MS4 be evaluated annually for potential illicit discharges. This is accomplished by performing through:
    a) Desktop evaluation to locate portions of the MS4 with highest potential for illicit discharges
    b) Reports and data from MS4 inventory and inspection activities
    c) Reports from maintenance crews and the public
    d) Coordination with other permittees

2. Dry Weather Field Screening: The IDDE Outfall Evaluation targets portions of DelDOT's MS4 that will be field screened for potential illicit discharges. The field screening consists of the following:
    a) Dry weather outfall screening
    b) Screening/inspection of structures draining to the outfalls

3. Tracking and Elimination of Illicit Discharges: Verification of the source and nature of the illicit discharge and actions or procedures to eliminate the source.

Each of these three components of the IDDE plan is described in detail below.

1. IDDE OUTFALL EVALUATION

a) Desktop evaluation to locate portions of the MS4 with highest potential for illicit discharges:

The process for desktop evaluation of the MS4 generally follows the Center for Watershed Protection's 2004 guidance manual, *Illicit Discharge Detection and Elimination, Chapter 5: Desktop Assessment of Illicit Discharge Potential*. The purpose of the desktop evaluation is to use available mapping and other data to locate MS4 outfalls with the highest potential for illicit discharges within a watershed. Using DelDOT's MS4 database and other available data, GIS software is used to target outfalls for field screening based on factors such as:

- Known past illicit discharges
- History of dry weather flow and/or detected ammonia or detergents
- Proximity to structures with environmental or pipe work orders
- Structures found during inspections to have connections from unknown sources
- Proximity to aging or abandoned sanitary sewer systems
- Communities with no sanitary sewer systems
- Proximity to potential discharge sources (e.g. industrial or commercial facilities)
- Proximity of outfalls to streams
- Proximity to previous known MS4 deficiencies
- Age of MS4 (pre-1962)

Past dry weather field screening experience has determined that illicit discharges often are found in non-outfall structures, such as catch basins or pipes, and that the discharge is not always evident at the outfall itself. As a result, other drainage structures (e.g., inlets) also are evaluated using the same criteria and referred to as "contributing structures."

This evaluation process results in a list of outfalls and structures in the watershed that have the greatest potential for illicit discharges or connections. Each of these is then screened in the field during dry weather.

The desktop evaluation will be conducted on a watershed by watershed basis. The 21 watersheds in New Castle County were divided into 5 evaluation years, with goal of evenly spreading out the number of outfalls over the 5-year permit term and meeting the permit requirement of evaluating 20% of the outfalls annually. **Table 1** describes the approximate schedule for evaluation of each watershed.

b) Reports from MS4 Inventory/Inspection Field Activities:

DelDOT's MS4 program includes a comprehensive field level inventory and inspection of the entire storm sewer system. Field crews record inventory and inspection data in a custom-designed DelDOT field application and database. If a member of the field crew observes flow from an outfall during routine MS4 inventory/inspection work, the information is noted in the field application. These outfalls are then screened during dry weather for potential illicit discharges by an IDDE crew.

Table 1. Approximate schedule for evaluation and screening of outfalls in each New Castle County watershed.

Year	Watershed
1	Shellpot C&D Canal East Appoquinimink River
2	Brandywine Creek Blackbird Creek Delaware Bay Smyrna River Delaware River Army Creek Red Lion Creek Dragon Run Creek
3	Christina River
4	White Clay Creek
5	Naamans Creek Red Clay Creek C & D Canal West Bohemia Creek Sassafras River Chester River Elk Creek Perch Creek

MS4 inspectors are also trained to recognize other signs of potential illicit discharges (such as oil sheens, unusual odors or toilet paper, for example). These are immediately reported to the IDDE manager for follow-up dry weather screening and investigation.

c) Reports/complaints from maintenance crews and the public:

DelDOT maintenance staff are trained to recognize and report signs of potential illicit discharges or connections into the MS4. In addition, the MS4 permittees are required to maintain a public hotline that allows Delaware citizens to report evidence of illegal spills or dumping to the MS4, such as:

- Anyone improperly disposing laundry wastewater, septic system effluent, oil, or any household chemicals into the storm drain system;
- Any strange odors or stains near a storm drain;
- Any dead fish in streams or ponds.

Reports may also be received from co-permittees or other municipalities or agencies.

IDDE staff respond within 48 hours to these reports after notification by DelDOT, including conducting field screening to identify potential illicit discharges.

d) Coordination with New Castle County and municipalities:

If an illicit discharge is suspected or reported in a portion of the MS4 that is not owned or maintained by the State, then DelDOT will notify New Castle County Special Services or the municipality that owns the system, as appropriate. The MS4 owner is then responsible for verification and/or elimination of the illicit discharge.

2. DRY WEATHER FIELD SCREENING

Dry weather field screening is conducted at each outfall targeted either by the desktop evaluation described in Section 1, or through reports of potential issues. The dry weather screening assists DelDOT in identifying potential illicit discharges. If a discharge is determined to be illicit, the IDDE consultant staff will follow up to help track the source of the discharge.

a) Dry weather field screening:

Dry weather screening is conducted in accordance with the recommendations provided in 40 CFR 122.26 (d)(1)(iv)(D) and in *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assistance* (CWP, 2004). All field screening is performed by a team of two people, allowing for the safe and efficient completion of the work.

A **Field Data Sheet** that documents the presence or absence of dry weather flow is filled out for each MS4 outfall or structure visited in the field **(Figure 1)**.

If an outfall has flow during dry weather, a sample is collected and analyzed in accordance with the recommendations provided in 40 CFR 122.26 (d)(1)(iv)(D) and *Illicit Discharge*

Detection and Elimination: A Guidance Manual for Program Development and Technical Assistance (CWP, 2004). Samples are tested in the field for ammonia and detergents. Laboratory tests for Oil and Grease, Total Petroleum Hydrocarbons, fecal bacteria and/or potassium are added if evidence exists of contamination from oils, sewage or industrial discharges. Likewise, tests for fecal bacteria are added if presence of sewage is suspected. Additional samples are taken to a certified laboratory to confirm field test results, as appropriate.

When the field testing and/or laboratory results are returned, a Flow Chart Method is used to identify contaminating sources based on parameter levels and land use. The results from the **Residential or Light Commercial Flowchart (Figure 2)** aid in categorizing discharge as:

- No Evidence of Illicit Discharge
- Likely Graywater/Washwater Source
- Likely Sanitary Wastewater or Graywater/Washwater Source
- Likely Sanitary Wastewater Source
- Probable Sewage Source

After field screening, any outfall or structure determined to have dry weather flow must also have an **IDDE Investigation Tracking Sheet** created (**Figure 3**). Tracking sheets are organized by incident ID number and serve as a summary of the IDDE evaluation and field screening, including photographs, determinations, follow up actions, and additional documentation that occurred throughout the IDDE process.

b) Screening/inspection of structures draining to the outfalls:

Often an outfall is located relatively far from the source of an illicit discharge or connection. For example, a pipe from a residential washing machine may be connected into a catch basin hundreds of feet from an outfall. When this occurs, dry weather flow may not be detected easily at the outfall.

Therefore, in addition to dry weather screening at the outfall itself, the IDDE field crew does a visual inspection of all MS4 structures in an outfall's drainage area to look for evidence of illicit discharges, connections or dumping. If such evidence is found then additional chemical testing of flow or standing water in catch basins may be performed.

3. TRACKING AND ELIMINATION OF ILLICIT DISCHARGES

Based on the results of dry weather screening and field inspections, it can be determined if steps for illicit discharge elimination are necessary or possible. The category of illicit discharge determines additional steps taken to verify the source and identify the responsible party.

When illicit discharges are detected, IDDE field crews create a Memorandum to DelDOT that includes information regarding how the discharge was reported (field evaluation, desktop targeted or miscellaneous report), field screening observations and lab results. The memo is updated with the dates, times, and details of every activity related to the illicit discharge until it is eliminated or removed. A record is kept of all correspondence and field visits for each potential illicit discharge, and tracking forms are updated when any new information is received.

a) Elimination and enforcement actions:

DelDOT has no enforcement authority of its own, so administrative action is the first step used to eliminate an illicit discharge. The party or parties responsible for an illicit discharge are notified in person, if possible, and in writing (certified mail) of the suspected or identified illicit discharge by way of a **Notice of Potential Illegal Discharge (Figure 4)**. Permission is sought from the property owner to conduct further inspections, including dye testing or video pipe inspection, if appropriate in order to confirm the source.

Once a discharge and its source are confirmed, the responsible party is requested voluntarily to eliminate the illicit discharge or to develop and submit to DelDOT a written time-appropriate plan to do so. If the voluntary compliance is insufficient, or if the approved plan is not being executed as agreed upon, a cease and desist order is issued. If there is no response or appropriate action taken by the responsible party(s), after notice and within a specified period, DelDOT may undertake the required actions to eliminate the illicit connection and subsequently recover the cost from the owner.

DelDOT also has a Memorandum of Agreement with DNREC to provide enforcement assistance when needed. In addition, the following types of reports/discharges are immediately referred to DNREC for follow-up: onsite wastewater treatment systems (OWTS), major spills, fish kills, immediate environmental hazards.

After illicit discharge elimination, consultant field crews return to the structure/outfall and complete follow-up field screening to confirm that the discharge has been eliminated.

b) Door hanger distribution:

In residential neighborhoods where dumping of materials into the MS4 is suspected or reported, DelDOT distributes **Stormwater Pollution Awareness Door Hangers (Figure 5)**. Door hangers are a public education tool to raise awareness that materials such as grass clippings, leaves, motor oil, pet waste, etc., are to be kept out of storm drains. Door hangers are distributed to a selected number of houses surrounding the affected outfall. The following information is presented on the door hangers:

- The type of illicit discharge that was found in the storm sewer system
- The location of affected structure
- The potentially affected water body
- The importance of stormwater management
- Guidelines for reducing stormwater runoff pollution
- DelDOT contact information for illegal discharge information

Figure 1. DelDOT IDDE Field Sheet for screened outfalls.

DELDOT AGREEMENT 1613
ILLICIT DISCHARGE DETECTION & ELIMINATION
FIELD SHEET

Structure Number: _____

Incident ID # _____

County: _____

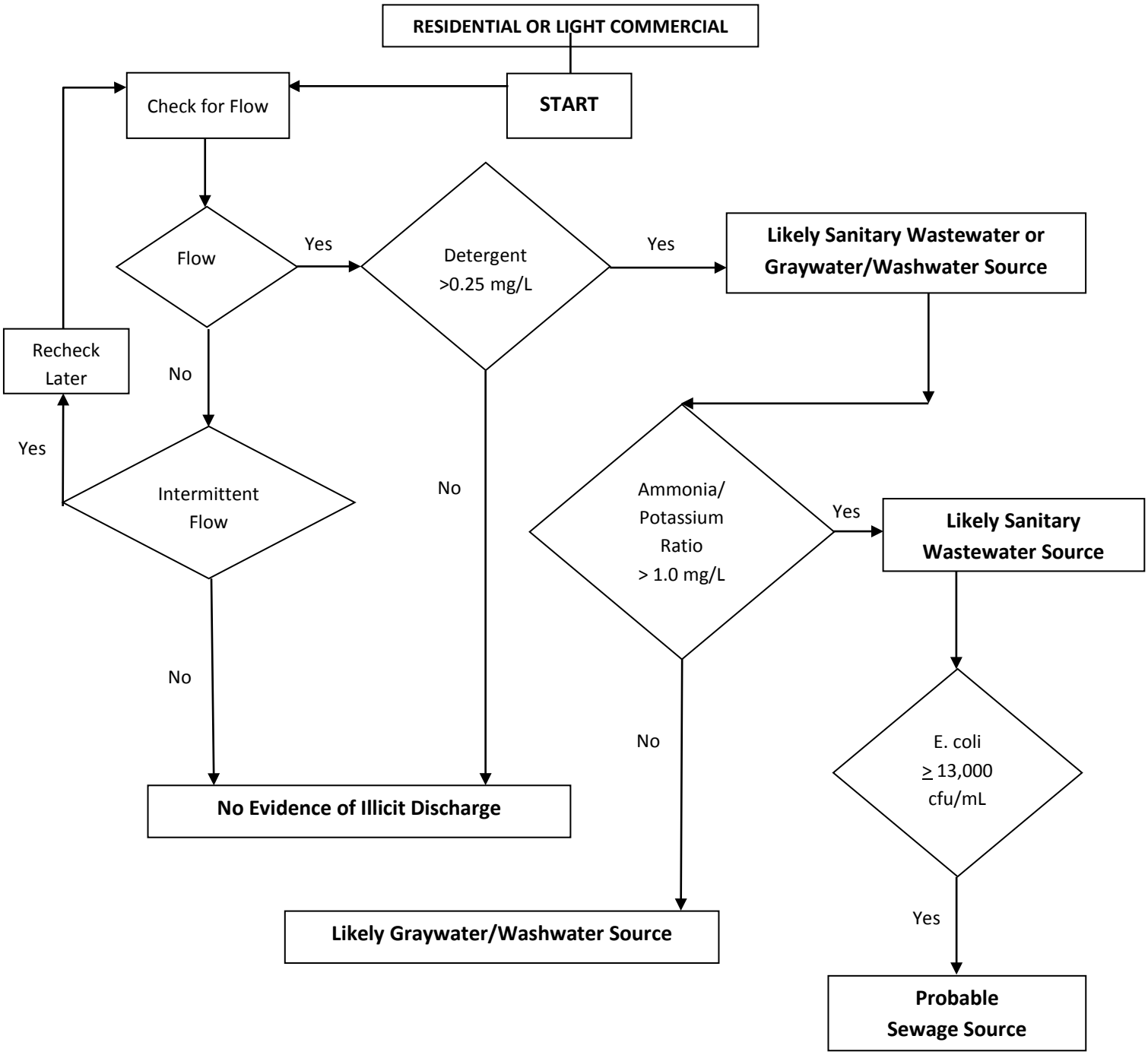
Subdivision: _____

Address/Location _____

Personnel		
Date		
Time		
Air Temperature (F)		
Photograph	Yes(Y), No(N)	
Date Last Rain		
Outfall Dimensions	(inches)	
Outfall Shape	Round(R), Oval(O), Box(B), V-Ditch(VD), Trap Ditch(TD)	
Outfall Type	Corrugated Metal Pipe(CMP), Reinforced Concrete Pipe(RCP) Polyvinyl Chloride Pipe(PVC), Other(O-explain)	
Flow Observed	Yes(Y), No(N)	
Land Use	Industrial(I), Commercial(C), Residential(R), Other(O-explain)	
Structural Condition	Normal(N), Concrete Spauling(SP) Peeling Paint(PP), Concrete Cracking(CC) Outfall Damaged(OD), Submerged(S), Metal Corrosion(MC), Other(O-explain)	
Erosion (Outfall Area)	None(N), Moderate(M), Severe(S)	
Algae Growth	Yes(Y), No(N)	
Vegetative Condition (Outfall Area)	Normal(N), Inhibited Growth(IG) Excessive Growth(EG), Other(O-explain)	
Flow Rate (cfs)		
Water Temperature (F)		
pH (units)		
Turbidity (ntu)		
Surfactants (mg/L)	**Field Tested:**	
	QC Lab Tested:	
	Follow Up QC Lab Tested:	
Ammonia (mg/L)	**Field Tested:**	
	QC Lab Tested:	
	Follow Up QC Lab Tested:	
Potassium (mg/L)	**QC Lab Tested:**	
	Follow Up QC Lab Tested:	
Other	As applicable	
Odor	None(N), Rancid-Sour(RS), Gas(G),Sewage(S), Oil(O), Sulfur(S), Other(O-explain)	
Deposits/Stains	None(N), Sediment(S), Oil(OY), Other(O-explain)	
Color	Clear(C), Gray(G), Red(R), Yellow(Y), Brown(B), Green(GR), Other(O-explain)	
Floatables	None(N), Trash(T), Oil Sheen(OS), Sewage(S), Other(O-explain)	
DETERMINATION (FROM IDDE FLOWCHART)		

Figure 2. Flowchart for determining probable source of illicit discharges

FLOW SOURCE DETERMINATION:
RESIDENTIAL or LIGHT COMMERCIAL



Robert Pitt, et al., *Source Verification of Inappropriate Discharges to Storm Drainage Systems*, Water Environmental Federation Technical Exhibition and Conference, September 2004.

Figure 3. Illicit Discharge Tracking Form (two pages).

IDDE INVESTIGATION TRACKING FORM

Incident ID No. **Date:**
Structure No.

EVIDENCE OF ILLICIT DISCHARGE: ☐ YES ☐ NO ☐ TBD

LOCATION:

County:	**House No:**	**Stream:**
ADC:	**Street:**	**Watershed:**
Subdivision:	**City:**	**Zip Code:**

SETTING:

☐	Storm Drain	☐	Outfall	☐	Other (specify):
☐	In Stream	☐	Along Bank		
☐	Stormwater Pond	☐	Upland		

VISUAL:

☐	Flow	☐	Soap	☐	Cloudy
☐	Staining	☐	Floatables (toilet paper, etc)	☐	Algae
☐	Oil / Oil Sheen	☐	Dead Fish	☐	Precip w/in 72 hrs
☐	Antifreeze	☐	Yard Waste	☐	Other: Iron Flocculent

ODOR:

☐	None	☐	Sulfide ("rotten egg")	☐	Gas/Oil
☐	Sewage	☐	Other (specify):		

IDDE INVESTIGATION SUMMARY:

Referred By:
Issue:
Determination:

Landscape Photo

DOCUMENTATION:

- ☐ Location Map from NPDES Map Viewer
- ☐ Summary Memorandum with Photographs
- ☐ Field Data Sheet
- ☐ QCL Laboratory Data
- ☐ Door Hanger
- ☐ Notice of Potential Illicit Discharge
- ☐ Other: DNREC LUST Project Comments

Structure Photo

IDDE INVESTIGATION TRACKING FORM

Incident ID No. **Date:**

Structure No.

Figure 4. Notice of Potential Illegal Discharge.

STATE OF DELAWARE
DEPARTMENT OF TRANSPORTATION
800 BAY ROAD
P.O. BOX 778
DOVER, DELAWARE 19903

CAROLANN WICKS, P.E.
SECRETARY

NOTICE OF POTENTIAL ILLEGAL DISCHARGE

The Delaware Department of Transportation (DelDOT) is responsible for maintaining not only roadways, but also the extensive storm drain and pipe networks located within State rights-of-way. The Federal National Pollutant Discharge Elimination System (NPDES) Program, which is a component of the Clean Water Act of 1972, requires DelDOT to control the amount of pollutants entering the drainage system. Part of this charge is the detection and elimination of *illegal discharges* or connections to the system that may contain pollutants or are otherwise not allowed. Left uncorrected, any pollutants entering the system will ultimately impact nearby streams, as storm drainage is not treated at any sort of treatment facility.

DelDOT has contracted with the engineering firm KCI Technologies, Inc. to survey and inspect the drainage system and to check for illegal discharges or connections. Please review the following checked items that pertain to you:

☐ ***You are receiving this notice because a potential illegal discharge or connection from your property was detected during a recent investigation. Please see details below.***

Date: _____ Outfall #: _____ Address: _____

Indicators or Source: _____

☐ ***This discharge or connection must be ceased or removed within 30 days. A follow up investigation will be conducted after that time to ensure compliance.***

☐ ***We are requesting access to your property to assist in our determination. Within seven days, please contact KCI Technologies, Inc. as shown below to make the appropriate arrangements.***

Bruce Thompson
KCI Technologies, Inc.
1352 Marrows Road, Suite 100
Newark, DE 19711
(302) 731-9176 ext. 3312
Bruce.Thompson@kci.com

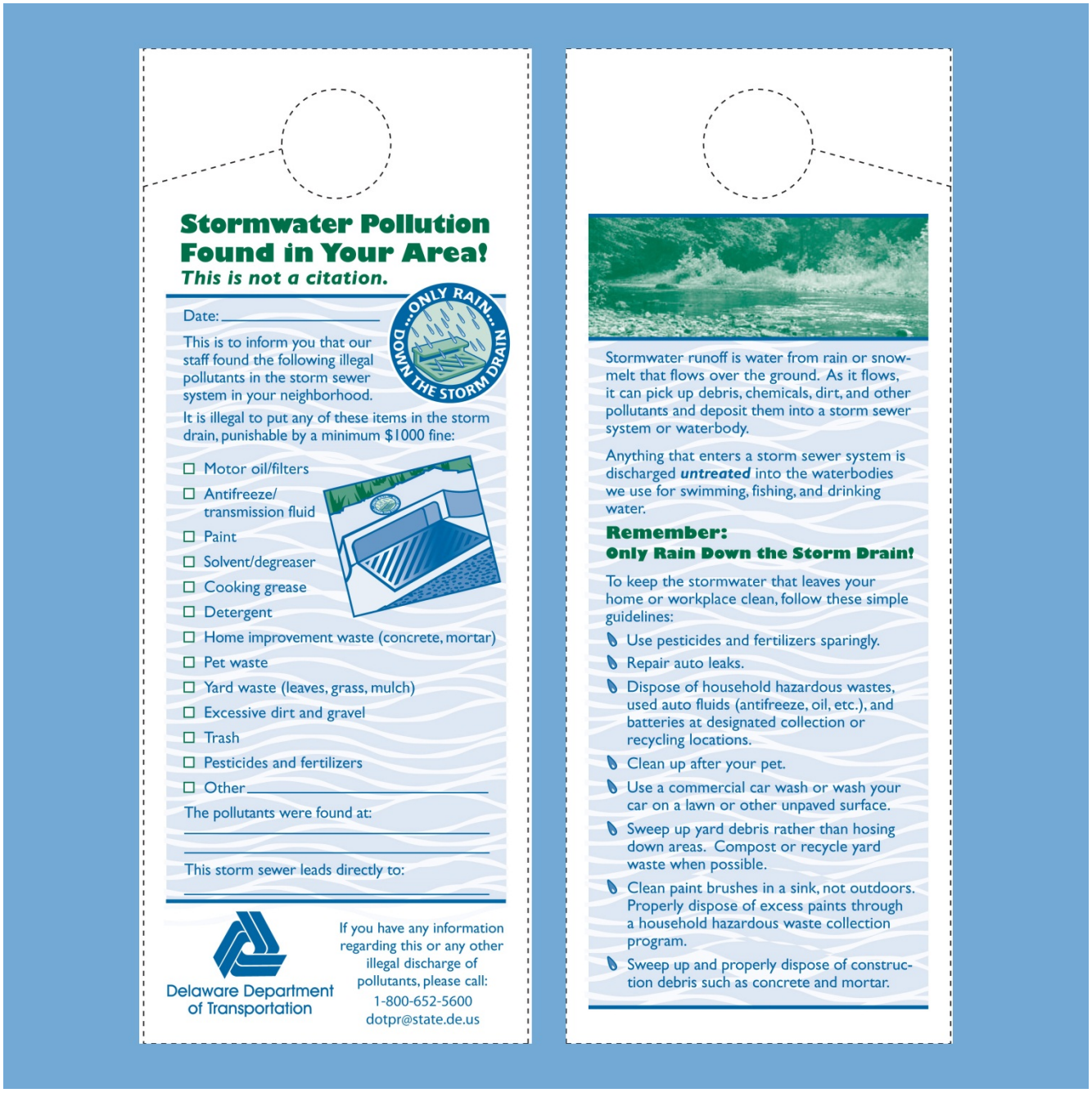
If the illegal discharge or connection cannot be removed within 30 days, you do not understand this notice, or you disagree that an illegal discharge or connection exists at your property, please contact KCI Technologies, Inc. with further details or explanation.

Program information can be obtained by contacting DelDOT's Project Manager, Randy Cole, by calling (302) 760-2194, or by email at randy.cole@state.de.us.

Thank you for helping us preserve Delaware's environment.

DelDOT

Figure 5. Stormwater Pollution Awareness Door Hanger.



Stormwater Pollution Found in Your Area!

This is not a citation.

...ONLY RAIN... DOWN THE STORM DRAIN

Date: _____

This is to inform you that our staff found the following illegal pollutants in the storm sewer system in your neighborhood.

It is illegal to put any of these items in the storm drain, punishable by a minimum $1000 fine:

- ☐ Motor oil/filters
- ☐ Antifreeze/ transmission fluid
- ☐ Paint
- ☐ Solvent/degreaser
- ☐ Cooking grease
- ☐ Detergent
- ☐ Home improvement waste (concrete, mortar)
- ☐ Pet waste
- ☐ Yard waste (leaves, grass, mulch)
- ☐ Excessive dirt and gravel
- ☐ Trash
- ☐ Pesticides and fertilizers
- ☐ Other _____

The pollutants were found at:

_____

_____

This storm sewer leads directly to:

_____

Delaware Department of Transportation

If you have any information regarding this or any other illegal discharge of pollutants, please call:
1-800-652-5600
dotpr@state.de.us

Stormwater runoff is water from rain or snow-melt that flows over the ground. As it flows, it can pick up debris, chemicals, dirt, and other pollutants and deposit them into a storm sewer system or waterbody.

Anything that enters a storm sewer system is discharged ***untreated*** into the waterbodies we use for swimming, fishing, and drinking water.

Remember:
Only Rain Down the Storm Drain!

To keep the stormwater that leaves your home or workplace clean, follow these simple guidelines:

- Use pesticides and fertilizers sparingly.
- Repair auto leaks.
- Dispose of household hazardous wastes, used auto fluids (antifreeze, oil, etc.), and batteries at designated collection or recycling locations.
- Clean up after your pet.
- Use a commercial car wash or wash your car on a lawn or other unpaved surface.
- Sweep up yard debris rather than hosing down areas. Compost or recycle yard waste when possible.
- Clean paint brushes in a sink, not outdoors. Properly dispose of excess paints through a household hazardous waste collection program.
- Sweep up and properly dispose of construction debris such as concrete and mortar.

APPENDIX F

INVENTORIES OF FACILITIES OR LOCATIONS COVERED BY GOOD HOUSEKEEPING PROVISIONS

(to be included in Final Plan)

APPENDIX G

STATEWIDE VEHICLE WASH WATER PRACTICES
FOR DELDOT MAINTENANCE YARDS

STATE OF DELAWARE
Department of Transportation
Nathan Hagerard III, Secretary

Statewide Vehicle Wash Water Practices for DelDOT Maintenance Yards

NPDES Program
Delaware Department of Transportation
P.O. Box 778
Dover, DE 19903

July 6, 2005

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Introduction

This report outlines the Department's proposal for treating vehicle wash water on-site at DelDOT's 16 maintenance yards. All facilities currently conduct washing operations on-site year round. The frequency in which vehicles are washed depends on their designated use. Regenerative vacuum and mechanical sweepers are washed at the end of the day of use, and snow-fighting equipment is washed after each storm event. Loaders, dump trucks, flusher trucks, pick-up trucks and passenger cars are washed on an as needed basis.

We first reviewed current operations, followed by site inspections, to help us identify areas requiring upgrading and to examine site-specific options for potential improvements and retrofits. We also considered the potential effects a proposed retrofit may have on each yard's functionality.

Our goal was to develop options to treat wash water and stormwater to acceptable levels before it exits our site or enters receiving waters. To meet this objective we developed a stormwater "treatment train" at each maintenance facility. This method incorporates multiple Best Management Practices (BMPs) to treat wash water to the maximum extent practicable. In several cases, existing practices, together with proposed policy changes and employee training, were sufficient to satisfactorily treat vehicle wash water.

The following section details BMPs chosen by the Department in the development of treatment trains at each maintenance facility.

1.0 Best Management Practices

Policy Implementation and Employee Training

DelDOT proposes implementing the following changes to existing "good housekeeping" practices:

1. Wash in designated areas on impervious pads only.
2. Equipment operators will be required to clean the wash area if an accumulation of sediment is present at the end of a wash event.
3. More frequent sweeping. A minimum of once a week will be required, and more frequently if accumulation is evident. Visual observation will determine the appropriate frequency.
4. Employees will be educated on the new requirement at weekly staff meetings.

Permanent Wash Pads

Yards without impervious wash surfaces will be retrofitted with asphalt wash pads with berms to restrict sediment runoff. All vehicle washing will occur in these designated areas only.

Sweeping

Sweeping from an impervious wash pad is an easy, effective method to prevent sediment from entering the stormwater system. New policy implementation, as stated above, will be the first step in the "treatment train." In addition to sweeping, we propose requiring equipment operators to clean the wash area if an accumulation of sediment is present at the end of a wash event. In our observation of the washing operations, sediment collects on the wash pad. Accumulated sediment enters the stormwater system through a rain event or continuing washing operations. We propose to require all designated wash areas to have an impervious pad that is swept manually and/or mechanically to remove accumulated sediment. Sweepers for this purpose will be purchased for those yards that do not currently have them on-site.

Catch Basin inserts

All catch basins in the DelDOT maintenance yards have been retrofitted with Suntree® catch basin inserts. These inserts are designed to remove sediment, oil and grease. Previous studies have indicated that the Suntree filters remove 73-93% of TSS and 54-96% of oil and grease from the water that passes through them. These units were installed in the summer of 2004. All units are inspected during the Dry Weather quarterly inspections, and the oil collecting filters are replaced when needed.

Vegetated Swales

Vegetated swales are stormwater conveyance system BMPs that are used at several of our maintenance facilities to transport stormwater off the roadway and provide water quality treatment. In the past, swales were created because of their ease of maintenance and low installation cost. Properly vegetated and maintained swales are an effective and low cost BMP for stormwater treatment. Our field investigation revealed that some existing swales are not functioning as designed. These swales

will be retrofitted and upgraded to improve their effectiveness. These upgrades will include the following:

- Planting the proper material
- Increasing the channel size for increased pollutant removal
- Installing check dams for increased sediment removal
- Regrading to achieve proper drainage

Wet Retention Ponds

Wet ponds typically remove approximately 80% of TSS and other pollutants attached to the sediment. Contrarily, dry ponds are not as efficient. Our monitoring data support this. Wet ponds are also considered less of a safety hazard. For these reasons, DelDOT is proposing converting our current dry ponds to wet ponds within the following maintenance yards: Bear, Middletown, Cheswold, and Harrington. These redesigned ponds will also have a well-defined forebay. Improvement in TSS and pollutants attached to sediment, such as metals, can be expected.

2.0 Wash Water Monitoring

The DelDOT NPDES Program has performed preliminary wash water and outfall monitoring to determine the effectiveness of our BMPs in controlling discharge of sediment and other contaminants from the yards. In January and April 2005, we sampled wash water from several different vehicle types at Kiamensi and Chapman Road yards. The wash area at Kiamensi is located at the back of the yard, and runoff from washing activities is treated by Suntree catch basin inserts and a wet retention pond. Additionally, we have wet weather monitoring data from the outfall of Kiamensi pond. Table 1 displays the concentration ranges of selected contaminants measured in the wash water coming directly off various types of vehicles as they were rinsed. These ranges are compared with the levels of those same contaminants measured in stormwater discharge from the Kiamensi pond outfall. The data indicate that the combination of catch basin insert filters and wet pond treatment removes nearly all of these constituents from the runoff water before it discharges from the yard.

Wet weather monitoring data from the pond outfalls at other DelDOT yards (Table 2) also supports the contention that inlet filters and wet retention ponds sufficiently treat yard runoff, which includes vehicle wash water. The ponds at Cheswold, Harrington, Middletown and Bear are dry ponds, and our data indicate that these BMPs do not remove solids as well as wet ponds (Table 2). Therefore, these yards are scheduled to be retrofitted with wet retention ponds.

We are also implementing the BMP of sweeping excess sediment from wash pads before it enters the treatment train. During our wash water monitoring, we found that much of the sediment that comes off the vehicles such as dump trucks and sweepers remains on the pad pavement. Therefore, if it is swept-up after wash operations, it is unlikely ever to enter the stormwater system.

3.0 Timeline

Currently, there are 16 DelDOT maintenance facilities that have washing operations. Table 3 shows the timeline for design and construction of structural BMPs for treating vehicle wash water.

4.0 Cost estimate

Table 4 shows the cost estimate to design and retrofit DelDOT maintenance facilities to improve the quality of vehicle wash water. Not shown are costs to DelDOT of using in-house staff and equipment to construct, inspect and maintain the retrofits.

5.0 Site Specific Proposal

The following section details each individual maintenance facility. Listed for each site are the current practices and proposed BMPs. Details of the treatment train selected to control wash water at each facility are described. Site plans are also included to better enable the reader to understand the layout of the facility and the operational needs.

5.1 **Talley (Figure 1)**

Current Practices

All vehicle washing is conducted in the designated outside wash area. Wash water and stormwater flows to the northwestern property boundary, where it enters a vegetated swale. This swale travels towards the rear property boundary where it leaves the site. There is no closed drainage system at this site.

Currently, to reduce pollutants that may enter the stormwater system, the vehicle wash area is swept periodically when large amounts of sediment accumulate.

Proposed BMPs

At this time, DelDOT is working with the Becker Morgan consulting firm to redesign Talley yard. The only building that will remain is the current maintenance building. All others will be replaced. During this redesign, stormwater management will be a priority, and vehicle wash issues will be addressed. We anticipate that the design will take approximately one year with advertising and construction to follow. Expected completion date is July 2008. New BMPs will be constructed, and new policy procedures will apply.

5.2 **Kiamensi (Figure 2)**

Current Practices

All vehicle washing is performed outside in one of two paved wash areas. Both areas drain to the back of the yard, enter catch basins fitted with Suntree inserts, and then discharge to the wet retention pond.

Currently, the vehicle wash area is swept periodically when large amounts of sediment accumulate in order to reduce pollutants that may enter the stormwater system.

Proposed BMPs

- Continue washing at designated areas.
- Require maintenance personnel to sweep the wash area at a minimum of once a week per the policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.
- With these practices in place and after review of the monitoring data, DelDOT feels that no further work is required at this site.

5.3 **Chapman (Figure 3)**

Current Practices

Summer washing occurs at Wash Area 1 on a partially paved surface. It then drains through a swale into the closed system and discharges into the stormwater pond. Winter washing is performed at Wash Area 2 due to freezing conditions at Wash Area 1. Wash Area 2 is on a paved surface and drains to a catch basin that is directed off site. Vehicle wash water does not enter a catch basin at Wash Area 1.

All catch basins on site have been retrofitted with Suntree catch basin inserts to remove sediment and hydrocarbons.

Currently, the vehicle wash area is swept periodically when large amounts of sediment accumulate to reduce pollutants that may enter the stormwater system.

Proposed BMPs

- Construct a wash pad at Wash Area 1.
- Regrade and refurbish the swale to include check dams.
- Ensure that all washing takes place in Wash Area 1 until freezing conditions dictate moving to Wash Area 2.
- Install new catch basin and associated piping to ensure that all water from Wash Area 2 is directed towards the stormwater pond.
- Require maintenance personnel to sweep the wash area at a minimum of once a week per the policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.4 **Bear (Figure 4)**

Current Practices

Vehicle washing can occur in three locations. Wash water from vehicles washed in the indoor wash bay enters a large trench drain connected to the closed stormwater system. The closed system opens into a vegetated swale that runs down the side property line before it leaves the site. Vehicles are also washed in front of or behind the wash bay. Wash water from vehicles washed on the front

side of the wash bay enters the closed system through a Suntree catch basin insert, then follows the same path as described above. For vehicles washed on the backside of the wash bay, the wash water sheet flows down the back of the property. In doing so, it crosses over both pavement and unstable soil before it enters the dry pond.

Currently the vehicle wash area is swept periodically when large amounts of sediment accumulate to reduce pollutants that may enter the stormwater system.

All catch basins on site have been retrofitted with Suntree catch basin inserts to remove sediment and hydrocarbons.

Proposed BMPs

The back of Bear yard currently is being redesigned by RK&K to correct erosion problems and improve stormwater quality. Construction is slated to begin by early 2006. Improvements include the following:

- Designated paved travel lanes.
- Pave/repave areas around the salt barn. This will allow material to be swept back into the barn after storm events. It will also help solve some of the erosion problems due to unstable soil.
- Vehicle washing will no longer be permitted on the front side of the wash facility due to lack of an adequate treatment train.
- The trench drain inside the wash bay will be connected to the closed drainage system during renovation. Therefore, wash water will flow to a Suntree catch basin insert, enter the closed drainage system where it will empty into vegetated swales with check dams before discharging to the wet retention pond.
- The dry pond will be retrofitted to a wet retention pond. This will allow for greater pollutant removal.
- Require maintenance personnel to sweep the wash area at a minimum of once a week per the policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.5 **Middletown (Figure 5)**

Current Practices

Most washing occurs in Wash Area 1, upstream of the dry pond. This area is a mix of pavement and tar and chip. During the winter months, washing takes place in Wash Area 2. All water from this location drains over pavement and discharges to the dry pond.

A wash building is under construction in the parking area west of the pond. When complete, vehicle washing will no longer occur in Wash Area 2.

Currently the vehicle wash area is swept periodically when large amounts of sediment accumulate to reduce pollutants that may enter the stormwater system.

Proposed BMPs

- Discontinue washing in Wash Area 2.
- Construct an impervious wash pad next to the wash building. This will allow several vehicles to be washed concurrently. It will also improve the efficiency of the sweeper to remove excess sediment from the wash area.
- Retrofit dry pond to a wet retention pond, and increase forebay area to enhance TSS and associated pollutant removal.
- Require maintenance personnel to sweep the wash area at a minimum of once a week per the policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.6 **Odessa (Figure 6)**

Current Practices

All vehicle washing occurs next to the maintenance garage on a gravel surface. Water from this area drains to an off-site dry pond via overland flow through grass. The dry pond collects all water from this site. This pond was designed as part of the SR1 construction project. Therefore, this pond will not be modified.

Proposed BMPs

- Construct an impervious wash pad in the current washing location. Sweepers will collect excess sediment before entering the stormwater pond.
- Require maintenance personnel to sweep the wash area at a minimum of once a week per policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.7 **Cheswold (Figure 7)**

Current Practices

All vehicle washing occurs outside in the wash area as shown in Figure 7. The area has a gravel surface and drains to a Suntree catch basin insert that discharges to the dry pond.

All catch basins on site were retrofitted with Suntree catch basin inserts to remove sediment and hydrocarbons.

Proposed BMPs

- Construct an impervious wash pad at the current wash location. This will allow the maintenance personnel to sweep the area following wash events to minimize sediment entering the pond.

- Construct a vegetated swale between the wash area and the nearest catch basin. This will allow greater volumes of sediment to be removed from the wash water. It also helps prevent any erosion of the yard surface.
- Convert the dry pond to a wet retention pond. This will allow greater treatment capability of the stormwater and wash water prior to exiting the site.
- Require maintenance personnel to sweep the wash area at a minimum of once a week per policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.8 **Dover (Figure 8)**

Current Practices

All vehicle washing occurs in the indoor wash bay located in the shop building. This bay, along with all other trench drains in the shop building, drains to an oil/water separator located in the parking area on the southwest side of the shop building. This separator is cleaned periodically under contract and drains to the City of Dover sanitary system.

All catch basins on site were retrofitted with Suntree catch basin inserts. At this time, wash water does not enter any catch basin.

Proposed BMPs

- Continue current practice using indoor wash bay – all wash water goes to the sanitary sewer.
- Require maintenance personnel to sweep the wash area at a minimum of once a week per policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.9 **Magnolia (Figure 9)**

Current Practices

Magnolia yard has two wash areas. Wash Area 1, located in the front of the facility, completes all washing operations inside the wash bay or directly outside the bay on a paved surface. In these locations, water drains through a Suntree catch basin insert, enters the closed system, then exits to a vegetated swale along the northern property line.

Wash Area 2 conducts all washing outside the shop building on a gravel/tar and chip surface. All wash water enters a Suntree catch basin insert that exits to a system of vegetated swales prior to it exiting the property.

Currently, both vehicle wash areas are swept periodically when large amounts of sediment accumulate to reduce pollutants that may enter the stormwater system.

All catch basins on site have been retrofitted with Suntree catch basin inserts to remove suspended solids and hydrocarbons.

Proposed BMPs

- Wash Area 1 will be eliminated due to an inadequate treatment train.
- Construct an impervious wash pad at Wash Area 2. This will allow maintenance personnel to sweep the area following wash events to minimize sediment entering the pond.
- Magnolia yard is currently being retrofitted with a wet retention pond. This pond will collect all wash water from Wash Area 2.
- Require maintenance personnel to sweep the wash area at a minimum of once a week per the policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.10 **Harrington (Figure 10)**

Current Practices

Most vehicle washing occurs outside on a gravel surface as shown in Figure 10. Wash water from this area flows through a large riprap protection area at the upstream end of the 10" CMP pipe. This prevents bulk sediments from entering the stormwater system. This area drains through several vegetated swales into the dry pond. In the winter months, vehicle washing also occurs inside the office and shop building. This runoff then drains into a Suntree catch basin insert, enters the closed system, and then discharges into a system of vegetated swales until it enters the dry pond.

All catch basins on site were retrofitted with Suntree catch basin inserts to remove sediment and hydrocarbons. This includes the catch basin that drains the inside wash area.

Proposed BMPs

- Construct an impervious wash pad at the outside wash area. This will allow maintenance personnel to sweep the area following wash events to minimize sediment entering the stormwater system.
- Upgrade/retrofit the existing swales. The existing swales will be re-graded, re-vegetated and check dams will be installed. This will help in removing sediment from the wash water.
- The current dry pond will be retrofitted to a wet retention pond. This will provide better removal of TSS and associated pollutants.
- Require the maintenance personnel to sweep the wash area at a minimum of once a week per policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.11 **Ellendale (Figure 11)**

Current Practices

The existing wash area is a gravel/tar and chip surface. All wash water drains to a vegetated swale and discharges to a borrow pit located at the back of the property. There is no outfall to this pond, so runoff remains on-site.

Currently, the vehicle wash area is swept periodically when large amounts of sediment accumulate to reduce pollutants that can enter the stormwater system.

Proposed BMPs

- Construct an impervious wash pad in the designated outside wash area. This will allow maintenance personnel to sweep the area following wash events to minimize sediment entering the stormwater system.
- Upgrade/retrofit the existing swales. The existing swales will be re-graded, re-vegetated and check dams will be installed. This will help in removing sediment from the wash water.
- Require the maintenance personnel to sweep the wash area at a minimum of once a week per the policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.12 **Georgetown (Figure 12)**

Current Practices

Vehicle washing is not a routine practice at the Georgetown facility. Any washing that takes place at the facility occurs on the west side of the maintenance building. Water from this area drains over the paved parking lot to a vegetated swale. This swale then drains to the wet retention pond.

Currently, the vehicle wash area is swept periodically when large amounts of sediment accumulate to reduce pollutants that may enter the stormwater system.

All catch basins on site have been retrofitted with Suntree catch basin inserts. Presently, wash water does not enter any catch basin.

Proposed BMPs

- Continue treating any wash water via vegetated swale and wet retention pond.
- Require the maintenance personnel to sweep the wash area at a minimum of once a week per policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.13 **Laurel (Figure 13)**

Current Practices

All vehicle washing occurs in the existing wash area. Water flows to a vegetated swale and discharges to Pond A. This pond is an old borrow pit that has filled with water. There is no outfall to this pond.

Currently, the vehicle wash area is swept periodically when large amounts of sediment accumulate to reduce pollutants that can enter the stormwater system.

All catch basins on site have been retrofitted with Suntree catch basin inserts. However, wash water does not enter any catch basin.

Proposed BMPs

- Construct an impervious wash pad in the current wash area. This will allow maintenance personnel to sweep the area following wash events to minimize sediment entering the stormwater system.
- Regrade/retrofit the existing swale. The swale will be widened and stabilized with vegetation. Check dams will also be installed to increase sediment retention.
- Require the maintenance personnel to sweep the wash area at a minimum of once a week per policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.14 **Seaford (Figure 14)**

Current Practices

All washing occurs in the wash area as shown in Figure 14. Runoff enters the stormwater system through a catch basin retrofitted with a Suntree catch basin insert before it discharges into a vegetated swale.

Currently, the vehicle wash area is swept periodically when large amounts of sediment accumulate to reduce pollutants that may enter the stormwater system.

Proposed BMPs

- Construct two (2) impervious wash pads by the existing wash area. This will allow maintenance personnel to sweep the area following wash events to minimize sediment entering the stormwater system.
- Require the maintenance personnel to sweep the wash area at a minimum of once a week per the policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.15 **Gravel Hill (Figure 15)**

Current Practices

Gravel Hill consists of two separate wash areas. Wash Area 1 conducts all washing operations in the enclosed wash bay. Water is collected by a catch basin fitted with a Suntree catch basin insert. Water is then filtered through a sediment trap prior to discharging to a borrow pit. This pond was not constructed as a stormwater pond and has no outfall structure.

Wash Area 2 conducts all washing next to the railroad tracks in the back of the facility. The area is gravel and drains to an inlet fitted with a Suntree catch basin insert that discharges into a vegetated swale along the tracks. The swale extends the length of the property and leaves the facility.

Currently, the vehicle wash area is swept periodically when large amounts of sediment accumulate to reduce pollutants that may enter the stormwater system.

All catch basins on site have been retrofitted with Suntree catch basin inserts to remove TSS and hydrocarbons.

Proposed BMPs

- Wash Area 2 will be eliminated due to inadequate treatment train.
- Construct wash pad at Wash Area 1.
- Replace the settlement tank outside Wash Area 1. The upgrade will also include a maintenance contract to maintain the unit.
- Continue treating wash water via Suntree inserts, settlement tank and borrow pit.
- Require the maintenance personnel to sweep the wash area at a minimum of once a week per the policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

5.16 **Dagsboro (Figure 16)**

Current Practices

All vehicle washing takes place in the designated washing area next to the vehicle shed. Water from the wash area drains toward the side property line and enters a vegetated swale. This swale extends the length of the property.

Currently, the vehicle wash area is swept periodically when large amounts of sediment accumulate to reduce pollutants that may enter the stormwater system.

All catch basins on site have been retrofitted with Suntree catch basin inserts. However, wash water does not enter any catch basin.

Proposed BMPs

- Construct an impervious wash pad to include a catch basin fitted with a Suntree catch basin insert. This will allow maintenance personnel to sweep the area following wash events to minimize sediment entering the stormwater system. Wash water from this area is then discharged to a vegetated swale.
- Regrade/retrofit the vegetated swale to increase capacity and install check dams to capture sediment.
- Require maintenance personnel to sweep the wash area at a minimum of once a week per policy implementation. Large accumulations of sediment will be the responsibility of the operator to dispose of properly and in a timely fashion.

Table 1. Ranges of values for selected contaminants in composites of wash water from different types of DelDOT vehicles. These ranges are compared to event mean concentrations (EMC) from wet weather monitoring at the outfall of the Kiamensi pond. All units are mg/L.

	TSS		Surfactants		Zinc**		TPH (DRO)	
Vehicle Type	**Vehicle Rinse**	**Pond Outfall (EMC)**	**Vehicle Rinse**	**Pond Outfall (EMC)**	**Vehicle Rinse**	**Pond Outfall (EMC)**	**Vehicle Rinse**	**Pond Outfall (EMC)**
Passenger Vehicle	64 - 645	10 - 23	0.06 – 110.0*	0.06 – 0.59	0.32 – 0.91	0.042 - 0.052	2.9 - 213	0 – 0.32
6-Wheel Dump Truck	251 - 1750		0.13 – 0.48		0.80 – 1.69		1.9 - 1370	
10-Wheel Dump Truck	1429 - 2210		0.17 – 0.34		0.40 – 2.50		1.4 - 4660	
Regenerative Air Sweeper	573 - 10811		0.16 – 0.84		1.46 – 9.01		1.9 - 625	

*Only passenger vehicles are washed with detergent.

**Levels of zinc consistently are highest of all the metals.

Table 2. Event mean concentrations of contaminants in discharge from maintenance yard pond outfalls. All units are mg/L.

	Georgetown		Harrington		Cheswold		Bear			Kiamensi	
Parameter	**11/4/04**	**12/7/04**	**11/4/04**	**1/14/05**	**11/4/04**	**12/7/04**	**11/19/03**	**8/30/04**	**11/4/04**	**11/4/04**	**12/7/04**
TSS	76	10	185	248	153	104	644	158	405	23	10
Surfactants	ND	0.03	ND	ND	0.024	0.17	0.11	0.48	0.22	0.59	0.06
Cadmium	ND	ND	ND	ND	0.0005	ND	0.002	0.003	0.0005	ND	ND
Chromium	0.004	ND	0.008	0.017	0.008	0.005	0.028	0.007	0.020	ND	0.002
Copper	0.018	0.012	0.017	0.240	0.022	0.012	0.041	0.034	0.045	0.016	0.007
Lead	0.008	ND	0.012	0.051	0.017	0.014	0.083	0.035	0.071	0.004	ND
Nickel	0.008	0.004	0.018	0.051	0.029	0.015	0.098	0.028	0.095	0.005	0.004
Zinc	0.054	0.048	0.084	0.506	0.090	0.086	0.201	0.071	0.173	0.027	0.029
TPH – DRO	ND	ND	ND	ND	0.18	ND	0.98	2.80	0.83	0.32	ND
TPH – GRO	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Table 3. Timeline for implementing structural BMPs at DelDOT's maintenance facilities.

Table 4. Current expenditures and cost estimate for design work and retrofit construction.

BMP		Cost
Catch Basin Inserts[1]	$	80,000.00
Replacement filters[1]	$	10,000.00
Middletown, Cheswold, Harrington:		
Design cost to convert dry pond to wet pond	$	20,000.00
Construction costs	$	100,000.00
Bear Yard design work[1]	$	20,000.00
Bear Yard retrofit	$	640,000.00
Chapman Yard drainage improvement	$	20,000.00
Magnolia pond construction[1]	$	30,000.00
Tally Yard design & construction	$	25,000.00
Wash pads	$	50,000.00
New sweeper purchases	$	300,000.00
Vegetated swales	$	20,000.00
TOTAL	**$**	**1,315,000.00**

[1] Expenses to date

APPENDIX H

DELDOT STREET SWEEPING PROGRAM

DELDOT STREET SWEEPING PLAN FOR NEW CASTLE COUNTY: A SCIENCE-BASED METHODOLOGY

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DELDOT STREET SWEEPING PLAN FOR NEW CASTLE COUNTY: A SCIENCE-BASED METHODOLOGY

As part of the Delaware Department of Transportation's (DelDOT) National Pollution Discharge Elimination System (NPDES) permit, KCI Technologies, Inc. (KCI) was contracted to assist the Department in revising its Street Sweeping Plan for New Castle County.

A. INTRODUCTION

DelDOT is a co-permittee with New Castle County on a Phase I NPDES Municipal Separate Storm Sewer System (MS4) permit, issued on May 7, 2014. As part of the permit conditions, the Storm Water Pollution Prevention and Management Plan (SWPP&MP) must include a street sweeping plan to reduce pollutant loads from roadways to improve runoff quality.

The current requirement is to sweep all state-owned roadways in permitted areas on a frequency based on Average Daily Traffic (ADT), as follows:

- Interstates and major highways a minimum of four times per year
- Major/minor collector roads two times per year
- Local/subdivision roads at least once per year

This strategy has been referred to as a 4:2:1 frequency. It should be noted that some of the state roadways get swept more frequently than this – usually because of excessive build-up of trash/sediment (on high-traffic roads such as I-95 and I-495), or for aesthetic reasons (e.g. SR1 near the beaches during the summer). The most recent cost of sweeping at this frequency was estimated to be approximately $538,000 annually.

DelDOT suspected that this was probably not the optimum sweeping strategy for maximum pollutant removal and had been considering revising the strategy based on a combination of data collection and modeling. Furthermore, the new Phase I MS4 permit was expected to require DelDOT to devise (and defend) a new sweeping program for the SWPP&MP. During discussions of permit conditions, two proposals were made by Delaware Department of Natural Resources and Environmental Control (DNREC). The first was to sweep all roads monthly (12:12:12) at a minimum. DelDOT estimated this program would require a substantial increase in cost, estimated at $3,200,000 annually. DNREC proposed an alternative plan of essentially doubling the current effort, and presumably doubling the pollutant removal, so that the three classifications of roads would be swept at a 7:4:2 frequency. The cost of this plan was estimated to be $1,033,700 annually, close to twice the current cost.

DelDOT proposed to conduct a study to determine if there was a more effective combination of sweeping frequency, existing equipment, and manpower that would increase the existing pollutant removal without greatly increasing the cost. The proposed methodology would need to meet four criteria:

- Must not "backslide" on existing estimated pollutant removal
- Must prescribe a numeric, measurable, sweeping program that demonstrates pollutant removal
- Can be documented to show that DelDOT is meeting the plan, including weighing swept material and tracking sweeper routes
- Must be robust enough to be accepted by both DNREC and the US Environmental Protection Agency (EPA)

The study was broken down into three tasks. Knowing that there was a considerable body of literature describing street sweeping effectiveness, the first task was to research variables affecting pollutant removal. Specific topics included identifying the highest priority roads to be swept, capability of different types and combinations of equipment, and sweeping procedures. The second task was to estimate the costs of sweeping per curb mile based on data provided by DelDOT and from a literature review. The third task was to develop a procedure for modeling pollutant removal for different road types, equipment and sweeping frequencies, and apply the model to a set of scenarios varying these three parameters in order to forecast results.

B. LITERATURE REVIEW

1. Roads to be Swept

The purpose of this review was to determine if there were particular types of roads or geographic locations which would provide better water quality benefits for the same frequency and type of sweeping. The review looked at the following:

- ADT to determine if roads with heavy traffic generate more buildup of pollutants than infrequently traveled roads
- Locations of hot spots or areas where accumulation rates were higher than average
- Dispersal of street dirt outside of the swept area due to street condition or traffic
- Effectiveness of sweeping for open section and closed section drainage

There were a number of references that discussed the effect of ADT on pollutant buildup. Sampling and research results were useful for estimating differences in loads based on ADT, but not on whether the source of street dirt was vehicles, adjacent land, or road surface breakup.

Information on ADT and pollutant loadings in general corroborated the earliest studies (Driscoll, 1990) of higher (or more rapid) buildup on roads with higher ADT.
Barrett et al. (1998) sampled runoff in Austin, TX, and found the median Event Mean Concentration (EMC) compared well with the data from Driscoll (1990) for sites with more or less than 30,000 ADT, with exceptions that could be explained by site conditions. Water quality of the high-traffic site was similar to industrial/commercial runoff, which the authors considered unsurprising because of the high percentage of streets and parking lots in these land uses, and the amount of pollutant loads derived from vehicles.

Walch (2006) found no clear pattern in the distribution of particle sizes collected from primary, secondary, and subdivision road types. The differences were small but not statistically significant. However, in general, metals and Total Petroleum Hydrocarbons (TPH) were higher on primary and secondary roads. Wu et al. (1998) tested for Total Suspended Solids (TSS), Chemical Oxygen Demand (COD), oil and grease (O&G), nutrients, and metals, and found that only TSS showed a positive linear trend with traffic volume.

Kayhanian et al. (2003) examined the correlation between ADT and pollutant concentrations based on sampling data over a four-year period. They divided traffic levels into four categories of urban highways and one category of non-urban highways. No direct linear correlation was found; with the conclusion that ADT should only be a general indicator of concentrations if used as the sole predictor. However, it appeared that ADT had a stronger influence on pollutant load levels, particularly for those pollutants resulting from transportation activities (metals and O&G). Recommendations included prioritizing high traffic sites for structural BMPs and conducting more regular street sweeping or inlet cleaning.

Irish et al (1998) collected storm samples from an expressway in Austin, TX to develop regression models for predicting loads. For sediment, conditions during the antecedent dry period (dustfall, maintenance, sweeping) were more significant than ADT, so sweeping would be an effective measure for any level of traffic. Metals, COD, Biological Oxygen Demand (BOD) and O&G were correlated with ADT. Rainfall was the most important source of nutrients in runoff, with high concentrations of nitrate and phosphorus relative to the concentrations in runoff.

Several researchers investigated whether particular land uses had a significant effect on pollutant buildup. CWP (2006) reported that accumulation rates for street dirt for a heavily traveled commercial street were 2 or 3 times higher than for high density residential streets. Industrial areas tended to accumulate pollutants faster than either commercial or residential areas. Law et al. (2008) found commercial / industrial land uses had higher accumulation rates than residential areas, by a factor of 4 on average.

Zarriello et al. (2002) summarized many of the studies of pollutants in street dirt. Streets were the main source of sediment and TSS. Lawns contributed phosphorus loads out of proportion to their area. Most of the phosphorus and metals were bound to the fine-grained particles. Breault et al. (2005) sampled street dirt and analyzed for 32 elements (including trace metals), hydrocarbons, and polycyclic aromatic hydrocarbons (PAH) for particles in five size classes. Most metals were detected in every size range and generally increased in concentration with decreasing size. Copper was the exception, being concentrated in gravels. PAH concentrations also increased with decreasing particle size, with a few exceptions. They found zinc, lead, and PAH were highly correlated with the finest silt/clay (<0.063mm) particles.

Street condition had an effect on the location and amount of street dirt buildup. Pitt et al. (2004) found that studies on smoother streets with no on-street parking corroborated the earliest findings that 90% of the street dirt was in the gutter, within 30 cm of the curb. However, other studies on rougher streets, where parking was common, found that most of the street dirt was in the driving lanes, trapped by the rougher street texture, or blocked by parked cars from being blown by traffic to the curb. Zarriello et al. (2002) reported on two studies that incorporated street condition into the results. Streets in poor condition (cracked and broken pavement) decreased the effectiveness because dirt particles could be lodged in the cracks but still be washed off during storms. Street condition likely affects mechanical sweepers the most. CWP (2006) reported that the amount of load contributed by the deterioration of the street surface depended on texture and condition of the road. Loads were higher for rough streets and for asphalt streets in poor conditions.

In summary, the highest priority roads appeared to be those with the most significant buildup of pollutants that are amenable to sweeping. These are roads with either ADT >30,000 or roads in commercial and industrial areas that are drained with curb, gutter, and storm drain. There were no studies identified that reported on the effectiveness of sweeping open section roads without curb and gutter.

2. Equipment Capability

There have been significant changes in sweeper technology since the Nationwide Urban Runoff Program (NURP) study in the early 1980s was unable to document statistically significant improvements from street sweeping. The improvements include vacuum-assisted sweepers and regenerative air sweepers that are capable of collecting finer particles than the mechanical broom sweepers tested during the NURP study. As particle size is a significant variable in pollutant loading, the ability to collect a wider range correlates to improvements in pollutant removal.

Selbig and Bannerman (2007) provided the results of several weeks of street sweeping with three types of sweepers operated under typical conditions. Street dirt samples were taken before and

after the sweepers cleaned each area. The median street dirt removal was 29% for regenerative air, 30% for vacuum assist, and 5% for mechanical broom sweeping. The same study also reported results of sweeper efficiency by particle size, and included information from previous studies. Consistent with studies dating back to the 1980s, their results showed mechanical broom sweepers were ineffective at collecting particles <250 um. The regenerative air sweeper could not pick up particles <125 um. The vacuum assist sweeper could reduce the street dirt yield for all particle sizes, including the smallest ones, <63 um.

Over half of the samples in the area swept by the mechanical broom had an increase in street dirt yield after sweeping. Their explanation was that the abrasive action of the wire bristle brooms may have torn up the pavement or loosened particles embedded in cracks. They also found that mechanical sweepers can increase the percentage of fine particles available to be washed off. This occurs through two mechanisms: first, gutter brooms can dislodge embedded particles, but not pick them up. Second, by removing larger particles, smaller ones which otherwise would have been armored, may be exposed to rainfall.

Breault et al. (2005) found that in their assessment, vacuum sweepers were at least 1.6 and up to 10 times as efficient as mechanical sweepers for all particle sizes.

Tandem sweeping, combining a mechanical broom sweeper followed by a vacuum-assist sweeper was found to be more effective than either of these types of sweepers operated individually. Pitt et al. (2004) reviewed street cleaner performance tests. In areas with high loadings of large particles that armored small particles (described by Selbig and Bannerman, 2007), it may be best to use a tandem operation where the streets are first cleaned with a mechanical broom to remove the large particles and dislodge the small ones, followed by a regenerative air sweeper to remove the finer particles. Sutherland and Jelen (1997) described the results of an earlier study in Portland, where tandem operation of a broom sweeper and a vacuum sweeper proved significantly more effective than the broom sweepers tested in NURP studies in the 1980s

3. Sweeping Procedure

The most significant procedural variable affecting pollutant removal is the frequency of sweeping. Ideally, sweeping would occur after a period of dry weather when pollutants built up on the road surface, and just prior to precipitation when they are washed off. Several studies, going back to the 1970s, correlated street dirt buildup with the length of the antecedent dry period.

However, Sutherland and Jelen (1996) identified the significance of street dirt buildup during wet weather events due to “washon”. Based on a study in Portland, OR, they found wet season

accumulation was higher than that in the dry season. They attributed the observations to situations where when runoff from adjoining pervious and impervious areas increased the amount of sediment on streets after higher intensity events.
Pitt et al. (2004) summarized earlier studies of street dirt accumulation. For long accumulation periods (infrequent rainfall) wind losses can approximate the accumulation rate, leading to low increases in loading. This was found in Bellevue WA when steady loadings were observed after 1 week of dry weather. Butcher (2003) described earlier studies that suggested buildup and storage of street dirt approaches its maximum in about 12 dry days for commercial and industrial land uses, and 20 dry days for residential land uses.

Zarriello et al. (2002) recommended that an optimal frequency would provide at least one cleaning between storms, and calculated the average dry period between measurable storms using a minimum inter-event time of 12 hours. Results were an average of 85 hours between storms. The authors also determined the length of time between storms with volumes of 0.10”, 0.25”, and 0.50”, and recommended weekly street sweeping to provide contaminant removal between most storms. Seattle (2009) reported that sweeping alternate sides of the street every other week was very effective at reducing sediment and associated pollutants.

Three other variables in sweeping procedure were examined for their effect on pollutant removal: operating speed, curbside parking, and weather. CWP (2006) found that removal efficiency was improved by staying at the optimal operating speed of about 6 to 8 MPH. The same report also discussed parking. While the majority of pollutants are found close to the curb, results of parking restrictions were mixed. Seattle (2009) enforced parking restrictions, but found there was no relationship between residential sweeper pickup and the number of parked cars, suggesting that the sweeper continued to collect street dirt from the center of the street, and that parking was not as important as other factors affecting efficiency.

None of the studies reviewed tested street sweeping during or after a snow storm. In the street dirt sampling conducted by Selbig and Bannerman (2007), collection was done in April through September to avoid snow and ice in the winter and organic detritus in the fall, which would have biased the samples. Pitt et al. (2004) briefly discussed effects of wet pavement in relation to equipment, writing that most vacuum sweepers can’t remove fine particles effectively under moist conditions; nor where there were larger particles that cover the finer street dirt. Zarriello et al. (2002) quoted an US Federal Highway Administration (FHWA) study that indicated the effectiveness of both mechanical and vacuum sweepers decreased in wet conditions.

C. COST ANALYSIS

The street sweeping cost analysis presented below is an effort to determine the estimated cost per curb mile for the implementation of a comprehensive sweeping program using tandem sweepers to improve water quality. Street sweeping costs were determined through two different approaches, a top-down approach using historic sweeping cost data from DelDOT, and a bottom-up approach where the estimate was derived from two sources of literature values for labor and equipment cost. Neither of these approaches addressed the cost of disposal, which should be equivalent per curb-mile for either estimate and varies among localities.

The top-down approach is a cost per curb-mile estimate which has been developed from data provided by DelDOT including total sweeping costs and curb-miles swept. The bottom-up approach estimate was developed from literature data, including equipment and operation and maintenance costs. The two sources were the Ramsey-Washington Metro Watershed Study (Schilling, 2005) and the EPA/NPDES data sets (EPA, 2006).

1. Top-Down Approach: DelDOT

In order to estimate the New Castle County cost per curb mile, DelDOT provided cost data for 2009-2011 for the North and Canal Districts of New Castle County. The data included all costs associated with the sweeping program except disposal. **Table 1** summarizes the data and the analysis. All annual costs were averaged, regardless of district or sweeper type, resulting in an average cost per curb mile of $47.08 for a single sweeper. To determine costs of tandem sweeping, this number was simply doubled, resulting in a cost per curb mile of $94.15.

TABLE 1
DELDOT SWEEPING COST DATA

District	Fiscal Year	Total Costs	Curb Miles Swept	Cost/curb Mile
North	2011	$248,360.56	1,229.50	$202.00
	2010	$186,815.46	3,264.00	$57.24
	2009	$241,596.43	4,981.80	$48.50
Canal	2011	$269,483.19	6,172.55	$43.66
	2010	$204,021.33	6,512.60	$31.33
	2009	$341,210.29	9,521.40	$35.84
Average (Single Sweeper)		$248,581.21	5,280.31	$47.08
Cost/Mile (Tandem)				**$94.15**

2. Bottom-Up Approach

Data for the bottom-up approach was a mix of capital costs for equipment and annual costs for operations and maintenance (O&M). Cost data for the Ramsey-Washington Metro District was published in Schilling (2005). EPA published cost data on their NPDES website (EPA, 2006).

Annual curb miles were estimated based on a sweeping speed of 6 mph, and an effective sweeping period of 50% of the day. This estimate was made to take into account time spent travelling to and from the sweeping site and time spent disposing of collected material. The result of the estimate was an average sweeping speed of 3 mph and mileage of 6,240 curb miles per year. The calculation is shown in the **Table 2**.

TABLE 2
ESTIMATED ANNUAL CURB MILES

Curb-Miles / Yr (one pair)	
mph	6
hrs/yr	2,080
Effectiveness	50%
Effective hrs/yr	1,040
Effective mi/yr	6,240

To provide an equivalent cost per curb mile for comparison with the DelDOT analysis, all costs had to be converted to a single annual cost. Both sources published capital costs for the equipment, which were annualized using net present value calculations based on the estimated life of five years for mechanical sweepers and eight years for vacuum sweepers provided by Schilling (2005). A discount rate of 3% was used in the calculation.

O&M costs were provided in both the Schilling (**Table 3**) and EPA (**Table 4**) reports. Labor costs were estimated using wage rates provided by DelDOT.

TABLE 3
RAMSEY-WASHINGTON METRO DISTRICT COST

Equipment	Life	Capital	Annualized @ 3%	Cost per curb mile
Mechanical	5	$100,000	$21,835.46	
Vacuum	8	$200,000	$25,000.00	
Pair			$46,835.46	$7.51
O&M				
Mechanical				$40.00
Vacuum				$20.00
Labor	$30.15			
Crew	2			
Cost / hr	$60.30			
Hrs/yr	2,080			
Labor Cost/yr	$125,424			$20.10
TOTAL				**$87.61**

3. Cost Analysis Conclusion

Both approaches resulted in very similar estimates of the cost per curb mile for tandem sweeping. The DelDOT data gave a cost of $94.15 and the average of the two costs based on literature values was $94.36. For the purposes of comparing costs for sweeping scenarios in the next task, a cost of $100.00 per curb mile was assumed for tandem sweepers and $50.00 per curb mile for single sweepers.

TABLE 4
EPA FACT SHEET COST

Equipment	Life	Capital	Annualized @ 3%	Cost per curb mile	Escalated, 1991-2011 @ 160%
Mechanical	5	$75,000	$16,376.59		
Vacuum	8	$150,000	$18,750.00		
Pair			$35,126.59	$5.63	$9.01
O&M					
Mechanical				$30.00	$48.00
Vacuum				$15.00	$24.00
Labor	$30.15				
Crew	2				
Cost / hr	$60.30				
Hrs/yr	2,080				
Labor Cost/yr	$125,424			$20.10	$20.10
TOTAL					**$101.11**

D. MODELING APPROACH

During the literature review, four models that could be used to estimate loads and pollutant removal from street sweeping were identified:

- Watershed Treatment Model (WTM) is a spreadsheet-based annual loading model for watershed analysis
- Stormwater Management Model (SWMM) and Source Loading and Management Model (WinSLAMM) are general purpose continuous simulation models for hydrology, hydraulics and water quality
- Simplified Particulate Transport Model (SIMPTM) is a continuous simulation model specifically targeted to pollutant load calculations for management practices such including street sweeping and catch basin cleaning.

1. SWMM, WinSLAMM, and SIMPTM Models

The benefit of using a continuous model is the ability to compare the results from actual rainfall events with monitoring data collected during the same events. This allows the modeler to calibrate the input data and replicate real-world conditions. However, in a situation such as this, where monitoring data was not collected, the additional effort for modeling does not give an equivalent benefit in accuracy. For example, for the most accurate results, SIMPTM should be calibrated by matching model results to field measurements of runoff volume, total solids, and concentrations of other pollutants.

Input data for SWMM, WinSLAMM, and SIMPTM allow models to replicate conditions well. SWMM, for example, has input parameters for percent impervious, surface slope, pervious and impervious depression storage, and infiltration that can be fine-tuned with local data to estimate runoff fairly closely.

For this project, the effort to develop continuous simulation was judged by project staff not to be justified for the following reasons:

- There was insufficient local water quality monitoring data throughout New Castle County and for the different roadway types to tailor the input data and calibrate output. Since default values from nationwide studies were the only input source available, the benefits of more sophisticated modeling techniques to develop accurate loads were lost.
- The purpose of the modeling was to estimate the differences in pollutant removal among different street sweeping scenarios. For this purpose, relative accuracy among scenarios was important, but absolute accuracy comparing results to monitoring data was not a high priority.

2. WTM Model

The WTM was reviewed for suitability. The procedures for estimating loads and reductions are based on the Simple Method developed over 25 years ago (Schueler, 1987) and extended recently (CSN, 2009) which have been applied to other loading models used for NPDES compliance. Runoff loads are developed for distinct land uses, differentiated by whether they have similar or different percentages of impervious cover or pollutant concentrations. For each land use, runoff volume is based on annual rainfall, percent impervious, percent turf, assumed to be 80% of pervious cover, and percent forest, assumed to be 20% of pervious cover. Pollutant loads are calculated from the runoff volume and the EMC, with adjustments based on lawn care management practices, in particular, fertilizer use.

Load reductions from sweeping in the WTM are based on removal efficiencies for nutrients and sediment, which vary based on type of equipment, frequency, type of road swept, and conditions. The model begins with a base removal rate for weekly sweeping, which is applied to the proportion of either residential or other loads represented by the street area swept vs. the total area of the land use. The base rate is subsequently revised by discount factors for monthly sweeping and parking restrictions.

While the WTM modeling approach seemed reasonable in light of the project goals, the model itself was not ideal. It is intended for watershed-wide analysis of runoff loads multiple types of land use, along with secondary loads such as Combined Sewer Overflows (CSOs), Sanitary Sewer Overflows (SSOs), septic systems, channel erosion, and livestock. It also models stormwater controls including structural, non-structural, and programmatic types. In addition, many of the variables of interest have been hard-coded into the formulas. For these reasons, a simpler spreadsheet model was developed. The spreadsheet grouped modeling calculations in three areas: development of loading rates for different road types, estimates of annual loads based on rainfall and road type, and pollutant reduction by street sweeping.

E. LOADING RATES

Loading rates were estimated based on procedures used in the WTM, which uses the estimated runoff volume and pollutant concentration for each type of land use to calculate the pollutant load in lb/yr. For this study, each roadway classification was defined similar to land uses.

1. Roadway Classifications

Five types of roads were defined for comparing sweeping scenarios. They began with the existing sweeping plan with different frequencies for interstates / major highways, major/minor

collector roads, and local/subdivision roads. Based on the literature review, delineation of roads with and without curbs was also considered to be important, as well as roads adjacent to industrial and commercial areas. The result was the classifications shown in **Table 5**. These classifications were aggregated in two different ways, one for Scenarios 1 to 4, then a second for Scenario 5.

TABLE 5
ROADWAY CLASSIFICATIONS FOR SWEEPING SCENARIOS

Roadway Type	**Centerline Length (mi)**	**Average Width (ft)**	**Area (ac)**
Interstates and Expressways	188.7	43.5	995.3
Targeted Areas > 30,000 ADT (Curb)	64.8	41.2	323.7
Targeted Areas COM/IND <30K ADT	96.7	38.3	449.3
Targeted Areas COM/IND >30K ADT	26.8	38.3	124.5
Local Roads, most curbed	937.7	29.2	3,321.7
Non Targeted Arterial <30K (Curb)	61.4	38.7	287.6
Non Targeted Arterial >30K (Curb)	6.2	37.3	27.9
Non Targeted Arterial <30K (No Curb)	117.6	40.7	579.5
Non Targeted Arterial >30K (No Curb)	32.2	44.3	172.9
Low Priority No Curb	732.1	28.2	2,503.0
All Roads	**2,264.2**		**8,785.4**

Interstates were defined as I-95, I-295, I-495, SR1, and ramps. Curbed roads were defined as all roads with curb on one or both sides of the roadway. Curbed roads adjacent to Industrial/Commercial land use were defined as all curbed roads within 250 feet of industrial/commercial areas, analyzed using a buffer of industrial/commercial land use. Delineation of roads based on traffic level was performed using DelDOT's ADT layer.

2. Runoff Volume

The procedure (CSN, 2009) builds on the Simple Method (Schueler, 1987) by incorporating hydrologic soil groups. A runoff coefficient is given for each type of soil and land cover. This calculation was simplified by using a weighted average for the entire state of Delaware, based on two assumptions. First, that the sweeping program would eventually be carried out statewide, and second, that the majority of the land cover generating runoff would be impervious pavement, and that detailed local knowledge of the soils would not have a significant effect on the results. Weighted average runoff coefficients for the modeling were calculated using default values from the WTM, as shown in **Table 6**.

TABLE 6
RUNOFF COEFFICIENTS

HSG	Statewide Percentage	IMPERV	FOREST	TURF
A Soils	0.3%	0.95	0.02	0.15
B Soils	59.8%	0.95	0.03	0.20
C Soils	23.0%	0.95	0.04	0.22
D Soils	16.9%	0.95	0.05	0.25
AVERAGE		**0.95**	**0.04**	**0.22**

Runoff coefficients for each type of roadway were based on GIS data, which delineated the area within the edge of pavement, and did not include the right-of-way (ROW). This is consistent with an assumption that runoff and potential pollutants will not drain onto the road surface, so calculations of loading rates should not take these areas into account.

As a result of the identical estimate of imperviousness of all types of roads runoff coefficients (Rv) and runoff volume for each classification are the same and are shown in **Table 7**. Roads were assumed to be 95 percent impervious, corresponding to the TR-55 classification of paved, with curbs and storm sewers. Runoff volume uses the runoff coefficient and the annual precipitation of 45 inches to find the annual amount of runoff with units of in/ac/yr.

TABLE 7
RUNOFF VOLUME BY ROADWAY CLASSIFICATION

Cover Type	%IMPERV	%FOR	%TURF	Rv	Runoff (in/ac/yr)
Interstates and Expressways	95		5	0.82	37.00
Arterial >30,000 ADT	95		5	0.82	37.00
Arterials or local roads <30,000 ADT	95		5	0.82	37.00
Adjacent to Commercial/Industrial Areas	95		5	0.82	37.00

3. Event Mean Concentration (EMC)

In the methodology, pollutant loads are calculated using the EMC derived from stormwater monitoring data. Several researchers have reported on or compiled pollutant data for highway runoff, including Shelley / Gaboury (1986), Driscoll (1990), Barrett et al. (1998), Wu et al., 1998, and Kayhanian et al. (2003). Pitt (2004) established a database of stormwater quality based on sampling for NPDES MS4 permits nationwide. These sources were reviewed to develop EMCs for model input. The monitored highway sites were categorized into two classifications based on ADT, with a breakdown of the data shown in **Tables 8 and 9**. Data are reported in mg/L except as noted. Note that the sediment shown in these stormwater monitoring results is reported as TSS.

TABLE 8
EMCs FOR HIGH TRAFFIC ROADS

Roads > 30K ADT	TN	TP	TSS	FC	Zn (ug/L)	Source
Freeways	2.28	0.25	99	1700	200	Pitt, 2004
Mixed freeways	2.20	0.26	81	730	90	Pitt, 2004
Freeway land, shoulder	2.72		220		380	Shelly/Gaboury, 1986, urban, median
Urban (>30K)	3.30	0.30	145	6700	228.8	Kayhanian et al, 2003, **Table 5**, avg
Walnut Creek Rd		0.10	19		24	Barrett et al, 1998, **Table 2**
W 35th St		0.33	129		222	Barrett et al, 1998, **Table 2**
>30K	2.59		142		329	Driscoll (1990)
AVERAGE	**2.62**	**0.25**	**119**	**3043**	**211**	
MEDIAN	**2.59**	**0.26**	**129**	**1700**	**222**	

TABLE 9
EMCs FOR LOW TRAFFIC ROADS

Roads < 30K ADT	TN	TP	TSS	FC	Zn (ug/L)	Source
Non-urban (<30K)	2.60	0.20	168	3800	63.4	Kayhanian et al, 2003, **Table 5**, avg
Convict Hill Rd		0.11	91		44	Barrett et al, 1998, **Table 2**
Freeway land, shoulder	1.40		26		90	Shelly / Gaboury, 1986, rural, med
Site I	1.38	0.20	215			Wu et al, 1998, **Table 3**
Site II	1.14	0.37	88			Wu et al, 1998, **Table 4**
Site III	1.10	0.26	14			Wu et al, 1998, **Table 5**
<30K	1.33		41		80	Driscoll (1990)
AVERAGE	**1.49**	**0.23**	**92**	**3800**	**69**	
MEDIAN	**1.36**	**0.20**	**88**	**3800**	**72**	

4. Loading Rates Summary

Loading rates, sometimes referred to as export coefficients, represent the unit load for one acre of land are reported in lb/ac/yr. They take into account the volume of runoff and the concentration of each pollutant. Runoff volume was calculated as the runoff coefficient times the average annual rainfall for Delaware of 45 inches. To derive pollutant concentrations, the average EMC was used for roads with > 30,000 ADT and < 30,000 ADT. Since the unit runoff is the same for all the roadways, the only differentiator for the loading rates is the EMC. **Table 10** shows the loading rates for TN, TP, and TSS in lb/ac/yr by roadway classification.

TABLE 10
LOADING RATES BY ROADWAY CLASSIFICATION

Cover Type	Rv	Runoff (in/ac/yr)	TN	TP	TSS
Interstates and Expressways	0.82	37.00	21.89	2.07	997
Arterial >30,000 ADT	0.82	37.00	21.89	2.07	997
Arterials or local roads <30,000 ADT	0.82	37.00	12.47	1.91	768
Adjacent to Commercial/Industrial Areas	0.82	37.00	21.89	2.07	997

F. POLLUTANT LOADS

The annual pollutant load is a function of the loading rate and the area of each roadway classification. The area was derived from data provided by DelDOT on the length and width of each type. Length was provided as miles of centerline, and width was a statewide average of the distance between edges of pavement. Classifications were based on the sweeping scenarios described earlier. The arterial roads were broken into categories depending on whether or not they would be targeted for sweeping in the scenario analysis. **Tables 11 and 12** list the results.

TABLE 11
SCENARIOS 1-4
ANNUAL POLLUTANT LOADING IN LB/YR BY ROADWAY CLASSIFICATION

Roadway Type	Centerline Miles	Acres	TN	TP	TSS
Interstate	188.7	995.3	21,788	2,060	992,511
Curbed, other	1,032.1	3,761.6	48,343	7,209	2,924,415
Targeted (Curbed > 30K ADT)	64.8	323.7	7,085	670	322,757
Targeted (Curbed IND/COM) <30K ADT	96.7	449.3	9,836	930	448,059
No Curbs	881.9	3,255.4	42,224	6,245	2,540,272
TOTAL UNTREATED LOADS	**2,265.0**	**8,785.4**	**129,275**	**17,115**	**7,228,019**

TABLE 12
SCENARIO 5
ANNUAL POLLUTANT LOADING IN LB/YR BY ROADWAY CLASSIFICATION

Roadway Type	Centerline Miles	Acres	TN	TP	TSS
Interstates and Expressways	188.7	995.3	21,788	2,060	992,511
Targeted Areas > 30K ADT or IND/COM, Curbed	188.3	897.5	19,646	1,858	894,948
Local Roads, most curbed	937.7	3,321.7	41,422	6,344	2,551,605
Non-targeted Arterial	217.4	1,067.8	15,207	2,072	866,234
Low Priority	732.1	2,503.0	31,213	4,781	1,922,716
TOTAL UNTREATED LOADS	**2,264.2**	**8,785.4**	**129,275**	**17,115**	**7,228,019**

G. STREET SWEEPING REMOVAL RATES

1. Introduction

There are a number of variables to take into account to estimate an annual removal rate for street sweeping. The first is the type of pickup itself. As the literature showed, there is a significant difference in the pickup efficiency of different sweeper technologies. Next is the frequency of sweeping. The more often a roadway is swept, the higher the level of pollutant removal will be. Finally, there are a number of other factors which affect the amount of each pollutant that is in particulate form and which can be collected by a sweeper operating near the curb. The starting point for developing removal rates to be used in modeling is the research identified during the literature review. In general, sediment shown in studies of street sweeping has been reported as Total Solids (TS), which includes both TSS and coarser material.

2. Pickup Efficiency

A number of studies have investigated the effectiveness of sweeper technologies. Most conducted measurements of street dirt at similar locations before and after sweeping, using procedures first documented by Pitt (1979), where a swath of street surface is vacuumed before sweeping to measure the buildup and a similar swath is vacuumed after sweeping to measure the remaining material.

To normalize the reporting of equipment capability, studies that reported results for reduction of solids for weekly sweeping are shown in **Table 13**. Several of these were documented in Zarriello (2002) and CWP (2006). Law et al. (2008) developed a conceptual model to develop street sweeping pollutant removal rates for the Chesapeake Bay Program, part of which summarized the research to come up with the removal rates for weekly sweeping for each type of equipment, shown in the last line of the table.

TABLE 13
PICKUP EFFICIENCY FOR VARIOUS SWEEPER TYPES, WEEKLY FREQUENCY

Primary Source	Secondary Source	Mechanical	Vacuum	Regenerative Air
Bender / Terstriep (1984)	Zariello, 2002	14% - 55%		
Shoemaker (2000)	Zariello, 2002	55%	93%	
Pitt (1985)	Zariello, 2002	< 30%		
Terrene Institute (1998)	Zariello, 2002		35-80%	
Bannerman (1999)	Zariello, 2002		98%	
WI DNR (1983)	CWP, 2006	24%		
Sutherland / Jelen (1997)*	CWP, 2006	30%		65%
CWP for CB Program	Law, 2008	25%	60%	60%

* Modeled results

There were fewer studies of the effectiveness of tandem sweeping. Sutherland and Jelen (1997) modeled tandem operation in comparison with older and newer mechanical sweeping technologies, along with regenerative air sweepers. The regenerative air sweeper reduced loads by approximately 65% while the tandem combination had an effectiveness of 48%.

3. Nutrient Removal

The pickup efficiencies reported are for street dirt or solids. Nutrient removal is a function of the amount of N or P bound to the sediment or existing in solid form. Equipment capability is significant in this regard, as the pollutant concentration in sediment varies with particle size. As described earlier, the effectiveness of removing different particle sizes varies by type of equipment. Since smaller particles carry more nutrients than larger ones, the vacuum and regenerative air sweepers that pick up more of the smaller particles are more effective at reducing nutrient loads.

The literature search to support developing rates for the Bay Program (CWP, 2006) gave removal rates for TS, TP, and TN for three sweeping frequencies. On average, the removal rate for TP was 41% of that for TS, and similarly, the rate for TN was 80%. Based on this information, the model developed in this paper made the assumption that TP and TN would be reduced at 40% and 80% the rate of sediment, respectively. **Table 14** shows the pickup efficiencies used in the DelDOT model.

TABLE 14
SUMMARY OF PICKUP EFFICIENCY, WEEKLY SWEEPING

Source	Sweeper	Percent Removal		
		TN	TP	TSS
Law, 2008	Mechanical	20	10	25
Law, 2008	Regenerative Air / Vacuum	48	24	60
Sutherland / Jelen 1997	Tandem	38	19	48

4. Frequency Discount

The frequency of sweeping is a significant element in pollutant removal and one of the key factors which was varied in developing different scenarios. The scenarios required modeling of pollutant removal for frequencies varying from one sweeping per year to two times per month. Recommendations for more frequent sweeping were based on asymptotic buildup of street dirt, which approached a maximum in 2 to 3 weeks.

Monitoring data focused on estimating removal for frequent sweeping, generally either twice a week or weekly. A summary of several of the studies is shown in **Tables 15 and 16**.

TABLE 15
MECHANICAL SWEEPER PICKUP EFFICIENCY BY FREQUENCY

Primary Source	Secondary Source	Twice per Week	Weekly
Bender / Terstriep (1984)	Zariello, 2002	23% - 62%	14% - 55%
Shoemaker (2000)	Zariello, 2002		55%
Pitt (1985)	Zariello, 2002		<30%
WI DNR (1983)	CWP, 2006	18.5%	24%
Law, 2008 Recommended			**25%**

TABLE 16
REGENERATIVE AIR/VACUUM SWEEPER PICKUP EFFICIENCY BY FREQUENCY

Primary Source	Secondary Source	Twice per Week	Weekly
Shoemaker (2000)	Zariello, 2002		93%
Pitt (1985)	CWP, 2006	49%	<30%
Terrene Institute (1998)	Zariello, 2002		35% to 80%
Bannerman (1999)	Zariello, 2002		98%
WI DNR (1983)	CWP, 2006	42%	24%
Law, 2008 Recommended			**60%**

No monitoring results were found for removal rates for monthly, quarterly, semi-annual, or annual sweeping. Law (2008) provided solids removal rates for weekly and monthly sweeping for two types of equipment, which were the basis for the Chesapeake Bay Program removal rates as of 2012, shown in **Table 17**.

TABLE 17
REMOVAL RATES FOR SOLIDS (LAW, 2008)

Sweeper	Weekly	Monthly
Mechanical	25%	18%
Regenerative Air / Vacuum	60%	42%

Two alternatives were investigated for estimating less frequent sweeps. The first was to research monitoring data for pollutant removal per curb-mile swept. The data obtained from this effort were highly variable and did not support the approach.

The second alternative involved simulated sweeping, reported in two studies, Zariello et al. (2002) who modeled variations of sweeping efficiency and frequency in SWMM for frequencies varying from daily to monthly, and Sutherland and Jelen (1997) who performed the same type of analysis using SIMPTM for frequencies from weekly to annually. Because the latter modeling provided results in the frequency range needed for this study, it was used to develop removal rate discount factors for sweeping at less than weekly frequencies. **Figure 1** shows the results of the SIMPTM simulations.

To estimate the reduced effectiveness as the sweeping frequency decreased, the percent reduction from weekly sweeping was calculated using removal rates read from **Figure 1** to supplement the data from Law (2008) in **Table 17**. For each of these rates, the ratio between the rate at the lower frequency and the weekly rate was calculated for Newer Mechanical, Tandem, and Regenerative Air sweepers. The average of the three ratios was calculated and was used for the frequency discount. **Table 18** shows the results.

These ratios were converted to discounts from weekly sweeping (**Table 19**) by subtracting the effectiveness in the last column of **Table 18**. For frequencies other than those shown in Error! Not a valid bookmark self-reference.~~Error! Not a valid bookmark self-reference.~~**~~Figure~~ 1,** values were calculated by interpolation.

FIGURE 1
PICKUP EFFICIENCY VARIED BY EQUIPMENT AND FREQUENCY
(SOURCE: SUTHERLAND AND JELEN, 1997)

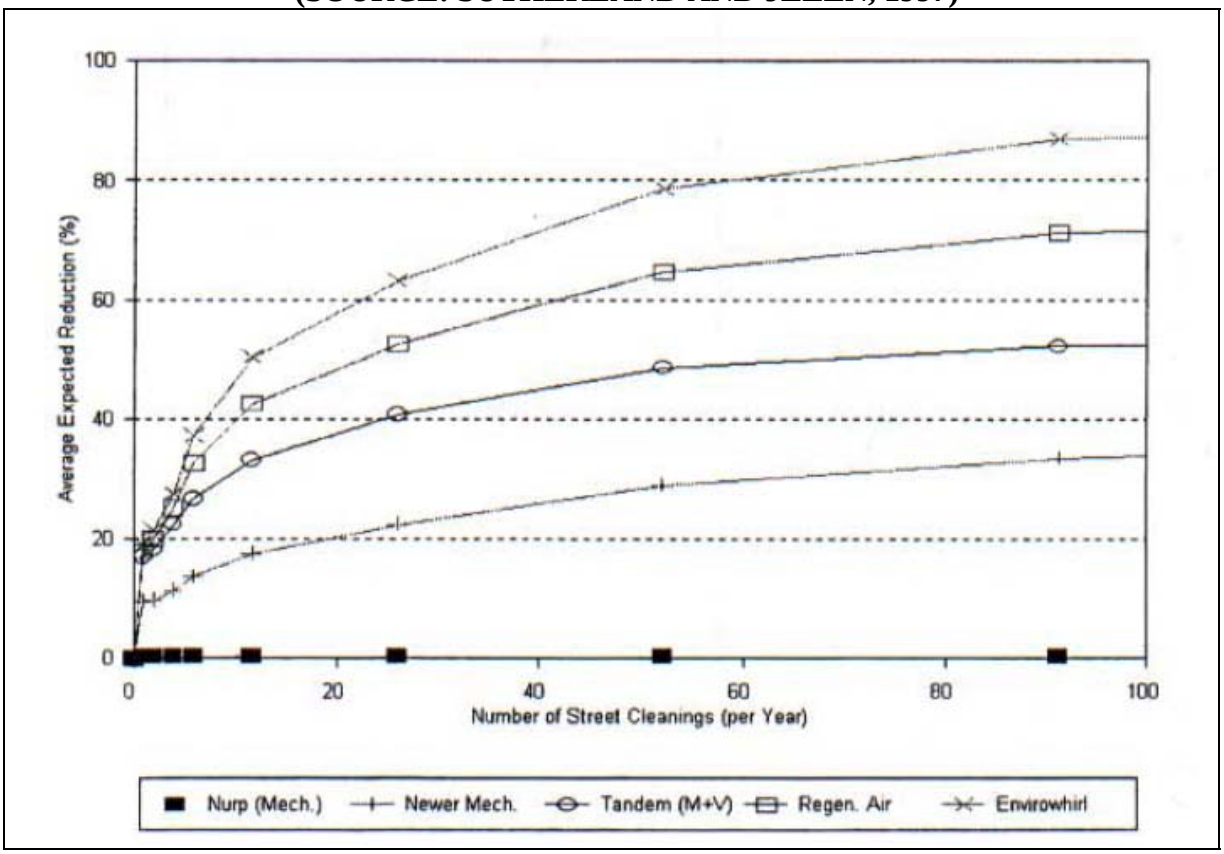


TABLE 18
REDUCED PICKUP EFFICIENCY BASED ON SWEEPING FREQUENCY

Sweep	Removal Rate (%)			Ratio against Weekly			Avg to use
per Year	New Mech	Tandem	Regen Air	New Mech	Tandem	Regen Air	
1	*9*	*17*	*18*	64%	65%	70%	66%
2	*10*	*18*	*19*	60%	63%	68%	64%
4	*11*	*22*	*25*	56%	54%	58%	56%
6	*14*	*27*	*33*	44%	44%	45%	44%
12	**18**	*33*	**42**	28%	31%	30%	30%
26	**21**	*41*	**51**	16%	15%	15%	15%
52	**25**	*48*	**60**	0%	0%	0%	0%

Source: **Bold**: Law et al., 2008
Italic Sutherland and Jelen, 1997

TABLE 19
DISCOUNT RATES FOR SWEEPING FREQUENCY

Source	Frequency	TS Removal Rate
Graph	1x	34%
Graph	2x	36%
Interpolated	3x	40%
Graph	4x	44%
Interpolated	7x	53%
Graph	8x	56%
Interpolated	9x	60%
Graph	12x	70%
Interpolated	18x	77%
Interpolated	24x	83%
Graph	26x	85%
Graph	52x	100%

5. Other Discount Factors

Other factors which come into play include estimates of how much of the pollutant load in runoff can be removed by sweeping as a procedure. Sweeping will not remove dissolved nutrients, so the fraction of the load represented by particulates is important. Fugitive dust loss is another factor, representing the portion of street dirt that may be blown off of the street during windy weather, removing it from reach of the sweeper. Similarly, research has found that 90 percent of street dirt is within a few feet of the curb. The portion near the center of the street will not be collected by sweeping. Finally, obstructions such as parked cars which prevent sweeping against the curb will reduce the effectiveness of sweeping.

Discount factors used in the model were taken from the conceptual model developed by Law et al. (2008), as shown in **Table 20**. All five were applied to every roadway classification except interstates, which were assumed not to have obstructions at the roadside similar to parked cars on residential or commercial streets.

TABLE 20
DISCOUNT RATES FOR OTHER FACTORS

Discounts	TN	TP	TSS
As particulate	67%	46%	100%
Fugitive dust loss	90%	90%	90%
Non-street contributions	75%	75%	80%
90% within 12" of curb	90%	90%	90%
Obstructions	80%	80%	80%

The particulate discount refers to the amount of pollutant that is in particulate form and therefore removable through sweeping. The factor of 100% for TSS indicates that all sediment is particulate and can be removed. The factor of 67% for TN indicates that two-thirds of this pollutant is bound to particulates and the remainder will not be removed by sweeping.

Fugitive dust loss shows that 10% of the street dirt is lost to sweeping when dust is created during the sweeping operation. Non-street contributions represent the loads contributed from off-site pollutant sources that are not reducible by sweeping, such as sidewalks, alleys, or roadsides that contribute washon loads but which are not swept.

The factor representing distance from the curb describes the fact that about 10% of the street dirt will be found away from the curb, where the sweeper will not reach it. Finally, the discount factor for obstructions shows that on average 20% of the curb length would not be swept because of parked cars or other obstructions.

H. RESULTS

1. Scenario Definitions

Five scenarios for sweeping were tested as alternatives to the existing sweeping procedure and the modification proposed by DNREC. All of them varied the frequency and equipment to be used. The first four used the same definition of roadway segments, while the fifth changed the mix of roads to be swept based on some of the preliminary planning for implementation. **Table 21** shows a summary of the roadway types and how they were combined for scenario planning.

TABLE 21
ROADWAY CLASSIFICATIONS AGGREGATED FOR SWEEPING SCENARIOS

<table>
<tr><th rowspan="2">Roadway Type</th><th rowspan="2">Area (ac)</th><th colspan="2">Scenarios 1 to 4</th><th colspan="2">Scenario 5</th></tr>
<tr><th>Length (miles)</th><th>Area (ac)</th><th>Length (miles)</th><th>Area (ac)</th></tr>
<tr><td>Interstates and Expressways</td><td>995.3</td><td>188.7</td><td>995.3</td><td>188.7</td><td>995.3</td></tr>
<tr><td>Targeted Areas > 30,000 ADT (Curb)</td><td>323.7</td><td>64.8</td><td>323.7</td><td rowspan="3">188.3</td><td rowspan="3">897.5</td></tr>
<tr><td>Targeted Areas COM/IND <30K ADT</td><td>449.3</td><td>96.7</td><td>449.3</td></tr>
<tr><td>Targeted Areas COM/IND >30K ADT</td><td>124.5</td><td rowspan="4">1,032.1</td><td rowspan="4">3,761.6</td></tr>
<tr><td>Local Roads, most curbed</td><td>3,321.7</td><td>937.7</td><td>3,321.7</td></tr>
<tr><td>Non Targeted Arterial <30K (Curb)</td><td>287.6</td><td rowspan="4">217.4</td><td rowspan="4">1,067.8</td></tr>
<tr><td>Non Targeted Arterial >30K (Curb)</td><td>27.9</td></tr>
<tr><td>Non Targeted Arterial <30K (No Curb)</td><td>579.5</td><td>881.9</td><td>3,255.4</td></tr>
<tr><td>Non Targeted Arterial >30K (No Curb)</td><td>172.9</td><td></td><td></td></tr>
<tr><td>Low Priority No Curb</td><td>2,503.0</td><td></td><td></td><td>732.1</td><td>2,503.0</td></tr>
<tr><td>All Roads</td><td>8,785.4</td><td>2,264.2</td><td>8,785.4</td><td>2,264.2</td><td>8,785.4</td></tr>
</table>

Scenario 1: Year-Round Sweep

Scenario 1 was a year-round sweep of all the roadway segments, with frequencies varying from twice a month to one annual sweep, and a total of 15,606 curb-miles swept.

Scenario 2: Seasonal Sweep

For the second scenario, sweeping frequencies were reduced to eliminate sweeping during winter months, when below-freezing temperatures and potential snowfall were not conducive to effective sweeping. Interstates were reduced to monthly sweeps and other targeted roads were

reduced to twice monthly sweeps for nine months out of the year. This scenario reduced the swept miles from Scenario 1 by about 2,500, to 13,148.

Scenario 3: Seasonal Curb-Only Sweep
With the understanding that sweeping curbed roadways is expected to result in significantly better pickup and pollutant removal than those without curbs, this alternative eliminated the single annual sweeping of open section roads, with a total of 11,384 miles swept.

Scenario 4: Seasonal, Curb-Only, Targeted Monthly Sweep
This scenario was developed to reduce all sweeping to a maximum frequency of once per month. This affected the targeted high-travel roads and roads adjacent to commercial and industrial land use, and a result that 9,150 miles would be swept.

Scenario 5: Revised Plan
Scenario 5 was developed after receiving comments from DelDOT Maintenance District personnel. It was based on revising the mix of targeted and non-targeted roadway segments to be swept in Scenario 4 to avoid constraints in equipment /staff allocation and funding. Scenario 5 included sweeping of non-targeted arterials (curbed and non-curbed) with greater than 10,000 ADT, and reducing the sweeping frequency by one less month (8x/year from 9x/year) for interstates and targeted roadways. As with earlier scenarios, interstates, high traffic roads, and those in commercial and industrial areas would be swept most often. In this scenario, the targeted roads were swept monthly for eight months, non-targeted arterials were swept quarterly, except for the winter, and all other curbed roads were swept once annually. The total minimum mileage to be swept was 8,498. **Table 22** (next page) provides a summary of roadway types, sweeping frequencies, total miles swept, and total cost for each scenario.

I. CONCLUSIONS AND RECOMMENDATIONS

1. Effectiveness

Table 23 and **Figure 2** provide a summary of the effectiveness and cost of each of the scenarios. In terms of percentage of pollutant removal, the goal was to exceed the removal of the 4:2:1 current scenario. All five scenarios met this goal, with the exception of Scenarios 3, 4, and 5, which equal the current removal for TP. It should be noted that pollutant removal effectiveness increases with Scenario 5 compared to Scenario 4; Scenario 5 added quarterly sweeping of high traffic volume roadways and reduced the sweeping frequency of interstate and targeted roadways from 9x/year to 8x/year.

TABLE 22
SCENARIO DEFINITION

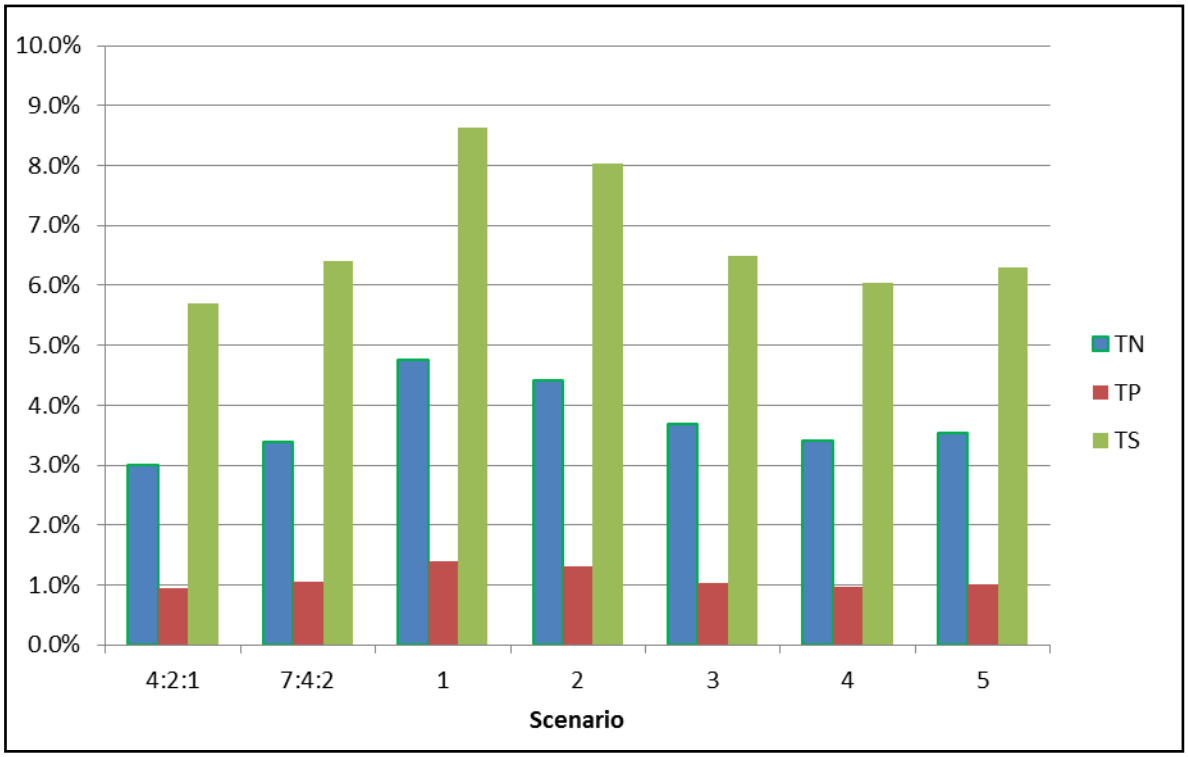
Scenario	Roadway Description	FRQ	Equipment	Cost/Mile	Curb-Miles Swept	Cost
1	**Year-Round**					
	Interstates	12x	Tandem	$100	3,882	$388,236
	Roads > 30K ADT, All	24x	Tandem	$100	2,132	$213,192
	Roads - Commercial / Industrial	24x	Tandem	$100	3,822	$382,200
	Roads- Open Section	1x	Mechanical	$50	1,764	$88,195
			Total		**15,606**	**$1,272,135**
2	**Seasonal**					
	Interstates	9x	Tandem	$100	2,912	$291,177
	Roads < 30K ADT, Curbs	2x	Mechanical	$50	4,006	$200,312
	Roads > 30K ADT, All	18x	Tandem	$100	1,599	$159,894
	Roads - Commercial / Industrial	18x	Tandem	$100	2,867	$286,650
	Roads- Open Section	1x	Mechanical	$50	1,764	$88,195
			Total		**13,148**	**$1,026,228**
3	**Seasonal Curb-Only**					
	Interstates	9x	Tandem	$100	2,912	$291,177
	Roads < 30K ADT, Curbs	2x	Mechanical	$50	4,006	$200,312
	Roads > 30K ADT, All	18x	Tandem	$100	1,599	$159,894
	Roads - Commercial / Industrial	18x	Tandem	$100	2,867	$286,650
	Roads- Open Section*		None		0	
			Total		**11,384**	**$938,033**
4	**Seasonal, Curb-Only, Targeted Monthly**					
	Interstates	9x	Tandem	$100	2,912	$291,177
	Roads < 30K ADT, Curbs	2x	Mechanical	$50	4,006	$200,312
	Roads > 30K ADT, All	9x	Tandem	$100	799	$79,947
	Roads - Commercial / Industrial	9x	Tandem	$100	1,433	$143,325
	Roads- Open Section*		None	$50	0	
			Total		**9,150**	**$714,761**
5	**Revised Plan**					
	Interstates and Expressways	8x	Tandem	$100	3,019	$301,904
	Roads > 30K ADT or IND/COM	8x	Tandem	$100	2,318	$231,800
	Local Roads, most curbed	1x	Mechanical	$50	1,857	$92,837
	Non-targeted Arterial	3x	Mechanical	$50	1,304	$65,214
	Low Priority *	0	Mechanical	$50	0	
			Total		**8,498**	**$691,755**

TABLE 23
POLLUTANT REMOVAL AND COST FOR ALL SCENARIOS

Scenario	TN	TP	TS	Miles Swept	Cost	Increased Cost
4:2:1	3.0%	1.0%	5.7%	9,032	$538,600	100%
7:4:2	3.4%	1.1%	6.4%	17,629	$1,033,700	192%
1	4.8%	1.4%	8.6%	15,606	$1,272,135	236%
2	4.4%	1.3%	8.0%	13,148	$1,026,228	191%
3	3.7%	1.0%	6.5%	11,384	$938,033	174%
4	3.4%	1.0%	6.0%	9,150	$714,761	133%
5	3.5%	1.0%	6.3%	8,498*	$691,755	128%

*This figure does not include additional roadways that would be swept, as needed, by special work order. They were excluded from this modeling exercise. Total actual miles swept in any given year would be greater, but variable.

FIGURE 2
POLLUTANT REMOVAL FOR ALL SCENARIOS (%)



2. Proposed Costs Compared to Existing Plan

Scenario 5 is the least costly of the proposed plans with an estimated increase of 28% over the existing 4:2:1 plan. Conversely, DNREC's proposed 7:4:2 plan was estimated to nearly double the cost of the existing plan.

3. Feasibility of the Proposed Plans

During the development of any proposed plans, it was assumed that DelDOT is limited to their existing manpower and equipment for any new Street Sweeping Plan. Therefore, feasibility of the proposed plans was based on keeping total sweeping miles similar to the existing 4:2:1 plan. Of the 5 scenarios, only Scenarios 4 and 5 have been deemed to be feasible. Scenarios 1, 2 and 3 increase total sweeping miles by 26-72%; DNREC's proposed 7:2:1 plan increases sweeping miles by 95%. Scenario 4 increases total sweeping miles slightly, and Scenario 5 reduces total sweeping miles slightly compared to the existing 4:2:1 plan. However, roadways excluded from the modeling in Scenario 5 would still be swept as needed, by special work order, Thus, in a given year, total mileage swept would be variable,, but still roughly equivalent to the existing 4:2:1 plan.

4. Ability to Meet the New Phase I MS4 Permit

DelDOT feels that each of Scenarios 1-5 meets the intent of the new Phase I MS4 Permit for New Castle County. Each scenario increases pollutant removal percentages for TN, TP and TS (with the exception of Scenarios 3, 4 and 5, which equal the current removal for TP) compared to the existing 4:2:1 plan. Scenarios 1, 2, and 3 exceed DNREC's proposed 7:4:2 plan pollutant removal; Scenario 4 has lower pollutant removal than DNREC's proposed 7:4:2 plan; and Scenario 5 nearly matches the pollutant removal for DNREC's proposed 7:4:2 plan.

5. Recommendation

Scenario 5 was judged to be the recommended scenario that met all of the objectives. This scenario increases pollutant removals over the existing 4:2:1 plan and nearly matches the pollutant removal of DNREC's 7:4:2 plan. Scenario 5 is the least costly of the proposed plans, with an estimated increase of 28% over the existing 4:2:1 plan. Conversely, DNREC's 7:4:2 plan was estimated to nearly double the cost of the existing plan. From a feasibility standpoint, Scenarios 4 and 5 were the only plans that realistically could be implemented with DelDOT's current manpower and equipment. This is based on comparing miles swept with the existing 4:2:1 plan. Scenario 5 is the only plan that reduces miles swept (by 8%) compared to the existing 4:2:1 plan.

J. REFERENCES

Barrett, M. E., Irish, L. B., Malina, J. F., Jr., and Charbeneau, R. J. (1998). "Characterization of highway runoff in Austin, Texas area." J. Environ. Eng., 124(2), 131–137.

Breault, R,F., K. P. Smith and J.R. Sorenson. 2005. Residential Street-Dirt Accumulation Rates and Chemical Composition, and Removal Efficiencies by Mechanical-and Vacuum-Type Sweepers, New Bedford, Massachusetts, 2003-04. Scientific Investigations Report 2005-5184. U.S. Department of the Interior, U.S. Geological Survey.

Butcher, Jonathan B. (2003). "Buildup, washoff, and event mean concentrations." JAWRA 39(6)1521-1528

Center for Watershed Protection (2006). Technical Memorandum 1 – Literature Review. Research in support of an interim pollutant removal rate for street sweeping and storm drain cleanout activities. CWP, Ellicott City, MD, October 2006.

Chesapeake Stormwater Network (2009). Technical Support for the Baywide Runoff Reduction Method, Version 2.0. Baltimore, MD www.chesapeakestormwater.net

Driscoll, E.D. Shelley, P.E., and Strecker, E.W. (1990). "Pollutant loadings and impacts from highway stormwater runoff. Vol. I: Design procedure." FHWA-RD-88-007. FHWA, Washington, DC.

Irish, L. B., Barrett, M. E., Malina, M. E., Jr., and Charbeneau, R. J. (1998). "Use of regression models for analyzing highway stormwater loads." J. Environ. Eng., 124(10), 987–993.

Kayhanian, Masoud, Amardeep Singh, Claus Suverkropp, and Steve Borroum (2003). impact of annual average daily traffic on highway runoff pollutant concentrations." J. Environ. Eng., 129(11), 975-990.

Law, Neely, Katie DiBlasi, and Upal Ghosh (2008). Deriving reliable pollutant removal rates for municipal street sweeping and storm drain cleanout programs in the Chesapeake Bay basin. Center for Watershed Protection, Ellicott City, MD, 2008.

Pitt, R.E (1979). Demonstration of Nonpoint Pollution Abatement Through Improved Street Cleaning Practices, EPA 600/2-79-161, August 1979.

Pitt, Robert, Roger Bannerman, Shirley Clark, and Derek Williamson (2004). "Sources of pollutants in urban areas (part 1) – older monitoring projects." Effective Modeling of Urban

Water Systems Monograph 13, W. James, K.N. Irvine, E.A. McBean, and R.E. Pitt, Eds., CHI Publications, 2004

Pitt, Robert, Alex Maestre, and Renee Morquecho (2004). The national stormwater quality database (NSQD, version 1.1).
http://unix.eng.ua.edu/~rpitt/Research/ms4/Paper/Mainms4paper.html

Schilling, J.G. (2005). "Street Sweeping-Report No.1, State of the Practice." Prepared for Ramsey-Washington Metro Watershed District http://www.rwmwd.org. North St. Paul, Minnesota.

Scheuler, Thomas R., 1987. Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPs. Metropolitan Washington Council of Governments, Washington, DC.

Seattle Public Utilities (2009). Seattle street sweeping pilot study. Monitoring report. Seattle Public Utilities, Seattle WA, April 22, 2009.

Selbig, W. R. and R.T. Bannerman. 2007. Evaluation of Street Sweeping as A Stormwater-Quality-Management Tool in Three Residential Basins in Madison, WI. U.S. Geological Survey Scientific Investigations Report 2007-5156, 115pp.

Shelley, P.E., and Gaboury, D.R., 1986, Estimation of pollution from highway runoff-Initial results, *in* Urbonas, B., and Roesner, L.A., eds., Urban Runoff Quality--Impact and Quality Enhancement Technology: Henniker, N.H., Proceedings of an Engineering Foundation Conference, Henniker, NH, June 23-27, 1986. ASCE, New York, NY.

Sutherland, R.C. and S.L. Jelen (1997), "Contrary to conventional wisdom: street sweeping can be an effective BMP", Advances in Modeling the Management of Stormwater Impacts, Volume 5, edited by Dr. William James, January 1997.

Sutherland, R. C., and Jelen, S. L. (1996). "Sophisticated stormwater quality modeling is worth the effort." Advances in modeling the management of stormwater impacts, W. James, ed., CHI, Guelph, Canada 1–14.

US Environmental Protection Agency (2006). "Parking Lot and Street Cleaning." NPDES. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm? action=browse&Rbutton= detail&bmp=99 (accessed 21/February/2012).

Walch, Marianne (2006). Monitoring of contaminants in Delaware street sweeping residuals and evaluation of recycling / disposal options. Presented at 21st International Conference on Solid Waste Technology and Management, Philadelphia, PA March 26-29, 2006.

Wu, J. S., Allan, D. J., Saunders, W. L., and Evett, J. B. (1998). "Characterization and pollutant loading estimation for urban and rural highway runoff." J. Environ. Eng., 124(7), 584–592.

Zarriello, Phillip J. Robert F.Breault, and Peter K. Weiskel (2002). Potential effects of structural controls and street sweeping on stormwater loads to the lower Charles River, Massachusetts. US Geological Survey Water Resources Investigations Report 02-4220, USGS, Northborough, MA, 2002.

Reviewed, Not Used

Bannerman, R., D. Owens and N. Hornewer. 1993. Sources of Pollutants in Wisconsin Stormwater. Water Science Technology, 28(3-5): 241-259.

Berretta, Christian, Saurabh Raje, and John J. Sansalone (2011). Quantifying nutrient loads associated with urban particulate matter (PM), and biogenic/litter recovery through current MS4 source control and maintenance practices. Final report to Florida Stormwater Association Educational Foundation (FSAEF). University of Florida, Gainesville FL.

Li, Ming-Han, Barrett, M.E., Rammohan, P., Olivera, F. and Landphair, H.C. (2008). "Documenting stormwater quality on Texas highways and adjacent vegetated roadsides." J. Environ. Eng., 134(1)48–59.

Pitt, R., Bannerman, R., and Sutherland, R., 2004, The role of street cleaning in stormwater management, in ASCE, World Water and Environment Congress, Salt Lake City, June 28–July 1, 2004, Proceedings: 9 p.

Sansalone, J.J., J.M. Koran, J.A. Smithson, and S.G. Buchberger. 1998. "Physical Characteristics of Urban Roadway Solids Transported During Rain Events," in Journal of Environmental Engineering. ASCE. 124(5): 348-365.

Schueler, Tom (2011). Nutrient accounting methods to document local stormwater load reductions in the Chesapeake Bay watershed. CSN Technical Bulletin No. 9. Review Draft. Ellicott City, MD, August 15, 2011.

Sutherland, R.C., S.L. Jelen, and G. Minton, 1998. High Efficiency Sweeping as an Alternative to the Use of Wet Vaults for Stormwater Treatment, Published in Advances in Modeling the Management of Stormwater Impacts, Volume 6, Edited by William James, CHI Publications.

Sutherland R.C. and S.L. Jelen (2002), "Development of accurate urban runoff pollutant loads for TMDL analyses", Proceedings of StormCon, The North American Surface Water Quality Conference & Exposition, Marco Island, Florida, August 2002.

Sutherland, R.C. and S.L. Jelen (2003), "Stormwater quality modeling improvements needed for SWMM", Practical Modeling of Urban Water Systems Monograph 11, edited by William James, CHI Publications, 2003, pp. 253-289

Sutherland, R. C. 2009. “Recent street sweeping pilot studies are flawed.” APWA Reporter 76(9): 50–53.

Sutherland, R.C. (2011). The role street sweeping must play in achieving numeric pollutant limits. Stormwater 12(8)

Waschbusch, R. J., Selbig, W. R. & Bannerman, R. T. (1999) Sources of phosphorus in stormwater and street dirt from two urban residential basins in Madison, WI, 1994–95. US Geological Survey Water-Resources Investigations Report 99-4021, Madison, WI.

Not Obtained

Shrake, J., N. Schaedler, M. Kayhanian and K. Tsay. 2003. Impacts of congestion on urban highway runoff water quality with similar average daily traffic. Proceedings StormCon ’03, San Antonio, Texas, July 28-31, 2003.

APPENDIX I1

NEW CASTLE COUNTY
HERBICIDE APPLICATION S.O.P.

New Castle County Special Services

Property Maintenance **Standard Operating Procedures**

Subject:	**Herbicide Usage**	**Approved By:**	**Paul Johnson**
Section:	**20.0**	**Page:**	**1 of 1**
		Date:	**September 1, 2006**

Objective: To provide information for the safety of our employees and the general public while using general purpose herbicides.

Statement: This procedure will be followed by all Property Maintenance Personnel.

Procedure:

1. All Property Maintenance Personnel will be trained on the safe usage of general purpose pesticides before applying.
2. All applications will be made in accordance with the product label. In Delaware, the label is the law.
3. The use of personal protective equipment as outlined on the product label is mandatory while mixing or spraying is taking place.
4. Spraying will not take place on days where the wind speed is greater than 5mph to reduce the potential for drift. Or, when precipitation is forecasted within 24 hours after spraying concludes.
5. Every effort will be made to protect the public when spraying. Ideally, no spraying will occur while a park is occupied. If necessary to spray while a park is occupied, the occupants will be notified and a safety zone will be established until the spraying is complete.
6. The use of restricted use herbicide is forbidden. Should the need arise to apply a restricted use herbicide; applications will be made by an employee licensed by the State of Delaware.
7. The gas powered sprayers will be operated as outlined in the owner's manual.
8. All personnel will be trained on the proper use of our spraying devices. Training will be documented and kept on file.
9. The Technician for each Sub-Section will approve all areas to be sprayed. The goal is to only spray labor intensive areas that would require extra manpower to maintain. This will be limited to smaller fixed objects such as fence lines, bollards, sign posts etc. No large open areas are permitted to be sprayed.
10. Spraying by our mowing contractors will only be performed after authorization and supervision of a NCC Property Maintenance supervisor.

APPENDIX I2

NEW CASTLE COUNTY
FERTILIZER APPLICATION S.O.P.

New Castle County Special Services

Property Maintenance **Standard Operating Procedures**

Subject:	**Fertilizer Applications**	**Approved By:**	**Paul Johnson**
Section:	**21.0**	**Page:**	**1 of 1**
		Date:	**September 1, 2006**

Objective: To outline the requirement for applying fertilizer to county owned property.

Statement: This procedure will be followed by all Property Maintenance Personnel.

Procedure:

1. Fertilization rates will be determined by a soil analysis conducted by a certified testing facility.
2. Applications will be made in accordance with the product label.
3. Application rates will not exceed 4# of Nitrogen per 1000 square feet in any given calendar year. 2# of nitrogen per 1000 square feet will never be exceeded during any single application.
4. An active nutrient management and animal waste plan will be kept up to date for our Carousel Park Equestrian operation.
5. To ensure accuracy of our application rates, all spreaders will be calibrated prior to applying fertilizer.
6. All applications made will be properly documented on the necessary work order.
7. All necessary safety gear and personal protective equipment will be worn in accordance with the product label.
8. Fertilization will primarily take place in the spring and fall. Fertilizer will not be applied throughout the summer months. (June through August)
9. Fertilizer will not be applied when precipitation is forecasted within a 24 hour period post-application.
10. As a general rule, to minimize fertilization rates, we will only fertilize the athletic fields within the park system.

APPENDIX J

NEW CASTLE COUNTY
WATER STORM OPERATIONS / SNOW REMOVAL PLAN

SUBJECT: Winter Storm Operations / Snow Removal Plan

The Department of Special Services is committed to perform snow removal and other necessary services at all County facilities in a timely and orderly manner, 7 days a week, 24 hours a day, thereby contributing to the general public welfare and eliminating unnecessary hardship. This will be accomplished in the most expeditious and safe way possible, utilizing the resources available within the Special Services Department.

PURPOSE: To establish a policy and set forth procedures for response to winter storm events by the Special Services Department (the "Department"). This policy shall apply to snow/ice removal activities, as well as other services that the Department must provide during winter storm events.

POLICY GUIDELINES:

A. Construction Support Section:

(1) Based on resource allocation and past practice, the Construction Support section of the Environmental Operations division shall normally be responsible for snow/ice removal and winter storm operations at County facilities listed in attachment "A" of this Policy. Attachment A also lists specific personnel assignments and priorities of response (High or Secondary Response.)

(2) The Environmental Operations division head or his/her designee (usually the supervisor of Construction Support) shall be designated the Snow Operations Coordinator and is authorized to utilize division resources to perform winter storm response operations.

(3) The Construction Support section areas of responsibility shall generally be supervised by one (1) Crew Chief II.

B. Property Maintenance Section:

(1) The Property Maintenance section of the Internal Services division shall normally be responsible for snow/ice removal and winter storm operations at County facilities listed in attachment "B" of this Policy. Attachment B also lists specific personnel assignments and priorities of response.

(a) The following list of priorities corresponds to Attachment B and must be handled accordingly.

High Priority:	Critical areas that must be completed first
Medium Priority:	Important areas that will be completed after the critical areas
Low Priority	Completed as time allows once high and medium are completed

(b) Personnel involved for each priority (non-working hours).

High Priority:	Technician for Sub-Sections 1 and 2/Warehouse Personnel Dist. 3, Special Projects and the Alapocas South Crews
Medium Priority:	Both Technicians/Warehouse Personnel All Crew Chiefs and sufficient personnel to complete priorities
Low Priority:	All low priority work will be accomplished during normal working hours

(2) The Property Maintenance section manager or his/her designee shall be designated as the Assistant Snow Operations Coordinator and shall provide necessary assistance to the Snow Operations Coordinator while directing Property Maintenance resources during winter storm operations.

(3) The Property Maintenance district shall be supervised by one (1) Property Technician. The County shall be divided into three property maintenance districts.

(4) During a snow event, the Property Manager and Property Supervisor will communicate and determine at what time employees will be deployed. All decisions for call-ins will be made by one of these individuals. Once a decision is made, the Property Maintenance snow coordinator and the Construction Support snow coordinator will begin communicating on the needs of each section. As each snow event is unique to severity, day of the week and time of the day, needs will change or be adjusted accordingly. Nonetheless, Property Maintenance is responsible for critical areas that must receive attention regardless of the variable factors associated with each storm.

1. Conner Building/Warehouse/Garage/EMS Station/Fuel Dispensers
2. Woodlawn Library
3. Tally Day Library
4. Rockwood
5. Carousel (due to the horses and fire department access)

C. Essential Personnel:

(1) Because of the multitude of responsibilities within the Operations branch of the Department, each section head must maintain a listing by job title and/or facility function designation "essential personnel" within their section. A copy of these lists shall be forwarded to the general manager's office through the appropriate division head and the Operations branch senior manager no later than November 1 of each year.

D. Snow and Ice Control Plan (.1):

(1) Attachments "A, " "B" and "C" set forth equipment requirements, personnel assignments and priority levels of service for the various facilities and parks that the Department must maintain during a winter storm event.

(2) Prioritization of facilities and parks are based on locations where there is a history of significant number of employees and/or citizens using the facility, even during storm events. Secondary priority plowing locations are infrequently used by the public during winter storm events or County facilities (such as pump stations) that would be a destination for County employees only if a malfunction occurred.

(3) Whenever there is any precipitation during the winter months which occurs between the hours of 7:00 a.m. and 3:00 p.m. during our regular work day, and the temperature is such that it could cause problems, all high priority areas will be checked during the day and before 2:00 p.m. If we receive a call for one location, all locations will then be considered for maintenance.

(4) If personnel are called in during the night for any high priority location, then the following areas will be checked and maintenance performed as necessary:

1. Conner Building
2. Government Center
3. Gilliam Building
4. Public Safety
5. Kimberton Police Academy
6. Carousel
7. EMS Stations
8. All libraries (depending on the time of the call in)

(5) In addition, if an emergency call-in occurs during the night, crews will be scheduled to come in at 5:00 a.m. (or earlier if determined by the Snow Operations Coordinator in conjunction with the Operations Branch Senior Manager) the next morning to begin the snow and ice removal schedule. This will be at the discretion of the Snow Operations Coordinator as to how many hand crews and trucks will be in operation. The remainder of the crews will be in operation as scheduling allows and as they are needed.

(6) The timeframe in which facilities or parks will be plowed/salted or sanded during snow events depend upon the severity and/or duration of the event. Ideally:

(a) For snow events 6 inches or less, all priority locations should be completed within 8 hours.
- For snow events 6 inches or less, secondary locations should be completed within 48 hours after all priority locations have been cleared.

(b) For snow events greater than 6 inches but less than 10 inches, priority locations should be completed within 16 hours.
- Secondary locations should be completed within 72 hours after all priority locations have been cleared.

(c) For snow events greater than 10 inches, priority locations should be completed within 24 hours of the end of the precipitation.
- Secondary locations should be completed within 96 hours of the end of precipitation.

(7) Supervisors shall ensure that Hansen entries are accomplished under the appropriate "Group Project" number to verify work accomplished.

(8) Pre-season Preparation: By November 1 of each year, the Snow Operations Coordinator and his/her assistant shall review this plan with special emphasis on:

(a) Updating added facility/park responsibilities, assigning responsibilities to appropriate crew and annotating attachments "A" and "B" of this Policy.

(b) Review the Department training program regarding updated facility/park responsibilities, safety issues, driving skills and new equipment.

(c) Coordinate with the Fiscal unit for purchase of necessary quantities of salt, sand or other materials and ensure that additional snow handling equipment has been ordered.

(9) Operator Training: Due to the hands-on nature of training necessary for plowing and salting operations, the Snow Operations Coordinator shall maintain a list of all personnel who have been trained and certified to utilize plowing and salting vehicles. Prior to an individual operating a plowing or salting vehicle who has not been trained, the Snow Operations Coordinator will assign that individual with a certified operator. The certified operator will explain all pertinent information needed for the safe operation of the equipment to be utilized and demonstrate during snow/ice conditions the appropriate use of the plowing/salting equipment vehicle. The certified trainer shall then observe the hands-on operation of the trainee. Once the trainee has successfully demonstrated his/her ability to operate the vehicle and equipment in snow event conditions, the trainer shall notify the Snow Operations Coordinator so that the trainee will be added to the list of authorized operators.

E. Snow Warning Notification (.2):

(1) When the Department receives credible information of a potential winter storm that will require snow plowing/salting and/or salting, the Snow Operations Coordinator shall:

(a) Coordinate with the Transportation section manager to ensure all essential equipment is prepared for utilization during the snow event and that garage facilities will be available during the storm event.

(b) Coordinate with the Assistant Snow Operations Coordinator concerning availability of personnel.

(c) Coordinate with the Central Receiving supervisor for warehouse resources.

(2) The New Castle County Office of Emergency Preparedness and the Delaware Emergency Management Office are the primary monitoring agencies for storm events. The Office of Emergency Preparedness issues winter storm warning information via the County e-mail system. In addition, the Special Services Dispatch office will monitor the Weather Channel and local television stations when winter storm events are eminent.

F. Personnel Scheduling (.3):

(1) Snow plows and other pieces of mechanical equipment are difficult to operate under storm conditions. Winter maintenance activities require night time use of plows, loaders, heavy equipment and snow blowers. Road surfaces are slippery, visibility can be limited and the potential for accidents increase during winter storm events. Fatigue and cold/damp weather conditions can reduce an employee's alertness or response time. Operators need to be aware that long hours of demanding work will exact a toll and the price paid for an error in judgment may be extremely high. To minimize the potential for injuries or property damage, employees working a storm event shall be limited to sixteen (16) continuous hours of actual work whenever it is possible. After sixteen (16) continuous hours, the employee will be required to rest at their assigned shop or other designated area, for at least four (4) hours (if possible) before resuming winter storm operations. Employees shall remain on the clock during this period of time. In all situations where employees have worked sixteen (16) continuous hours, the Snow Operations Coordinator and the General Manager, or his/her designee, shall discuss each situation and document their meeting and conclusions. Supervisors shall closely monitor the ability of vehicle/heavy vehicle operations after sixteen (16) continuous hours of operation to gauge the employee's ability to continue their operations with a rest period. Operators indicating a desire to rest for at least a four (4) hour period of time, shall be granted that request.

(2) When scheduling crews, supervisors must ensure maximum use of equipment and equalization of work assignments of their personnel.

(3) As noted in Sections A, B and C of this Policy, areas of responsibility have been pre-designated for snow/ice removal activity. The Snow Operations Coordinator may make adjustments to those assignments due to severity of storm events or in the best interest of

public health/safety. Variations in assignments from this Policy do not create a precedent for future activities.

G. Mobilization (.4):

(1) The Snow Operations Coordinator shall initiate the Winter Storm Operation Plan upon:

(a) A severe weather warning being received and the storm is eminent; or
(b) Field conditions indicated snow or icing hazards.

(2) If the Winter Storm Operation Plan is activated during normal work hours of the Department (Monday through Friday, 7:00 a.m. to 3:00 p.m.), the Snow Operations Coordinator shall notify:

(a) The General Manager.

(b) The Dispatch office, who shall notify all personnel by radio.

(c) Essential personnel on vacation who may be available.

(d) The Property Maintenance manager (i.e., Assistant Snow Operations Coordinator).

(e) The Fleet Operations manager.

(3) If the Winter Storm Operation Plan is activated during off hours, the Snow Operations Coordinator shall notify:

(a) The General Manager.

(b) His/her subordinate supervisors who will, in turn, contact all essential personnel in the Environmental Operations division to advise that the Plan is activated.

(c) The Property Maintenance manager/the Assistant Snow Operations Coordinator who shall make the appropriate notification to Property Maintenance personnel that the Plan is activated.

(d) Dispatch (if open) who, in turn, shall notify the Fleet Operations manager or the Fleet Operations supervisor on call.

H. Snow and Ice Control Materials (.5):

(1) Rock salt is the primary material that will be applied by snow removal equipment and all personnel performing this function need to be aware of their surroundings, intensity of the storm, consistency of the snow and temperature.

(2) Operators of salt spreading vehicles **will not** spread salt within a 10± foot area of the main entrances to New Castle County buildings (i.e., Government Center, Public Safety Building, Conner Building, Gilliam Building, paramedic facilities/stations, libraries). Hand crews will apply an ice melting agent (magnesium chloride) in these main entrance areas to maintain a minimum level of "tracking" of salt residue into the buildings.

(3) Operators will adjust the intensity of the salt application when working near vehicles that are parked nearby. This will avoid possible damage to the paint caused by the "sandblasting" effect of the rock salt striking the vehicle. Spinners should be adjusted to rotate at the lowest possible speed to accomplish this goal.

(4) The application of salt will be monitored by the Snow Operations Coordinator, who will assess each storm and direct the operators as to the need for applying this chemical. Each storm event will require various levels and timeframes in the applications of salt, and every effort will be made to ensure the safety of both the public and New Castle County employees. However, good resource management practices dictate that the salt should not be wasted due to financial and environmental concerns.

I. Equipment Preparation (.6):

(1) All snow removal equipment (Attachment "C") will be checked by Fleet Maintenance for the purpose of assuring that everything is available for winter operations no later than November 15 of each year. Any deficiencies will be corrected as soon as they are noted.

(2) Depending upon the temperature and weather forecasts, further preparation of snow removal equipment will be done well in advance of any impending storm event. This preparation should be started as early as late November of each year. In the Environmental Operations division, the Snow Operations Coordinator will be responsible for the implementation of this task; the Property Maintenance manager/Assistant Snow Operations Coordinator will be responsible for the same task within the Internal Services division.

(3) Prior to the operation of snow removal equipment/vehicles for a winter storm event, operators shall inspect the equipment/vehicle for damage, ensure fluid levels are full, belts and tire pressure are appropriate, and all lights, safety and warning devices are operational.

(4) On the first working day of November, December, January, February and March, the Snow Operations Coordinator shall forward a listing of the operational status of all equipment listed in Attachment "C," noting those equipment items that are not operational, reason not operational and estimated date of full operational capability.

J. Equipment Calibration (.7):

(1) Once all the equipment is mounted and ready for use, the vehicle coordinator in Construction Support, under the direction of the Snow Operations Coordinator, will instruct all operators in the proper operation and settings of the spinners, plows and all associated snow removal equipment. This will ensure that everyone, seasoned plowing veterans and those learning how to plow/salt, will understand the proper operation and function of his/her equipment. This is especially important when new equipment has been purchased or different personnel have been assigned to Construction Support.

K. Snow Route Assignment (.8):

(1) The vehicle assignment sheet for Construction Support (Attachment "A" and"A-1") of this Policy will be strictly adhered to in order to prevent unnecessary confusion and the possibility of an assignment within an area not being plowed.

(2) The Snow Operations Coordinator, or his/her designee, is the only person authorized to alter the assignment sheet.

(3) A copy of this sheet, along with any changes made during each snow/ice event, will be supplied to Dispatch, who will assist and monitor the snow operations.

L. Loading Procedures (.9):

(1) Only qualified personnel authorized by the Snow Operations Coordinator will load snow removal equipment with salt.

(2) Every effort shall be made by the operator of the loader to perform this task in the safest and most effective manner possible. Material wastage shall be held to a minimum, and all trucks will be loaded to level with or below the sideboards of the truck bed.

(3) After loading, each dump truck operator will ensure that his/her vehicle is properly tarped.

M. Spreading and Plowing Procedures (.10):

(1) Operators are expected to know their snow plowing routes and, where possible, will be afforded the opportunity to perform a pre-winter season run of the assigned areas during regular working hours. In this way, the operator can recognize possible hazards that exist before it snows when everything is covered over.

(2) Before each winter season begins, markers will be placed in the areas deemed necessary by the Snow Operations Coordinator to avoid potential problems and aid the operators in their effort to plow safely. Participation of the Property Maintenance section is an

important part of this task, since they are located throughout New Castle County and can readily perform this vital function. The Snow Operations Coordinator will request assistance of Property Maintenance through the Property Maintenance manager.

(3) When actual plowing operations commence, each individual operator will perform in his/her area of responsibility and report any problems, concerns or equipment failure to the Snow Operations Coordinator. Any areas not plowed will be noted with the appropriate reasons and this information will be turned over to the Snow Operations Coordinator.

(4) Snow removal vehicles traveling with and working around traffic are subject to the same traffic regulations as other vehicles. Operators must be alert and should adopt defensive driving habits. All snow removal operators will ensure that all emergency situation lighting is working properly on their assigned vehicle and will turn in for repair anything that is malfunctioning. The Snow Operations Coordinator must be notified if any vehicle is put down for repairs.

(5) No snow removal operator will leave his/her assigned area without notification from the Snow Operations Coordinator or his/her designee.

N. Snow Storage (.11):

(1) During plowing operations, snow can be pushed into piles when it is not feasible to attempt to push it totally off paved areas. Depending on the intensity of the storm, rubber tire loaders/backhoes will be utilized to consolidate the materials into larger piles in order to provide more post-storm parking at County facilities.

(2) In the event of large storm events where the amount of plowed snow needs to be totally removed, the Snow Operations Coordinator will explore the different options available.

(a) Contact the Delaware River & Bay Authority (DRBA) to haul snow to designated areas at the New Castle County Airport.

(b) In County parks, haul to an area in the parkland where storage of snow will not interfere with the daily operations of the park.

(c) Contact State agencies to explore the feasibility of dumping snow into the Christiana River at the boat ramp area on Churchmans Road.

O. Snow Operations Damages (.12):

(1) In the event any operator of a snow removal vehicle/equipment encounters any problems such as accidents, damage to plow equipment due to hidden objects, or personal injury, the operator will adhere to the following procedures:

(a) Notify Dispatch with the seriousness of the problem and inform them to notify the Snow Operations Coordinator or his/her designee and police/fire units if deemed necessary. The Snow Operations Coordinator will direct the operator on how to proceed to rectify the problem.

(b) The Snow Operations Coordinator or his/her designee shall record all pertinent data that will be needed for the SIR and/or injury report. This will include, but is not limited to, the time and place of the incident, what happened, if police were notified, and the damage and condition of the vehicle and operator.

(c) As soon as possible after the storm event, complete all appropriate paperwork and forward same through the general manager to Risk Management so that the accident/ problem may be resolved as expeditiously as possible.

P. Parking Control (.13):

(1) An informative and concise plan (Attachment "D") has been established concerning parking at County facilities during the winter/snow/ice season. The Snow Operations Coordinator shall meet with his supervisors, to include a senior manager of the Department, to establish and update parking procedures and to inform all locations of the plan.

(2) A contact will be established at the following County locations to aid in the implementation of parking control:

(a) Government Center
(b) Public Safety
(c) PAL Hockessin
(d) Churchmans Road Complex – Fleet Maintenance

General Manager, Special Services Department

1/15/10
Date

Attachments:

A. Construction Support Location/Equipment/Personnel Assignment Roster
B. Property Maintenance Location/Personnel Assignment Roster
C. Snow Plan Equipment Listing
D. Snow Plan Parking Control Plan

CONSTRUCTION SUPPORT – 2011/2 CREW ASSIGNMENT BY AREA

IMMEDIATE AREA AND WEST		IMMEDIATE AREA AND SOUTH		IMMEDIATE AREA AND NORTH	
CC II – B. Kocher (#4318)		**CC II – B. Lockard (#4317)**		**CC II – T. Casson (#4350)**	
High Priority		**High Priority**		**High Priority**	
Code	Location	Code	Location	Code	Location
ABD	Churchmans Road Base (Churchmans 18)	ABCD	Government Center	ABCD	Public Safety Building
		ABCD	Airport Road Pump Station	ABC	Garfield PAL
ABD	Conner Building (Churchmans 1)	ABCE	Gilliam Building	AB	Rockwood Museum
		ABC	Bear Library	ABC	Westover Hills Substation
AB	Duncan Road Substation	ABC	Newark Library	ABC	River Road (Cerebral Palsy)
ABCD	Hockessin PAL	ABC	Appoquinimink Library	ABC	Claymont Library
BC	Hockessin Library	ABC	Kimberton Police Academy	ABC	Brandywine Hundred Library
AB	Carousel Park	AB	Glasgow EMS Station #6	AB	Alapocas Maintenance Base
ABC	Kirkwood Library and EMS #3	AB	Iron Hill Maintenance Base	AB	Edgemoore Pump Station
AB	Delcastle Maintenance Base	AB	MOT Treatment Plant		
AB	Brandywine Springs Maintenance Base	AB	Port Penn Treatment Plant		
		AB	Delaware City Treatment Plant		
		AB	Southern Patrol		
Secondary Priority		**Secondary Priority**		**Secondary Priority**	
Code	Location	Code	Location	Code	Location
AB	White Clay Creek Pump Station	AB	Tybouts Pump Station	ABC	Bonsall Park
AB	Christiana Pump Station	AB	State Road Pump Station	ABC	Bechtel Park
AB	Delcastle Park (parking lots)	AB	Iron Hill Park	ABC	Talley Day Park
AB	Brandywine Springs Park	ABC	Weiss Park	AB	River Road Park
AB	Powell Ford Park	AB	Harmony Hills Park	AB	Stoney Creek Pump Station
AB	Greenbank Park	AB	Deacon's Walk	AB	Naamans Pump Station
AB	Swift Park	AB	Glasgow Park	C	Society Drive
AB	Woodcreek Park	AB	Paper Mill Park	AB	Woodshaven-Kruse Park
		AB	Marl Pit Road (Vaughn 01)	ABC	Woodley Park
				ABC	The Streed Property
				AB	Richardson Park Pump Station
				AB	Banning Park

CODES:
A – Dump w/Plow + Spreader
B – 4x4 w/Plow
C – Hand Crew
D – Backhoe / Loader

Attachment A

Property Maintenance Snow Assignments

Area	Location	Description	Linear Feet	Priority	Order
Alapocas North	Bechtel	Walking path / School access	2565	High	1
	Harvey Mill	Walking path	1372	High	2
	Holiday Hill	Walking path	721	High	3
	Ramblewood	Walking path	385	Medium	4
	Afton	Walking path	495	Low	5
	Knollwood	Sidewalks	862	Low	6
	Channin	Walking path	196	Low	7
	Cardiff	Walking path	225	Low	8
	Tarleton	Walking path	200	Low	9
	Devonshire	Walking path	275	Low	10
	Darley Woods	Walking path	53	Low	11
	Total Linear Feet		**7349**		
Alapocas South	Talley Day	Sidewalks around the Library / Bus stop	760	High	1
	Rockwood	Sidewalks around thw Mansion / Visitors Center	250	High	2
	Chatham	Bus Stop	331	High	3
	Graylyn Crest	Bus Stop	728	High	4
	Shellpot	Bus Stop / Walking path	665	HIgh	5
	Woodley	Sidewalks / Path	1213	Medium	6
	Oaklane Manor	Walking path	105	Low	7
	Delwynn	Walking path	571	Low	8
	Woodbrook	Sidewalks	1375	Low	9
	Sharpley	Sidewalks	407	Low	10
	Total Linear Feet		**6405**		
Banning Park	**Park**	Sidewalks and Bus Stop	9000	High	1
		Around the Maintenance Base	200	High	2
		Woodstock sidewalks	350	Low	3
	Total Linear Feet		**9550**		

Attachment B

Spe[illegible] Projects	Conner Builing	Sidewalks	800	High	1
	Woodlawn Library	Sidewalks	700	High	2
	Assist Dist 3	Various Locations		Medium	3
	Total Linear Feet		**1500**		
Glasgow	IH Maintenance Base	Plow the Base to allow access	250	High	1
	Park	Plow the walking path	15000	High	2
	Park	Plow the Parking Lots	2500	High	3
	Dist 4	Assist the IH crew until the park is fully developed	0	High	4
	Total Linear Feet		**17750**		
Iron Hill	PaperMill	Walking Path	5200	High	1
	Fox Run	Sidewalk and Bus Stop	600	High	2
	Robscott	School Path	800	High	3
	Hann	Sidewalk and Bus Stop	150	High	4
	Sycamore Gardens	Bus Stop	0	Medium	5
	Newkirk	Sidewalk and Bus Stop	222	Medium	6
	Meadowood	Sidewalk and Bus Stop	350	Medium	7
	Tri-Woods	Sidewalk and Bus Stop	700	Medium	8
	Linden Hill	School Path	145	Medium	9
	Heritage Park	School Path	425	Medium	10
	Townsend	Sidewalk and Bus Stop	240	Medium	11
	Rutherford	Sidewalk	95	Low	12
	Windy Mill	Walking Path	75	Low	13
	Old Mill Manor	Walking Path	22	Low	14
	Linden Heath	Walking Path	495	Low	15
	Brookbend	Walking Path	700	Low	16
	Todd Estates 4	Sidewalk	45	Low	17
	Total Linear Feet		**10264**		
Carousel	Park	Plow entrance and lane into the park	2500	High	1
	Park	Plow Parking lots	20	High	2
	Maintenance Base	Clear sidewalks around the Base	350	High	3
	Office Building	Clear sidewalks around the Base	125	High	4
	Total Linear Feet		**2995**		

Attachment B

Snow Equipment

Crew	Equipment	Description
Alapocas North	5605	Gravely Pro 12 with attachments
		Broadcast spreaders
		Miscellaneous hand tools
Alapocas South	5600	Bobcat with attachments
	5604	Gravely Pro 12 with attachments
	5523	Ford Tractor with a plow
		Broadcast spreaders
		Miscellaneous hand tools
Banning	5607	Gravely Pro 12 with attachments
	5621	Kubota ATV with a plow
		Broadcast spreaders
		Miscellaneous hand tools
BWS	5609	Gravely Pro 12 with attachments
		Broadcast spreaders
		Miscellaneous hand tools
Canby	5606	Gravely Pro 12 with attachments
	5622	Kubota ATV with plow
Carousel	4326	Ford pick up with a plow
	5610	Gravely Pro 12 with attachments
		Broadcast spreaders
		Miscellaneous hand tools
DelCastle	5077	Ford pick-up with a plow
	5617	Gravely Pro 12 with attachments
	5623	Kubota ATV with a plow
	5501	Kubota tractor with a plow
		Broadcast spreaders
		tailgate spreader
		Miscellaneous hand tools
Dist 3	5601	Gravely Pro 12 with attachments
	5603	Gravely Pro 12 with attachments
	5699	Bobcat with plow and broom attachments

New Castle County
Department of Special Services
Snow Plan Parking Control Plan

1. **Government Center** – During snow events when the County is closed, crews will plow all open parking areas. Upon the re-opening of the County, the Snow Operations Coordinator or his/her designee will contact the Front Desk at the Government Center to coordinate the moving of any County vehicle(s) for additional clearing of the snow.

   For snow removal during normal County business hours, the Front Desk at the Government Center will continue to be the contact for the coordination of any parking issues.

2. **Public Safety Building** – During all snow events, the Duty Lieutenant will be contacted by the Snow Operations Coordinator or his/her designee to assist in the relocation of any parked vehicle(s) in order to facilitate snow removal operations.

3. **PAL Hockessin** – Although there are normally only a few County vehicles parked at this facility, the Snow Operations Coordinator or his/her designee will contact the County Police desk in the front office when there are any parking issues.

4. **Churchmans Road Complex–Fleet Maintenance** – The Snow Operations Coordinator or his/her designee will contact Fleet Maintenance supervisors in the Garage to assist in providing keys for any County vehicle(s) that may need to be moved during snow removal operations.

APPENDIX K

STATEWIDE SALT BEST MANAGEMENT PRACTICES FOR DELDOT MAINTENANCE YARDS

STATE OF DELAWARE
Department of Transportation
Nathan Hagward III, Secretary

Statewide Salt Best Management Practices for DelDOT Maintenance Yards

Table of Contents

1.0 Introduction

1.1 Overview

2.0 Operational Practices and Strategies

2.1 Salt Delivery
2.2 Salt Stockpiling
2.3 Liquid Storage Facilities
2.4 Salt/Sand Mixing
2.5 Loading
2.6 Site Drainage

1.0 INTRODUCTION

1.1 Overview

Maintaining a safe and efficient road network in Delaware throughout the year is essential. For winter road maintenance, salt has been the deicer of choice for keeping roads passable and safe during storms. It is effective, economical and reliable. The benefits of using road salt, however, come with costs, both economic and environmental.

There is increasing concern about the environmental impacts of the handling and application of road salt and abrasives. Because salt is highly soluble in water, it moves easily with the flow of both surface water and groundwater. It can enter the environment from storage piles, spilled salt or salt spread on roadways. Salt that enters the environment can travel great distances and potentially impact - directly or indirectly - soils, vegetation, groundwater and wells, aquatic habitats, and wildlife.

Highway maintenance yards can be sources of significant salt loss to the environment. Potential sources of salt loss to the environment include:

- Runoff from exposed stockpiles
- Washing of vehicles
- Blowing salt from exposed stockpiles
- Spillage during delivery, handling and loading.

Effective salt management practices can help reduce the amount of road salt that enters the environment. This document outlines best management practices (BMPs) for salt management at DelDOT maintenance facilities. These BMPs are consistent with those used across North America. Good yard design and salt handling practices are essential to preventing unnecessary salt loss. This translates into savings for DelDOT, protection against liability, and minimization of impacts of salt on our environment.

2.0 OPERTIONAL PRACTICES and STRATEGIES

This section was organized by looking at the cycle of salt handling at our maintenance facilities and other satellite salt storage facilities. The typical salt handling cycle flows from delivery, to stockpiling, to mixing, and to loading on the spreader and off-loading any unspent salt. The section will present the strategies related to the effective management of salt for each of the main elements of the handling cycle. Salt is needed to ensure public safety on the roadways in the winter months, but there is also a need to reduce the environmental effects as well. These measures will assist in the protection of surface and ground waters.

2.1 Salt Delivery

Deliveries of salt should be arranged such that material is placed within the covered storage facility as soon as possible upon delivery. Deliveries should be scheduled for periods of good weather.

All deliveries should be covered when being transported to the maintenance yard.

2.2 Salt Stockpiling

Solid salt stockpiles must not be exposed to rain or snow. Dissolved salt does not "disappear," but rather enters the groundwater and creates problems offsite. Therefore, proper storage of salt and sand/salt mix requires that they be covered to protect them from the elements.

Stockpiles frequently have portions that have become frozen. These frozen blocks need to be properly managed and should not be placed into spreaders. These blocks should be pushed into the corner of the storage facility and allowed to thaw and dry. Once they have thawed and dried, the material should be broken up and reintroduced to the pile. Where brine production is ongoing, blocks of pure salt can be put into the brine production tank.

There are a variety of types of covers in use around the State. They range from tarps to sheds, to large domes and barns. Salt should never be stored outside.

2.2.1 Inside Storage

The roof and exterior of the storage structures should be constructed of waterproof material such that precipitation and moisture are prevented from entering the building.

The entrance to the storage structure should have a door, curtain or a sufficient overhang to minimize precipitation entering the structure.

Any roof leaks, tears, or damage should be temporarily repaired during winter to reduce the entrance of precipitation, with permanent repairs being completed prior to the next winter season. At no time should leaks be allowed to persist when materials are being stored inside.

The storage shed floor as well as the loading area should be an impervious surface such as asphalt or concrete.

2.2.2 Outside Storage

If sand/salt stockpiles must be stored outside a structure, an asphalt or concrete pad must be utilized. The pile will also require a cover.

All covers must meet the following requirements:

- Be water-resistant or impermeable.
- Be secured against wind with weights or tie-downs, such as ropes, cables or wire-mesh.
- Completely cover the entire pile.
- Opened only at working face, which is: uncovered only while salt is actually being removed; and open only to the minimum dimensions reasonably necessary.

2.3 Liquid Storage Facilities

Where salt brine storage tanks are used, these tanks should be placed above ground, protected from potential impacts by vehicles and periodically inspected for leaks.

2.4 Salt/Sand Mixing

Sand and salt mixtures should be mixed inside, or on low permeable pad located as close to the salt storage area as possible.

Mixing should be done during good weather. This will reduce salt loss due to precipitation and wind, and minimize the moisture content of the sand/salt mix.

After the sand and salt have been mixed, the mix should be loaded into a storage facility as soon as possible. The mixing area should then be swept and the sweepings returned to the storage facility.

2.5 Loading

Spillage during stockpiling and spreader loading is the main sources of salt loss. The extent to which these activities can be carried out under cover minimizes salt loss. Care to minimize spillage and practices to clean up spilled salt can reduce costly losses. Spilled materials should be swept up and returned to the pile.

When loading spreaders outside of the storage structure, care should be taken to minimize spillage of salt onto the loading pad.

Overloaded spreaders are prone to spilling salt during operations. Therefore, spreaders should not be loaded beyond their capacity.

Salt and sand/salt mixtures that are spilled outside of storage facilities or within, or adjacent to maintenance yards should be collected and returned to the storage facility as soon as possible following the completion of the storm event.

Excess salt and sand remaining in the spreader following a storm should be returned to the storage facility and deposited within or as close to the entrance of the salt storage facility as possible. Where materials are off-loaded outside of the storage facility, they must be placed into the storage facility as soon as possible.

2.6 Site Drainage

The site should be graded to direct drainage away from the storage areas. Snow plowed from the site should be directed to areas where the melt water will be directed away from the storage area.

APPENDIX L

MEMORANDUM OF
UNDERSTANDING BETWEEN
DNREC AND NEW CASTLE COUNTY
REGARDING THE INDUSTRIAL STORMWATER
PROGRAM

STATE OF DELAWARE
DEPARTMENT OF NATURAL RESOURCES &
ENVIRONMENTAL CONTROL
DIVISION OF WATER
89 KINGS HIGHWAY
DOVER, DELAWARE 19901

Surface Water Discharges Section

Telephone: (302) 739-9946
Facsimile: (302) 739-8369

RECEIVED
FEB 07 2014
SURFACE WATER

MEMORANDUM OF AGREEMENT BETWEEN THE DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL, DIVISION OF WATER, SURFACE WATER DISCHARGE SECTION AND THE COUNTY OF NEW CASTLE, DEPARTMENT OF SPECIAL SERVICES

December 16, 2013

WHEREAS, the Surface Water Discharge Section of the Division of Water within the Delaware Department of Natural Resources and Environmental Control ("Department") has enjoyed a successful and mutually beneficial relationship in carrying out the Industrial Stormwater Inspection Program with the New Castle County Department of Special Services ("DSS") as a component of the Phase I MS4 permit issued in 2001; and

WHEREAS, a new Phase I MS4 permit ("Permit") was issued on May 7, 2013 necessitating modifications to the terms and conditions of the previous Memorandum of Agreement between the Department and DSS signed in 2001; and

WHEREAS, the Department has been delegated the NPDES program from the Environmental Protection Agency; and

WHEREAS, industrial facilities throughout the State of Delaware with specific identified Standard Industrial Classification (SIC) codes are required to have NPDES permit coverage for storm water discharge according to 7 Del. Admin. C §7201-9.0 of Delaware's *Regulations Governing the Control of Water Pollution*; and

WHEREAS, DSS has familiar knowledge of those industrial sites within the unincorporated boundaries of New Castle County and will be able to identify those industrial facilities that require additional attention; and

WHEREAS, DSS has gained experience in inspecting and reporting on the stormwater management programs practiced at industrial sites requiring permitting around the County; and

WHEREAS, this MOA is not intended to transfer any part of the delegated Industrial Storm Water General Permitting Program to DSS; and

WHEREAS, the Department and its Secretary have the power and authority to, among other things, require a permit from any person who undertakes any activity in a way which may cause or contribute to discharge of a pollutant into any surface or groundwater, and make necessary and desirable agreements in the performance of such functions, pursuant to 7 Del. C. Ch. 60 and 29 Del. C. Ch 80; and

WHEREAS, the Department has promulgated 7 Del. Admin C. §7201-9.1 (Industrial Storm Water Regulations).

NOW THEREFORE, in consideration of the mutual covenants and promises contained herein, the parties hereto agree as follows:

SECTION ONE: DEFINITIONS

A. Industrial Storm Water Permit Program: A portion of the National Pollutant Discharge Elimination System (NPDES) program that is delegated to the Department by the U.S. Environmental Protection Agency. This program includes the issuance of individual and general permits for storm water discharge to industrial facilities that possess specifically identified SIC codes as identified in 40 CFR 122.26(b)(14)(i)-(xi).

B. "High Risk" Facilities: Those industrial facilities that have been determined, by the Department, in conference with DSS, and agreed to by both parties, to possess some defining character that makes these facilities more likely to discharge contaminated stormwater to the Waters of the State or to discharge stormwater that may incur a larger deleterious effect on the receiving water body. The character of these facilities could include, but are not limited to the following:

    1. Industrial sites that have had compliance problems in the past;
    2. Industrial sites that have the potential to release higher levels of industrial contamination to the areas outside of the building;
    3. Industrial sites in or near ecologically sensitive areas;
    4. Industrial sites that are listed among facilities reporting to the Toxic Release Inventory
    5. Industrial sites with a large total amount of impervious area; and
    6. Industrial sites that have a complicated strategy to comply with the Industrial Storm Water Regulations.

C. Waters of the State or State Waters: All water, on the surface and under the ground, wholly or partially within, or bordering the State of Delaware, or within its jurisdiction including but not limited to:

    1. Waters which are subject to the ebb and flow of the tide including, but not limited to, estuaries, bays and the Atlantic Ocean;
    2. All interstate waters, including interstate wetlands;
    3. All other waters of the State, such as lakes, rivers, streams,(including intermittent and ephemeral streams), drainage ditches, tax ditches, creeks, mudflats, sandflats, wetlands, sloughs, or natural or impounded ponds;
    4. All impoundments of waters otherwise defined as waters of the State under this definition;

5. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in (1)-(4).

Waste and storm water treatment systems that would otherwise meet this definition are not "waters of the State" or "State waters".

D. Notice of Intent (NOI): A document filed by an industrial facility to request coverage under the Industrial Storm Water General Permit Program to gain authorization to discharge storm water to Waters of the State.

SECTION TWO: Overview of Phase I MS4 Collaboration for the Industrial Storm Water Permit Program in New Castle County

A. The Department will serve as the lead agency for coordination with the EPA consistent with the EPA NPDES program delegation agreement between the two agencies.

B. The Department will provide DSS with a full list of all Industrial Stormwater Permittees within the unincorporated area of New Castle County and within the incorporated areas of co-permittees on the Phase I MS4 permit within the boundaries of the County of New Castle. If inspector, or any authorized New Castle County individual identifies a facility that may require coverage under the Industrial Stormwater Program within these areas, this information shall be communicated in writing to the Department.

C. DSS shall include a provision in the inter-jurisdictional agreement(s) with co-permittees defining mutual responsibilities for implementing the Industrial Storm Water Inspection provision written in Part II Section A.6 aa of the permit.

D. DSS will continue to exercise its delegation of the Department's Sediment and Stormwater Regulations and perform BMP inspections on sites in their post-construction inventory regardless of whether or not the sites are on the "high risk" facility list assigned to DSS or the Department.

E. DSS will be the initial point of contact for those facilities that have been designated as, "high risk" and that have been assigned by the Department to DSS pursuant to the annual "New Castle County High Risk Facility" list ("List").

F. DSS will ensure permittee is aware that the Department is the only point of contact for Notice of Intent, No Exposure Certification, Notice of Termination, billing and SWP submission. (Satisfying this requirement may be done by creating and distributing a Department approved fact sheet to permittees that details the structure of the inspection process).

G. The Department will ensure that the Storm Water Management Plan (SWP) submitted by the facility for permit compliance meets all regulatory requirements. The Department will review and approve the SWP or the Department will provide comments to the facility on alterations necessary to bring the SWP into compliance.

H. Each of the facilities on the List shall be inspected by DSS once per calendar year.

SECTION THREE: INSPECTION PROCESS

A. A list of designated "high risk" facilities will be determined by the Department, in conference with DSS, on an annual basis. There are three options for the annual renewal of this list:

    1. The list will remain the same, and the same facilities will be inspected again during the current year;
    2. Some of the facilities will change on the list and those facilities will be inspected by DSS. Those facilities that remain on the list will be re-inspected by DSS during the current year.
    3. The entire list will be revised

B. The "high risk" facility list shall include no fewer than thirty-six (36) industrial facilities that are currently permitted by the Department. In the event that NCC DSS is unable to fulfill this obligation, a written request for relief shall be submitted to the Department within 90 days before the end of the inspection year. This request shall include the reasons for the delay in inspections and a schedule to perform these inspections, in addition to the following year's inspections during the following inspection year. Each inspection year shall be run on a calendar year basis

C. The inspection will be performed by only a properly trained individual. DSS will be responsible for ensuring that adequate training be maintained for all inspectors and that only properly trained individuals perform these industrial storm water inspections.

D. Inspections will be performed to ensure compliance with 7 Del. Admin. C. § 7201-9.1 of the *Regulations Governing Storm Water Discharges Associated with Industrial Activit*ies. Several guidance documents can be used to assist the decision making process on compliance issues. These documents include:

    1. "Developing Your Stormwater Pollution Prevention Plan, A Guide for Industrial Operators", EPA 833-B-09-002, February 2009 (http://www.epa.gov/npdes/pubs/industrial_swppp_guide.pdf)
    2. Industrial Fact Sheet Series for Activities Covered by EPA's Multi-Sector General Permit (http://cfpub.epa.gov/npdes/docs.cfm?program_id=6&view=allprog&sort=name)
    3. NPDES Storm Water Sampling Guidance Document, EPA 833-8-92-001, July 1992 (http://www.epa.gov/npdes/pubs/owm0093.pdf)
    4. How to do Stormwater Sampling, A guide for industrial facilities, Department of Ecology, State of Washington, Publication #02-10-071, December 2002 (rev. march 2010) (https://fortress.wa.gov/ecy/publications/publications/0210071.pdf)
    5. Delaware Industrial Storm Water BMP Manual, DRAFT- July 2012

E. A Department approved inspection checklist shall be used during the on-site inspection. This checklist and any additional documents or communication initiated by DSS should include the logo of the DSS only when an employee of the DSS performs the inspection.

F. The DSS inspector shall coordinate the timing of the inspection with the facility operator, or that individual specified as contact person on the Notice of Intent (NOI).

G. Photo documentation shall be one aspect of the inspection process and all photos shall be submitted to the Department with the inspection report.

H. For each of the "high risk" facilities on the DSS Inspection List, the NOI and SWP that have been submitted to the Department shall be provided to DSS. These documents shall be reviewed by the DSS inspector prior to inspection to ensure accuracy. If any element of the NOI is not currently accurate, the DSS inspector shall work with the facility to ensure the proper documentation is on file at the Department.

I. DSS shall contact the Department if any questions on proper procedure should occur.

J. DSS shall immediately notify the Department if inspector observes any violation of *7 Del. C.*, Chapter 60, beyond the scope of the Industrial Storm Water Permitting Program or if stormwater management violations exist that require immediate Department intervention.

K. The Department may accompany DSS on any site inspections to either, 1) provide input on the inspection of an identified permittee, or 2) to evaluate procedures employed by DSS inspector.

L. The Department may also conduct its own separate inspections of these facilities without notification to DSS or having DSS present.

SECTION FOUR: FOLLOW-UP & REPORTING

A. The DSS inspector will perform inspections on designated "high risk" facilities as necessary (but annually at a minimum) to ensure compliance with the applicable regulations,

B. The DSS inspector shall provide notice to the Department of a scheduled inspection. Electronic mail is an acceptable form of communication for this requirement.

C. The DSS inspector will provide the Department the inspection reports within 30 days of the inspection.

D. Submittal of the inspection report shall be accompanied by any follow up communication (letters, e-mails, details of phone or one-on-one conversations) with the regulated facility that occurs within that time frame.

E. The DSS inspector will perform full follow up with the facility to obtain full compliance with the regulations. If follow up is required past the initial 30 day reporting period, DSS inspector shall provide the Department with an update (in writing) no later than 90 days after the initial inspection.

F. If compliance cannot be obtained after 180 days from date of inspection, DSS inspector shall provide the Department with all follow up communication. The Department will then take over enforcement under the General Industrial Stormwater Permitting process.

SECTION FIVE: COORDINATION

A. Annual reporting- As part of the MS4 Annual Report, the following information for each inspection performed during the reporting year shall be recorded:

1. Date of inspection
2. Facility name
3. Facility I.D.
4. Facility address
5. Contact during inspection
6. Summary of inspection

B. The face-to-face annual review meeting will take place near the end of the calendar year and include all relevant parties from DSS and the Department.

C. If for any reason the annual review is not conducted within an appropriate time frame for DSS planning, DSS will continue to inspect facilities on most current List

D. The Department herby acknowledges that this agreement is designed to fulfill DSS's obligations with respect to industrial and high risk runoff found in Part II, Section A.6.aa of the Permit.

E. This MOA shall not be construed to confer or create any rights in third parties.

[Signature Page Follows]

IN WITNESS THEREOF, the parties have duly executed this Agreement as of the day, month and year first above written.

NEW CASTLE COUNTY DEPARTMENT OF SPECIAL SERVICES

J Wayne Merritt

J.Wayne Merritt
Acting General Manager

1/30/14
Date

THE DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL, SURFACE WATER DISCHARGE SECTION

Bryan A Ashby

Bryan Ashby
Program Manager

2/10/14
Date

APPENDIX M

WATERSHED PRIORITY LIST MATRIX

NEW CASTLE COUNTY / DelDOT NPDES MS4 SWPP MP
WATERSHED PRIORITY LIST RANKING FOR WQIP DEVELOPMENT

	305(b) report and 303(d) list - nutrients	305(b) report and 303(d) list - bacteria	STORET analysis - nutrients	STORET analysis - bacteria	Percent load reductions	Existing impervious cover / EIA	Planned DelDOT roadways / projects	Projected growth	Public or quasi-public open space	ERES waters	Drinking water sources	Flood prone areas	Areas with SSO / CSO impacts	Total score		Implementation costs
Restoration Watersheds																
	Weighted Criteria															
	Watershed Scores															
Army Creek																$$$
Brandywine Creek																$$$
Christina River																$$$$
Delaware River																$$$
Naamans Creek																$$$
Red Clay Creek																$$$
Shellpot Creek																$$$
White Clay Creek																$$$$
Preservation Watersheds																
	Weighted Criteria															
	Watershed Scores															
Appoquinimink River																$$$
Blackbird Creek																$
Bohemia Creek																$
C&D Canal East																$$
C&D Canal West																$$
Chester River																$
Delaware Bay																$
Dragon Run																$$
Elk Creek																$
Perch Creek																$
Red Lion Creek																$$
Sassafras River																$
Smyrna River																$

Draft as of 5/5/2014

NEW CASTLE COUNTY / DelDOT NPDES MS4 PERMIT
WATERSHED PRIORITY LIST
EFFECTIVE IMPERVIOUS AREAS AND WATERSHED CATEGORIZATION

Row Labels	Sum of Total Drainage Area (acres)	Sum of Computed EIA (acres)	Sum of 3% of EIA (acres)	Ratio 3% EIA to Total Drainage Area	Type
Appoquinimink River	29,677	1,547	46.42	0.16%	Preservation
Army Creek	6,364	1,180	35.40	0.56%	Restoration
Blackbird Creek	19,825	188	5.65	0.03%	Preservation
Bohemia Creek	5,600	34	1.03	0.02%	Preservation
Brandywine Creek	14,700	2,472	74.15	0.50%	Restoration
C & D Canal East	28,161	616	18.48	0.07%	Preservation
C & D Canal West	11,123	322	9.65	0.09%	Preservation
Chester River	6,528	16	0.48	0.01%	Preservation
Christina River	42,964	12,762	382.85	0.89%	Restoration
Delaware Bay	6,154	2	0.06	0.00%	Preservation
Delaware River	4,077	1,018	30.55	0.75%	Restoration
Dragon Run Creek	6,533	384	11.51	0.18%	Preservation
Elk Creek	274	1	0.03	0.01%	Preservation
Naamans Creek	6,407	1,823	54.69	0.85%	Restoration
Perch Creek	1,295	30	0.91	0.07%	Preservation
Red Clay Creek	13,510	1,329	39.87	0.30%	Restoration
Red Lion Creek	6,954	442	13.26	0.19%	Preservation
Sassafras River	5,101	3	0.10	0.00%	Preservation
Shellpot Creek	9,149	2,555	76.66	0.84%	Restoration
Smyrna River	21,888	164	4.91	0.02%	Preservation
White Clay Creek	29,557	6,442	193.25	0.65%	Restoration
Grand Total	275,843	33,330	1,000		

APPENDIX N

POLLUTANT MINIMIZATION PLAN FOR PCBs

******DRAFT******

POLLUTION MINIMIZATION PLAN (PMP) FOR POLYCHLORINATED BIPHENYLS (PCBs)

National Pollutant Discharge Elimination System (NPDES)
Permit Number: DE 0051071
State Permit Number: WPCC 3063A/96

May 2014

Submitted to:

Delaware Department of Natural Resources and Environmental Control
Division of Water
Surface Water Discharges Section

Prepared by:

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****DRAFT****

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ATTACHMENTS

Attachment 1 – Table 1 – DNREC WATAR-Identified Waterbody Segments
Attachment 2 – DNREC WATAR-Implementation Schedule

1.0 INTRODUCTION / PURPOSE

This Pollution Minimization Plan (PMP) for polychlorinated biphenyls (PCBs) has been prepared on behalf of the Principal and Co-permittees (TBD) as a requirement of National Pollutant Discharge Elimination System (NPDES) Permit Number DE 0051071, State Permit Number WPCC 3063A/96 (the "permit"). The purpose of this PMP for PCBs is to address the potential conveyance of PCBs in the Delaware River Watershed from the municipal separate storm sewer system (MS4) located in New Castle County, Delaware. The PMP described herein was established in general accordance with the elements described in Part II. B.1. of the permit. In addition, this PMP for PCBs will be implemented in parallel to the ongoing efforts of New Castle County regarding its wastewater collection system.

Although overland transport of PCBs into the MS4 following a significant storm event is possible [assuming the presence of a PCB source(s) within the watershed], the magnitude and extent of that transport is not well characterized. This PMP proposes to gather data and information leading to a better understanding of the situation, which in turn will be used to propose a path forward to further assess or otherwise address identified sources. In this regard, it is understood that the scope of this PMP is limited to only those PCB sources that have the potential to discharge from the MS4. It is also understood that the ultimate responsibility for managing and controlling PCB sources within the MS4 may or may not lie exclusively with the Permittees. The Permittees are however committed to working cooperatively with the Department of Natural Resources and Environmental Control (DNREC).

In addition to meeting the requirements of the permit, this PMP is also intended to provide the PCB analytic data collected for this PMP to the DNREC to supplement and complement their ongoing water quality management efforts with respect to toxic substances. More specifically, DNREC's Division of Watershed Stewardship (DWS) and DNREC's Division of Waste and Hazardous Substances (DWHS) have developed a Watershed Approach to Toxics Assessment and Restoration (WATAR) work plan that presents the implementation process by which DNREC intends to address toxics in the aquatic environment (for more information refer to Section 5.0 of this document). Data gathered during implementation of this PMP is intended to be used by DNREC to support those efforts.

This PMP was developed with the following principles in mind:

- Acquiring high quality, useable, reliable, and cost-effective data is key to support sound decisions regarding the potential conveyance of PCBs from the MS4 to the Delaware River Watershed;
- A holistic, "good science" approach to this PMP is desirable;
- A deliberate, collaborative and cooperative approach that recognizes the need to use personnel and financial resources efficiently and effectively will be vital to achieving progress in PCB load reduction; and

- PCB minimization/load reduction is a long-term endeavor and discerning improvements to impaired waterways is a gradual process.

2.0 DISCHARGER CONTACT

The following is a list of key representatives and PCB minimization team members, their job titles, and contact information.

Michael Harris
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New Castle County
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Delaware Department of Transportation
800 Bay Road
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302.760.2194
Randy.Cole@state.de.us

New Castle County and DelDOT are the Principal Permittees. The towns of Bellefonte, Elsmere, and Newport and the cities of Delaware City and New Castle are the Co-permittees. The Principal Permittees are preparing this PMP for PCBs on behalf of the Co-permittees as stipulated in Inter-jurisdictional Agreements.

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3.0 MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) DESCRIPTION

The New Castle County MS4 is considered a “large” municipal separate storm sewer system. The system is a route of drainage for precipitation (e.g., rain or snow) that is considered “runoff” once the precipitation hits the ground and starts to flow over land. This runoff can transport harmful materials and/or substances to local waterways, which is why prevention of contaminated runoff is a growing concern and maintaining local water quality is a priority. Accordingly, this PMP will assess the potential for PCBs to be conveyed from the MS4 into local waterways.

4.0 KNOWN / PROBABLE PCB SOURCES

DNREC's Site Investigation and Restoration Section (SIRS), working cooperatively with DNREC-DWS, compiled a list of known/probable PCB sources within New Castle County. Under this PMP, an updated list specific to areas of the County draining to the MS4 will be generated. Since the list was compiled more than a year ago and appears to be limited to areas north of the Chesapeake and Delaware (C&D) Canal, site status(es) may have changed, additional information may now be available, and potential sites in New Castle County south of the C&D Canal may need to be added. The review will also remove from consideration known and/or probable PCB sources that fall out of the jurisdiction of the permit (e.g., sources within the City of Wilmington that are covered under individual NPDES permit #DE0020320; State Permit No. WPCC 3074D74).

As such, the list will be reviewed relative to: 1) the current status of the source (e.g., closed, remediated); 2) the location of each source with respect to the impaired waterbody segments targeted by DNREC's WATAR (see Section 5.0 and Attachment 1); and 3) the location of each source relative to the MS4. Based on the review, the list of PCB sources will be updated, as appropriate and pertinent to the focus of this PMP. Further, a description of remaining known and/or probable sources (including, but not necessarily limited to, materials, equipment, processes, soil areas or facilities) and pathways and pollutant concentrations, if known, will be reported.

Using the PMP-specific list discussed above, it is anticipated that the applicable PCB sources will be mapped relative to the locations of the impaired waterbody segments targeted by DNREC's WATAR (see Section 5.0 and Attachment 1). Mapping using a location-enabled framework is intended to provide visualization for informed and collaborative decision making as well as for future sampling strategy design.

5.0 DNREC WATAR

DNREC's WATAR work plan utilizes a watershed-based approach to assess and manage Delaware's aquatic environment. This type of approach considers the cumulative effects of multiple pollutant sources within a watershed. In addition to providing a broader, more complete representation of conditions within a watershed, this approach also allows the relative importance of individual sources or collection of sources that contribute to environmental impairments to be assessed.

WATAR is aimed at reducing toxins (including PCBs) in impaired Delaware waterways. It seeks to draw connections between sources and sinks within a watershed so that follow-up steps can be taken to control significant release to local waterways. The WATAR work plan is part of a larger initiative intended to improve water quality in Delaware through the implementation of Section 303(d) of the Federal Clean Water Act. One requirement of Section 303(d) is for DNREC to develop a list of water bodies for which existing pollution control activities are not sufficient to attain applicable water

quality standards (303(d) list) and to develop Total Maximum Daily Loads (TMDLs) for pollutants of concern (including PCBs), as necessary and appropriate to meet standards.

Utilizing results from prior sampling events and PCB site mapping information, DNREC has assembled a list of waterbodies within Delaware which do not meet applicable standards for PCBs. The majority of these waterbodies lie in New Castle County, Delaware, and all flow toward the Delaware River and Delaware Bay. The list of waters includes information such as:

- Name of the watershed of which the waterbody is a part;
- Identification number specific to the waterbody;
- Segment of the waterbody most impaired as well as the length of that segment; and
- Pollutant and/or stressor and the probable source(s).

The U.S. EPA has established PCB TMDLs for the tidal Delaware River and the Delaware Bay. Those TMDLs considered the PCB mass loads discharged from Delaware's watersheds into the Delaware River and Delaware Bay. As such, the EPA has determined that PCB TMDLs have already been established for the Delaware watersheds. This is significant because it means that Delaware can focus its resources on implementing PCB TMDLs rather than developing TMDLs. Indeed, the fact that the Permittees are initiating a PCB PMP for their MS4, and that the PMP is being developed in concert with DNREC's WATAR program demonstrates that Delaware is actively implementing the PCB TMDLs for the tidal Delaware River and Delaware Bay.

As noted in the WATAR, two key objectives, which are pertinent to this PMP, include:

- Acquire new, comprehensive data on the concentrations of persistent, bioaccumulative, and toxic (PBT) contaminants in priority watersheds; and
- Identify high priority remediation projects that have the potential to significantly address toxics problems in State waterways.

The efforts associated with this PMP can contribute to meeting those objectives. As such, the rationale for source prioritization as well as the sampling and analytic methodologies described in the following section will be based partially on these objectives.

6.0 SOURCE PRIORITIZATION

Although numerous PCB sources have been identified within New Castle County, it is important, both financially and administratively, to prioritize the sources based on those with the greatest potential to be conveyed to the MS4. This can be accomplished by considering the current status of the source (e.g., active, closed, remediated) as well as the likelihood that a pathway exists that may convey elevated PCB levels from the source

into the MS4. Further, previously identified PCB sources can be prioritized based on their spatial relation to waterways listed in DNREC's WATAR to be impaired by PCBs.

To some degree and as it relates to this permit, source prioritization has been completed by DNREC with respect to the identified impaired waterbody segments listed in the WATAR. Specific PCB sources were considered priorities by DNREC due to an assessed higher probability that these sources contributed to the apparent impairments identified in the listed waterbody segments. There is not, however, affirmation that the impairments can be attributed in whole or part to conveyance from the MS4. Although the Delaware 303(d) list is state-wide in geographic scope and includes substances in addition to PCBs, this PMP will focus only on waters within New Castle County that drain to the Delaware River and Bay and which have been indicated to be impacted by PCBs (see Attachment 1 - adapted from full WATAR list included as Attachment 1).

7.0 MEASURING, DEMONSTRATING, AND REPORTING PROGRESS

In order to evaluate the efficacy and/or success of this pollution minimization process, measurement and demonstration of progress towards PCB load reduction, over time, if occurring, must be performed. In conjunction with DNREC's WATAR, this section describes how progress in PCB pollution minimization, assuming PCB conveyance from the MS4, will be tracked and documented over time using a phased approach.

7.1 Sampling and Analytic Approach

The sampling and analytic approach described herein will be implemented in an iterative, phased approach with the rationale for any one phase being dependent upon the results of the prior phase. As stated previously, the sampling and analytic approach is intended to not only satisfy the requirements of the permit, but also to provide high quality supplemental PCB analytic data to DNREC as part of the WATAR.

Currently, two initial phases are being proposed; the first being a desktop review phase, and the second being a focused, sampling and analysis phase. Limiting this PMP to two phases, at least initially, was intentional given the lack of prior PCB sampling and/or PCB analytic data to indicate if PCBs are being conveyed by the MS4. The initial phases are intended to allow for establishment of baseline conditions against which future sampling activities can be compared. This PMP is intended to be dynamic and as analytic data is acquired, additional phases may be proposed in an effort to further assess the conditions indicated in prior phases. This is a form of adaptive management that permits adjustments as new information is gathered.

Sampling efforts will be limited to "outfalls" or specific points where conveyance of MS4 storm water discharges directly into waterbodies. Specifically, this PMP will target outfalls that discharge into impaired water segments identified and

listed in the WATAR. Further, it is anticipated that the sequence in which the waterbody segments are assessed by this PMP will generally follow the implementation schedule presented in the WATAR (see Attachment 2), recognizing that some watersheds have already been assessed by DNREC prior to implementation of this PMP. Those waterbody segments will be evaluated independent of DNREC's schedule but will consider data collected under those prior efforts.

The following sections describe the objective of each phase as well as the anticipated sampling strategy to be employed. As required by the permit, a more detailed sampling and analysis plan (SAP) will be submitted to DNREC for their review and approval, prior to the commencement of field activities. As stated above, the resultant data, specifically from the second phase, will be used to establish baseline conditions (discussed further in Section 9.2) upon which the continuing assessment outlined in Section 9.3 can be based.

7.1.1 First Phase- Outfall Selection / Prioritization

The goal for this initial phase is to select the outfalls that will be targeted for sampling and analysis during the second phase (discussed below). In order to accomplish this, a desktop-type review consisting of, but not limited to, the following will be performed:

- Review of known and probable PCB sources located within the area applicable to the permit and relevant to the DNREC WATAR-listed impaired waterbody segments;
- Review of relevant regulatory databases [e.g., DNREC Delaware Environmental Navigator (DEN)] for updates to known and/or recently identified PCB sources located within the area applicable to the permit;
- Mapping and review of MS4 outfalls as defined in this PMP; and
- Compilation of PCB sources, MS4 outfall locations, and DNREC WATAR-listed impaired waterbody segments into a Geographic Information System (GIS) file and overlain for data management and spatial analysis purposes.

Following the creation of a spatially-referenced GIS file, the specific outfalls that will be selected for sampling and analysis during the second phase of this PMP will be considered based on the following:

- Accessibility of the outfall;
- Spatial relation to segment of impaired waterbody;
- Proximity to suspected PCB source relative to impaired waterbody; and

- Outfalls that have the highest potential to largest PCB mass loads. This will consider the number and source strength within the MS4 drainage area as well as the expected stormwater flows. Here it is understood that both concentration and flow are important to consider in determining mass load.

Although the exact number of outfalls selected for sampling and analysis will be dependent upon the conditions described above, as well as the number of outfalls that exist along each targeted water segment, it is anticipated that a maximum of 10 outfalls per WATAR-listed impaired waterbody segment will be considered for further analysis. The desktop review does not include sampling and/or analytic testing and is intended to be performed once (updated as necessary). Alternatively, the focused assessment described below will include sampling and analytic testing and will target specific impaired waterbody segments each year, generally following the implementation schedule presented in the DNREC WATAR.

7.1.2 Second Phase- Focused Assessment

Utilizing the data compiled as part of the desktop review, specific outfalls along each waterbody segment will be targeted for sampling and analysis. Prior to sample collection, several parameters will be measured and recorded. The parameters, which include turbidity and flow rate, will be important for data interpretation as well as future loading calculations. In addition, physical measurements (e.g., outfall pipe diameter, distance above surface water), description of the outfall, tidal information, and global positioning system (GPS) coordinates of the outfall will be recorded.

It is anticipated that stormwater samples will be collected during a significant storm event (i.e., wet weather sampling event). For the purposes of this PMP, a significant storm event is defined as a precipitation event of 0.1 inches or greater, provided that precipitation greater than 0.1 inches has not occurred within the previous 72 hours. The samples will be collected directly beneath the point at which the stormwater exits the outfall (i.e., as close as possible to outfall) and will be collected prior to the stormwater contacting and mixing with the surface water. One sample will be collected per outfall, with up to 10 outfall water samples collected from any one WATAR-listed impaired waterbody segment. In addition, it is anticipated that quality assurance/quality control (QA/QC) samples will be collected in order to assess the accuracy and precision of the sampling and analytic procedures utilized.

The water samples will be submitted to an environmental laboratory for analysis of PCB congeners using high resolution gas

chromatography/mass spectroscopy (GC/MS) by Environmental Protection Agency (US EPA) Method 1668. This method is highly sensitive and specific and can achieve detection limits in the parts per quadrillion (ppq) range for individual PCB congeners. PCB congener analysis has several advantages over conventional PCB analysis using Aroclors as analytical standards.

Prior to the commencement of field work, a more detailed sampling and analysis plan for the sampling events will be submitted to DNREC for review and approval. The sampling and analysis plan will include details regarding sampling methodologies (e.g., discrete versus composite samples, automated versus manual sampling) specific outfall sampling locations, QA/QC samples to be collected, and schedule. It may also include contingencies should unanticipated field conditions be encountered during a sampling event.

With respect to the WATAR and assuming detections of PCB congeners are reported, PCB congener data collected during this phase could be used in direct comparison with PCB congener data collected by DNREC from the impaired waterbody segment. Such a comparison would support future source trackdown efforts.

7.2 Methodology for Establishment of Baseline Loading

Establishing baseline loading of PCBs is critical to assessing and demonstrating progress towards PCB load reductions, if PCB loading is occurring. Urban land use data shall be used in conjunction with the approved TMDL pollutant loading rates for PCBs to calculate local baseline stormwater pollutant loads. This can be achieved using the analytic data, measured parameters, and physical measurements acquired during the second phase.

7.3 PCB Monitoring – Continuing Assessment

After compiling data acquired from the initial and second phases, the baseline loading calculations, and information regarding source identification/trackdown, a plan for continuing assessment and/or a plan of action to control the discharge of PCBs can be designed by the Permittees, DNREC, and other appropriate agencies.

7.4 Reporting

As required by the permit, reporting shall occur annually as part of the permittees' Annual Storm Water Report and should provide evidence of implementation of this PMP. Topics to be reported in the report include the number of known PCB sites, number of sites referred for joint interagency action, sampling results, and other actions taken in furtherance of this PMP.

8.0 SCHEDULE / KEY DATES

******TBD******

WORD\4192WL.0514-Appendix N PMP FOR PCBs.COR

ATTACHMENT 1

TABLE 1 – DNREC WATAR-IDENTIFIED WATERBODY SEGMENTS

******DRAFT******

ATTACHMENT 1

List of Waters Needing TMDLs

Adapted from DNREC WATAR

and limited to New Castle County and PCBs only

FINAL DETERMINATION FOR THE STATE OF DELAWARE 2012 CLEAN WATER ACT SECTION 303(d) LIST OF WATERS NEEDING TMDLs

WATERBODY ID	WATERSHED NAME	SEGMENT	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Pollutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
Piedmont Basin												
DE300-001-01	Shellpot Creek	Lower Shellpot Creek	From the head of tide below the east set of railroad tracks to the mouth of the Delaware River	1.0 mile	PCBs	NPS Del. River	2002	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
DE040-001	Brandywine Creek	Lower Brandywine	Mainstem Lower Brandywine	3.8 miles	PCBs	PS, NPS, SF	1996	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
DE040-002	Brandywine Creek	Upper Brandywine	From State Line to Wilmington	9.3 miles	PCBs	PS, NPS, SF	1996	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
DE260-001	Red Clay Creek	Mainstem	From PA-DE line to the confluence with White Clay Creek	12.8 miles	PCBs	PS, NPS, SF	1996	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
DE320-001	White Clay Creek	Mainstem	White Clay Creek from the PA-DE line to the confluence with the Christina River	15.6 miles	PCBs	PS, NPS	1996, 2006	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
DE120-001	Christina River	Lower Christina River	Mainstem Lower Christina River	1.5 miles	PCBs	NPS, SF	1996	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
DE120-002	Christina River	Mid Christina River	Between White Clay Creek and Brandywine River	7.5 miles	PCBs	SF	1996	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
DE120-003	Christina River	Upper Christina River	Mainstem Upper Christina River	6.3 miles	PCBs	NPS, PS	1996	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
DE120-004-01	Christina River	Lower Christina Creek	Mainstem Lower Christina Creek	8.4 miles	PCBs	NPS, SF	1996	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
DE120-007-01	Christina River	Little Mill Creek and Willow Run	From the confluence of Willow Run and Chestnut Run to the confluence with the Christina River	5.1 miles	PCBs	NPS	1996	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
DE120-L01 DE120-L02 DE120-L03	Christina River	Smalleys Pond	Smalleys Pond east of Newark	30.0 acres	PCBs	NPS	1996	2003	2003	4a	2012	EPA TMDL for PCBS in Delaware River Zone 5 and tributaries
	Christina River	Becks Pond	Becks Pond southeast of Newark	25.6 acres	PCBs	NPS	2002	2003		1		Listed in 2002, Delisted 2010 due to removal of advisory. EPA TMDL for PCBS in Delaware River

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ATTACHMENT 1

List of Waters Needing TMDLs

Adapted from DNREC WATAR

and limited to New Castle County and PCBs only

WATERBODY ID	WATERSHED NAME	SEGMENT	DESCRIPTION	SIZE	POLLUTANT OR STRESSOR	PROBABLE SOURCE(S)	YEAR LISTED	TARGET DATE FOR TMDL	TMDL DATE	Pollutant CALM Code	Year Changed from Category 5 Per 305(b) Assessment and Methodology	Notes
DELAWARE BAY BASIN												
NA	Delaware River	DRBC Zone 5	From the Pennsylvania- Delaware line to Liston Point, Delaware.	59.0 sq. mi.	PCBs	PS, NPS, SF	1996	2005	2003	4a	2006	
DE020-001	Army Creek	Lower Army Creek	Segment from Route 13 to mouth at Delaware River tidal freshwater segment	3.0 miles	PCBs		2006	2015	2006	4a	2012	EPA TMDL for PCBS in Delaware River Zone 6 and tributaries
DE020-002	Army Creek	Upper Army Creek	Nontidal segment from headwaters to Route 13	1.1 miles	PCBs		2006	2006	2006	4a	2012	EPA TMDL for PCBS in Delaware River Zone 6 and tributaries
DE270-001-01	Red Lion Creek	Lower Red Lion	From U.S. Route 13 to the mouth at Delaware River	1.5 miles	PCBs	NPS	2002	2006	2006	4a	2012	EPA TMDL for PCBS in Delaware River Zone 6 and tributaries
DE090-001	Chesapeake & Delaware Canal	C&D Canal	C&D Canal from the MD Line to Delaware River	15.0M	PCBs	NPS	2002	2006	2006	4a	2012	EPA TMDL for PCBS in Delaware River Zone 6 and tributaries
DE010-001-01	Appoquinimink River	Lower Appoquinimink River	Saline Tidal Reach, excluding Hangman's Run	7.1 miles	PCBs	NPS	2002	2006	2006	4a	2012	EPA TMDL for PCBS in Delaware River Zone 6 and tributaries
DE010-001-02	Appoquinimink River	Upper Appoquinimink River	Freshwater Tidal Reach	6.1 miles	PCBs	NPS	2002	2006	2006	4a	2012	EPA TMDL for PCBS in Delaware River Zone 6 and tributaries
DE010-001-03	Appoquinimink River	Drawyer Creek	Tidal Portion	5.45 miles	PCBs	NPS	2002	2006	2006	4a	2012	EPA TMDL for PCBS in Delaware River Zone 6 and tributaries
DE010-L02	Appoquinimink River	Silver Lake	Lake adjacent to Middletown, below Deep Creek	38.7 acres	PCB	NPS	2002	2006	2006	4a	2012	EPA TMDL for PCBS in Delaware River Zone 6 and tributaries
DELAWARE ESTUARY BASIN												
N/A	Delaware Bay	DRBC Zone 6	From Liston Point to the confluence with the Atlantic Ocean	782.0 sq. mi.	PCBs	PS, NPS, SF	1996	2005	2006	4a	2008	

KEY for Pollutant(s) or Stressor(s):
DO = Dissolved Oxygen

KEY for Probable Source(s):
NPS = Nonpoint Source(s)
PS = Point Source(s)
SF = Superfund Site(s)

KEY for CALM Code
1= Fully Supporting for this parameter
3= Information is insufficent to make a determination
4a= TMDL has been completed and approved by EPA
4b= Management Actions are expected to solve impairment
5= TMDL Needed

A WATERBODY ID highlighted in light grey is an indication no data was collected in that segment in the assessment period

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ATTACHMENT 2

DNREC WATAR-IMPLEMENTATION SCHEDULE

Duffield Associates, Inc.
Project No. 4192.WL
May 2014

DRAFT

ATTACHMENT 2

Table 1. Proposed Schedule for Toxics Monitoring in Impaired Delaware Watersheds

Watershed	Contaminant(s)	Media	Calendar Year	Fiscal Year
Del Est. Zone 5	Hg	Water, sediment, biota	2012	2013
Del Est. Zones 5&6	PCBs, DxF, OC Pest, Hg	Biota only (striped bass)	2012	2013
Red Lion Creek	PCBs, DxF, OC Pest, Hg, Chlorobenzenes	Water, sediment, biota	2013	2013
C&D Canal	PCBs, DxF, OC Pest, Hg, Chlorobenzenes, PAHs	Water, sediment, biota	2013	2013
Saint Jones	PCBs, DxF, OC Pest, Hg, PAHs	Water, sediment, biota	2013	2014
Army Creek	PCBs, DxF, OC Pest, Hg, PAHs	Water, sediment, biota	2014	2014
Appoquinimink	PCBs, DxF, OC Pest, Hg, PAHs	Water, sediment, biota	2014	2015
Shellpot Creek	PCBs, DxF, OC Pest, Hg, PAHs	Water, sediment, biota	2015	2015
Christina Basin	PCBs, DxF, OC Pest, Hg, PAHs	Water, sediment, biota	2015	2016
Slaughter Creek	PCBs, DxF, OC Pest, Hg	Water, sediment, biota	2016	2016
Waples Pond & Primehook Creek	Hg	Water, sediment, biota	2016	2017
Saint Jones	Hg (if needed)	Water, sediment, biota	2017	2017
Del Est. Zones 5&6	PCBs, DxF, OC Pest, Hg	Biota only (striped bass)	2017	2017

APPENDIX O

SUMMARY OF STORET DATABASE ASSESSMENT

(to be included in Final Plan)

APPENDIX P

WET WEATHER MONITORING PLAN

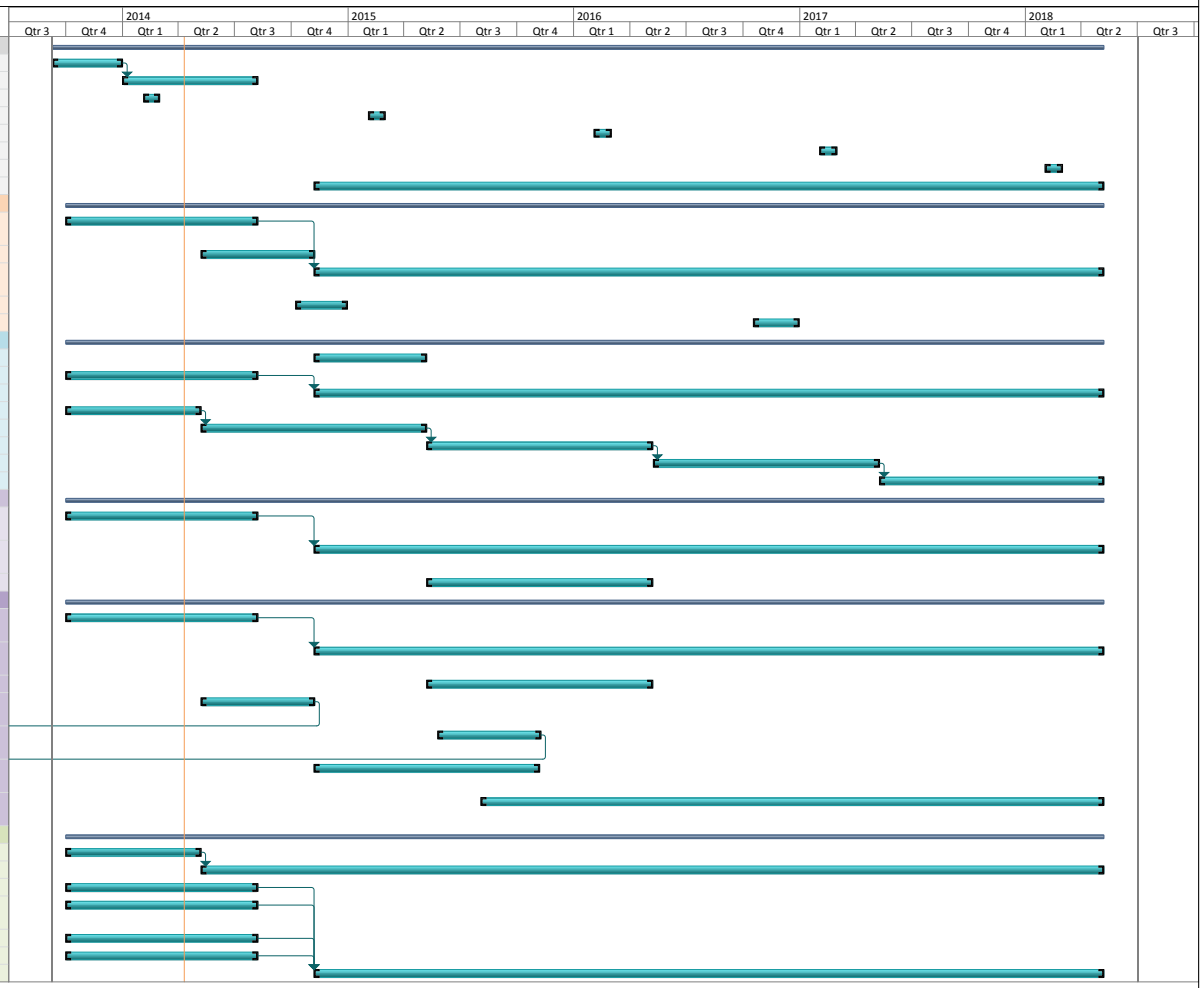
(to be included in Final Plan)

APPENDIX Q

SCHEDULE OF IMPLEMENTATION

NEW CASTLE COUNTY NPDES PERMIT DE 0051071
SWPP & MP PROJECT MASTER SCHEDULE
DRAFT AS OF April 11, 2014

ID	Task Mode	Task Name	Start	Finish	Predecessors
1		**Inter-jurisdictional coordination**			
2		Initial coordination with Co-permittees	Tue 9/10/13	Tue 12/31/13	
3		Inter-jurisdictional agreements	Wed 1/1/14	Thu 8/7/14	2
4		Annual meeting year 1	Tue 2/4/14	Sat 3/1/14	
5		Annual meeting year 2	Tue 2/3/15	Sun 3/1/15	
6		Annual meeting year 3	Wed 2/3/16	Tue 3/1/16	
7		Annual meeting year 4	Thu 2/2/17	Wed 3/1/17	
8		Annual meeting year 5	Fri 2/2/18	Thu 3/1/18	
9		Training of employees	Fri 11/7/14	Mon 5/7/18	
10		**Public Education and Involvement**			
11		Public Education and Involvement program development	Tue 10/1/13	Thu 8/7/14	
12		Public review of SWPP & MP	Thu 5/8/14	Fri 11/7/14	
13		Public Education and Involvement program implementation	Fri 11/7/14	Mon 5/7/18	11
14		First public education survey	Wed 10/8/14	Tue 12/30/14	
15		Second public education survey	Tue 10/18/16	Fri 12/30/16	
16		**Illicit Discharge Detection and Elimination**			
17		IDD&E statute or ordinance (Co-permittees)	Fri 11/7/14	Thu 5/7/15	
18		IDD&E program development	Tue 10/1/13	Thu 8/7/14	
19		IDD&E program implementation	Fri 11/7/14	Mon 5/7/18	18
20		Screen first 20% of outfalls	Tue 10/1/13	Wed 5/7/14	
21		Screen second 20% of outfalls	Thu 5/8/14	Thu 5/7/15	20
22		Screen third 20% of outfalls	Fri 5/8/15	Sat 5/7/16	21
23		Screen fourth 20% of outfalls	Mon 5/9/16	Tue 5/9/17	22
24		Screen fifth 20% of outfalls	Wed 5/10/17	Mon 5/7/18	23
25		**Stormwater Management During Construction**			
26		Stormwater Management During Construction program development	Tue 10/1/13	Thu 8/7/14	
27		Stormwater Management During Construction program implementation	Fri 11/7/14	Mon 5/7/18	26
28		Local regulatory mechanism (Co-permittees)	Fri 5/8/15	Sat 5/7/16	
29		**Post Construction Stormwater Management**			
30		Post Construction Stormwater Management program development	Tue 10/1/13	Thu 8/7/14	
31		Post Construction Stormwater Management program implementation	Fri 11/7/14	Mon 5/7/18	30
32		Local regulatory mechanism (Co-permittees)	Fri 5/8/15	Sat 5/7/16	
33		BMP database updates with new fields in 1st WQIP watershed	Thu 5/8/14	Fri 11/7/14	
34		BMP database updates with new fields in 2nd WQIP watershed	Tue 5/26/15	Sun 11/8/15	
35		BMP database updates with locations in Co-permittee jurisdictions	Fri 11/7/14	Fri 11/6/15	
36		BMP database updates with new fields Countywide	Tue 8/4/15	Mon 5/7/18	
37		**Good Housekeeping**			
38		Good Housekeeping inventory	Tue 10/1/13	Wed 5/7/14	
39		Annual inspections of facilities	Thu 5/8/14	Mon 5/7/18	38
40		Street sweeping program development	Tue 10/1/13	Thu 8/7/14	
41		Pesticides, herbicides, and fertilizers program development	Tue 10/1/13	Thu 8/7/14	
42		Snow and ice program development	Tue 10/1/13	Thu 8/7/14	
43		Litter control program development	Tue 10/1/13	Thu 8/7/14	
44		Good Housekeeping program implementation	Fri 11/7/14	Mon 5/7/18	40,41,42,43

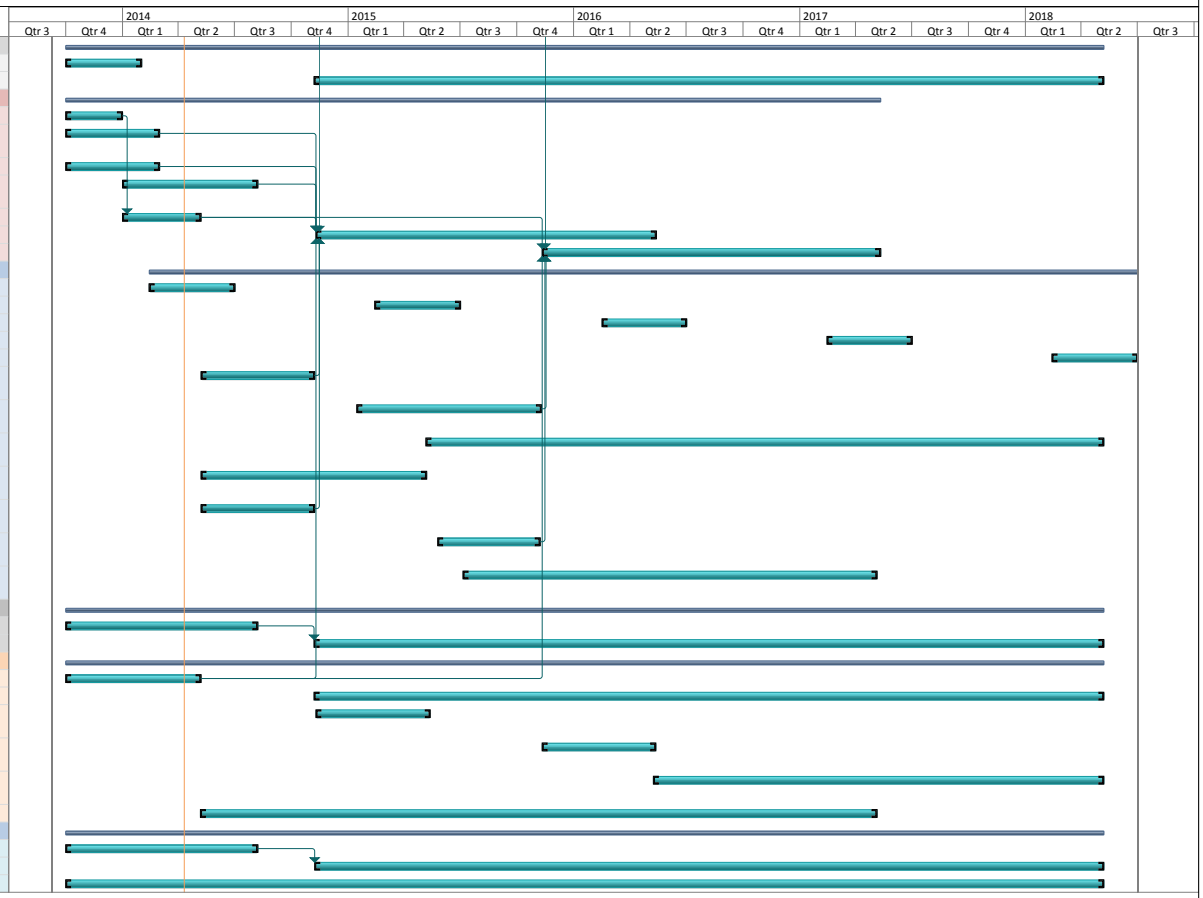


Project: SWPP & MP
Date: Fri 4/11/14

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Baseline | Progress

NEW CASTLE COUNTY NPDES PERMIT DE 0051071
SWPP & MP PROJECT MASTER SCHEDULE
DRAFT AS OF April 11, 2014

ID	Task Mode	Task Name	Start	Finish	Predecessors
45		**Industrial Stormwater**			
46		Industrial stormwater inventory	Tue 10/1/13	Fri 1/31/14	
47		Industrial stormwater facility inspections	Fri 11/7/14	Mon 5/7/18	
48		**Watershed Priority List (and WQIPs)**			
49		Criteria for watershed priority list	Tue 10/1/13	Tue 12/31/13	
50		Process for computing effective impervious area (EIA)	Tue 10/1/13	Sat 3/1/14	
51		Methodology for determining EIA equivalents	Tue 10/1/13	Sat 3/1/14	
52		Process for modifying DURMM for use on watershed scale	Wed 1/1/14	Thu 8/7/14	
53		Watershed priority list	Wed 1/1/14	Wed 5/7/14	49
54		1st WQIP development	Mon 11/10/14	Fri 5/13/16	53,62,73,66,52,50,51,33
55		2nd WQIP development	Wed 11/11/15	Thu 5/11/17	53,73,67,63,34
56		**Mapping**			
57		Mapping update year 1	Thu 2/13/14	Tue 7/1/14	
58		Mapping update year 2	Fri 2/13/15	Wed 7/1/15	
59		Mapping update year 3	Tue 2/16/16	Fri 7/1/16	
60		Mapping update year 4	Tue 2/14/17	Sat 7/1/17	
61		Mapping update year 5	Tue 2/13/18	Sun 7/1/18	
62		Outfall database update with drainage areas in 1st WQIP watershed	Thu 5/8/14	Fri 11/7/14	
63		Outfall database update with drainage areas in 2nd WQIP watershed	Thu 1/15/15	Mon 11/9/15	
64		Outfall database update with drainage areas Countywide	Thu 5/7/15	Mon 5/7/18	
65		Outfall database with information from Co-permittee jurisdictions	Thu 5/8/14	Thu 5/7/15	
66		GIS layer for all urbanized / impervious areas in 1st WQIP watershed	Thu 5/8/14	Fri 11/7/14	
67		GIS layer for all urbanized / impervious areas in 2nd WQIP watershed	Tue 5/26/15	Sat 11/7/15	
68		GIS urbanized / impervious areas layer Countywide	Mon 7/6/15	Fri 5/5/17	
69		**PMP for PCBs**			
70		Pollutant minimization plan for PCBs	Tue 10/1/13	Thu 8/7/14	
71		Monitoring and sampling for PCBs	Fri 11/7/14	Mon 5/7/18	70
72		**TMDL WLAs and Applicable Water Quality Standards**			
73		Existing water quality data analysis	Tue 10/1/13	Wed 5/7/14	
74		WLA spreadsheets for watersheds Countywide	Fri 11/7/14	Mon 5/7/18	
75		Load reductions from BMPs calculations in 1st WQIP watershed	Mon 11/10/14	Wed 5/13/15	
76		Load reductions from BMPs calculations in 2nd WQIP watershed	Wed 11/11/15	Thu 5/12/16	
77		Load reductions from BMPs calculations Countywide	Mon 5/9/16	Mon 5/7/18	
78		Submittal of GIS layer of impervious areas	Wed 5/7/14	Fri 5/5/17	
79		**Wet Weather Performance Monitoring Plan**			
80		Wet weather monitoring program development	Tue 10/1/13	Thu 8/7/14	
81		Wet weather monitoring implementation	Sat 11/8/14	Mon 5/7/18	80
82		Research of highway BMPs	Tue 10/1/13	Mon 5/7/18	



Project: SWPP & MP
Date: Fri 4/11/14

Task		Summary		External Milestone		Inactive Summary		Manual Summary Rollup		Finish-only		Progress	
Split		Project Summary		Inactive Task		Manual Task		Manual Summary		Deadline			
Milestone		External Tasks		Inactive Milestone		Duration-only		Start-only		Baseline			