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**NATIONAL POLLUTANT DISCHARGE  
ELIMINATION SYSTEM**

**KENT COUNTY MS4  
Permit No. DE 0051144**

**submitted by  
DELAWARE DEPARTMENT OF TRANSPORTATION**

**ANNUAL REPORT FOR CALENDAR YEAR 2012**

**Volume 1 of 1  
DelDOT Report and Appendices**



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Submitted July 1, 2013



STATE OF DELAWARE  
*DEPARTMENT OF TRANSPORTATION*  
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SHAILEN P. BHATT  
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July 1, 2013

Mr. Bryan Ashby  
Manager, Surface Water Discharge Section  
Delaware Department of Natural Resources  
and Environmental Control  
89 Kings Highway  
Dover, DE 19901

Re: NPDES Phase II Annual Report for Calendar Year 2012  
NPDES Permit No. DE 0051144

Dear Mr. Ashby:

Enclosed please find DeIDOT's annual NPDES Phase II Report. This volume covers permit activities for calendar year 2012 for the Kent County MS4.

Sincerely,

Randy Cole  
NPDES Program Manager

Enclosures

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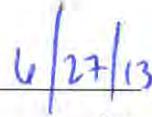
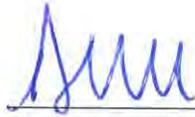
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## CERTIFICATION

I certify under penalty of perjury that this document and all attachments are true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations. As to the identified portions of this document for which I cannot personally verify their truth and accuracy, I certify as Delaware Department of Transportation's official having responsibility for the persons who, acting under my direct instruction, made the verification that this information is true, accurate, and complete.



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date

## **Program Summary and Projection**

The objective of the Delaware Department of Transportation NPDES Program is to reduce stormwater pollutants from the MS4 (municipal separate storm sewer system) to the maximum extent practicable. This is accomplished through the implementation of a comprehensive stormwater pollution prevention and management program as contained in the NPDES Permit No. DE 0051144, effective July 1, 2003.

The purpose of this review and update is to summarize activities for 2012 and provide a projection of work for calendar year 2013. Table A summarizes the Minimum Control Measures, BMPs, Measurable Goals, and Status of Implementation for the entire permit term. Work projections for 2013 are provided at the end of this section in Table B.

### **2012 Program Summary**

#### Public Education and Outreach

DelDOT's public education program includes the following accomplishments for calendar year 2012:

- Partnered with the Appoquinimink River Association for public education and outreach that included continuation of the Delaware Livable Lawns campaign. As of November 2012, this agreement expired. We therefore executed an agreement with the Delaware Nursery Landscape Association to manage the Delaware Livable Lawns program for the next three years.
- Completed final report of an education/outreach management plan through an agreement with the University of Delaware, Water Resource Agency, to investigate cost effective social marketing options.
- DelDOT is continuing the "Door hanger campaign," begun in 2006, as an educational tool to neighborhoods where illicit disposal are reported.
- DelDOT staff participated in the following public outreach events and distributed educational materials including bookmarks, brochures, calendars and promotional giveaways that carry a water quality message:
  - Delaware Rural Water Association – we exhibited our display board and graphics and touch screen stormwater slide show;
  - Delaware State Fair – we exhibited our display board and graphics and touch screen stormwater quiz.
- Served on the board of directors with the Delaware Association for Environmental Education (DAEE) and helped organize the annual statewide environmental education conference.

#### Public Involvement and Participation

DelDOT makes opportunities for members of the public to participate in program development and implementation through:

- Public participation in the DelDOT budget process.
- The Adopt-a-Highway program, a volunteer program to reduce litter along state roadways.
- DelDOT held its eighth annual “Imagine a Litter Free Delaware” cleanup day along roads, highways and community areas.
- DelDOT is continuing with its door hanger campaign to solicit public participation to report illegal dumping and “neighborhood watch.”

#### Illicit Discharge Detection and Elimination (IDDE)

DelDOT completed inventory, inspection and dry-weather screening of all parts of the DelDOT owned stormwater conveyance system in the Phase II urbanized area in 2007. These data are incorporated into the existing comprehensive GIS database that enables users to view the entire stormwater system, corresponding inspection data and photographs. KCI Technologies and Century Engineering continue to expand the inventory and inspection program to the rest of Kent and Sussex Counties and to update new structures that are added to the system. New outfalls are screened for dry weather flow or evidence of illicit discharges as they are inventoried and inspected.

Inventory and inspection of Kent County has been completed. Emphasis in 2012 was on completion of Sussex County. The MS4 database and map viewer are continually updated as the inspections are completed.

DelDOT also continued a public education program to help eliminate improper disposal and dumping into storm drains. Whenever evidence of improper dumping is discovered, either through routine inspections or citizen complaints, the entire community is canvassed with educational door hangers. In addition, we helped publicize Delaware Solid Waste Authority (DSWA)’s Household Hazardous Waste Collection Program and DNREC’s “TrashStoppers” Program.

#### Construction Site Stormwater Runoff Control

The Department of Natural Resources and Environmental Control has delegated the authority to administer a sediment and stormwater program to DelDOT. Satisfactory performance of the delegated responsibilities will be considered compliance with this component of the SWMP. This delegation was renewed for another three years through June 30, 2015.

#### Post-Construction Stormwater Management in Newly Developed Areas and in Redeveloped Areas

The Department of Natural Resources and Environmental Control has delegated the authority to administer a sediment and stormwater program to DelDOT. Satisfactory performance of the delegated responsibilities will be considered compliance with this component of the SWMP. This delegation was renewed for another three years through June 30, 2015.

## Pollution Prevention and Good Housekeeping

DelDOT has developed and implemented an operation and maintenance program with a goal of preventing and/or reducing discharges of pollutants associated with our operations through implementation of the following:

- Maintenance of the roadways and stormwater conveyance system.
- Continued to implement a 4:2:1 street sweeping frequency.
- Continued to upgrade the existing snow removal fleet with ground speed spreader controls, plow balance valves and apply the techniques of anti-icing and pre-wetting in an effort to reduce overall salt usage during the winter season. New trucks will be fully equipped with ground speed spreader controls and plow balance valves. To date, all DelDOT trucks are equipped with the latest snow fighting equipment.
- Litter pickup by Department maintenance staff, prison crews, and the Adopt-a-Highway Program, and an annual “Imagine a Litter Free Delaware” cleanup day.
- Monitoring of stormwater outfalls at our maintenance yards per Pollution Prevention Plans.
- Continued implementation of the Stormwater Pollution Prevention Program (SWPPP) at all DelDOT maintenance facilities. Quarterly wet and dry weather inspections are conducted at each yard.
- Continued to implement Spill Prevention Control and Countermeasures (SPCC) plans for all maintenance yards.
- Continuation of a pilot study on alternative vegetation management strategies for guardrails to reduce pesticide usage.
- Conducted employee training through:
  - Training videos on the SWPPP’s
  - Training videos on SPCC Plans
  - Maintenance bulletins posted at each maintenance facility.

### **2013 Work Projection and Plan:**

Work projections for 2013 are provided at the end of this section in Table B (page xi).

**Table A.** Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DeIDOT Phase II NPDES.

<b>MCM #1: Public Education and Outreach Program</b>		
<b>BMP</b>	<b>Measurable Goal</b>	<b>Status of Implementation</b>
<b>A. Citizen Outreach / Educational Materials</b>	Conduct citizen outreach using media and materials:	
Educational bookmark	Distribute 11,000 to 7th graders in public and private schools	Completed 2005
Stormwater brochures	Distribute at public events	Annually since 2002
Kid's activity booklet	a. Distribute 9,000 booklets to 4th graders in public and private schools statewide b. Distribute at public events	a. completed 2004, 2005 & 2006 b. continuous through permit at public events
Book cover	Distribute 4,000 at public events and per teacher request	Completed 2006
Restaurant placemat	Distribute 7,500 placemats to 11 restaurants statewide	Completed 2005
Public Service Announcement	Air twenty 60-second PSA spots in spring on WSTW, 93.7 FM	Completed Spring 2005
Bags-on-Board	Distribute 4,000 units (2006), 7,200 units (2010), tipcards and follow-up surveys to vet clinics, dog groomer, dog trainer, animal rescue	2006 and 2010; annually thereafter at public events
<b>B. Watershed Training Workshop</b>	Present four 2 ½-hour watershed training course on basic watershed education and good-housekeeping measures to DeIDOT and NCCo. employees	Completed 2002
<b>C. Stormwater Web Page</b>	Develop a website to educate the public on stormwater issues and good housekeeping measures; update as needed; track web-site visits	Completed 2003 in partnership with NCC; developed DeIDOT hosted stormwater website in 2007- continuous through permit
<b>D. Storm Drain Marking</b>	Install water quality message markers on the estimated 4,500 storm drains	Completed June 2007; continuous with newly accepted subdivisions

**Table A (cont.).** Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DeIDOT Phase II NPDES.

<b>E. School Participation</b>	Engage public and private schools statewide in stormwater education	
Statewide drawing contest	Coordinate "Clean Water Begins and Ends with You!" drawing contest for K-12 graders	Annually from 2004 - 2008; 1,500 participants in 2008, canceled due to budget cuts
Technology Students Asso.	Judge TSA competition for middle and high school students statewide; students develop restaurant placemat and coloring book cover	Annually since 2003, continuous through permit
<b>F. Public Event Participation/Display</b>	Develop display and interactive stormwater game for use at public events	Purchased 2002; updated continuous through permit; partnered with U of Del. computer science dept. to develop computer games - continuous since 2011
<b>G. Promotional giveaways</b>	Purchase items that display a water quality message for prizes and giveaways at public events	Annually since 2002, continuous through permit
<b>H. Local Group Interaction</b>	Partner with local non-profit groups in the development of education materials and outreach manuals, pet waste campaign and user surveys	Began 2005, continuous through 2012
<b>I. Stormwater Video</b>	Reprint "Protecting Our Water: Who's Got the Power" video. We will reprint the video into a DVD format and offer it as a teacher package at public events and watershed training for Tributary Action Team participants.	Completed September 2007
<b>J. Newspaper Advertisements</b>	Submit newspaper advertisements to increase public awareness on the importance water quality related to stormwater.	Completed October 2008
<b>K. Storm System Inventory Brochure</b>	Revise and distribute existing brochure for all residents in Phase II area	Completed February 2008
<b>L. Delaware Livable Lawns</b>	Promote program, launch website, develop brochures, certify qualified companies	Continuous since 2010
<b>M. Chesapeake Bay WIP</b>	Contribute to the activities of DNREC's Chesapeake Bay WIP Communications & Outreach Committee	Continuous since 2012

**Table A (cont.).** Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DeIDOT Phase II NPDES.

<b>MCM #2: Public Participation/Involvement</b>		
<b>BMP</b>	<b>Measurable Goal</b>	<b>Status of Implementation</b>
<b>A. Litter control programs</b>		
Adopt-a-Highway	DeIDOT will continue the Adopt-a-Highway program and document all participants and solicit new volunteers through newspaper ads and DeIDOT website.	Continuous program since 2003
"Imagine a Litter Free Delaware" cleanup day.	Statewide public event for clean up along roads, highways and community areas.	Annually since 2005
Anti-litter education program	Education program for elementary students all across Delaware to educate kids about the harmful effects of littering and encourage participation in the Adopt-a-Highway program	2005-2006
<b>B. Public workshop – maintenance organizations</b>		
	Hold two public workshops for Kent and Sussex County maintenance organizations on stormwater pond maintenance and the NPDES program and solicit public comment through a survey and comment form	Completed May 2007
<b>C. Development of stormwater and watershed presentation/survey for community groups</b>		
	Review and revise current watershed presentation.	Completed May 2008
<b>D. Door hanger campaign</b>		
	Distribute door hangers to all subdivision residents where illegal dumping was reported or discovered. Solicit public participation for future reporting.	Annually since 2005
<b>E. Tributary Action Teams</b>		
	Participate in TAT meetings of the Murderkill and St. Jones River watersheds to assist in the development of Pollution Control Strategies and to determine the effect of TMDL implementation on DeIDOT projects.	2002-2007; participate as new TATs are formed
<b>F. National Nonpoint Education for Municipal Officials (NEMO)</b>		
	Serve on the Delaware NEMO steering committee and co-author a chapter on stormwater management.	2003-2006

**Table A (cont.).** Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DeIDOT Phase II NPDES.

<b>MCM #3: Illicit Discharge Detection and Elimination</b>		
<b><u>BMP</u></b>	<b><u>Measurable Goal</u></b>	<b><u>Status of Implementation</u></b>
<b>A. Storm Sewer System Map</b>	Develop map showing location of all outfalls & names and location of all waters of the US receiving discharges from them	
Database and viewer application	a. Develop storm sewer system system inventory and inspection database application and GIS mapping viewer application for Kent County. b. Improvements to map viewer database	a. Completed 2003 b. 3rd iteration of map viewer
Inventory and inspection	Complete initial inventory and inspection of all storm sewer system components in the permitted area, at a rate of 20% each year, Update database at least annually to include inventory and initial inspection of all new system components within and outside the permitted area	Completed 2007
Database update		Ongoing, annually
Expand inventory to rest of Kent & Sussex Counties	Expanded inspection database and mapping to include all of Kent and Sussex Counties	Ongoing, begun in 2007; Kent Co. completed in 2011; continuing in Sussex Co.
<hr/>		
<b>B. Dry Weather Outfall Screening</b>	Screen 20% of known DeIDOT outfalls in the permitted area per year	Completed 2007
Ongoing IDDE Program	Inventory and screen new outfalls; screen outfalls as part of MS4 reinspections; investigate reported PIDs	Continuous since 2007
New Outfalls	Conduct screening on new outfalls added to the system since the original inventory.	Ongoing, annually
<hr/>		
<b>C. Public Reporting and Education</b>	Publicize phone number for reporting illicit discharges or dumping into the storm sewer system through all education and outreach materials and in public workshops.	Ongoing; added to new stormwater website in 2007
	Distribute educational door hangers to homes in all neighborhoods in which illicit dumping activities have been reported, found or suspected.	Completed 2006, and ongoing

**Table A (cont.).** Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DeIDOT Phase II NPDES.

<b>MCM #4 &amp; #5: Construction Site Runoff Control/Post Construction Stormwater Management</b>		
<b><u>BMP</u></b>	<b><u>Measurable Goal</u></b>	<b><u>Status of Implementation</u></b>
A. Delegated Agency	DeIDOT is a delegated agency to administer its own Sediment and Storm Water Management Program per Delaware's Sediment and Stormwater Regulations. Review delegation every 3-years.	Annually since 1991
B. Operations and Maintenance of BMPs	Annually inspect stormwater BMPs statewide.	Annually since 2001
C. BMP maintenance contract	Maintain stormwater ponds in need of major repairs that are functioning below design standard for quantity and quality.	Annually or as required
D. Revise Standard Specification 110	Progressive step-wise approach to gaining compliance with approved plans, regulations, and laws towards enforcement of construction site erosion and sediment controls	Revised 2007
E. Third party CCR inspectors	Use third party consultant services to conduct erosion and sediment control inspections on DeIDOT projects	Annually since 2011

**Table A (cont.).** Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DeIDOT Phase II NPDES.

<b>MCM #6: Pollution Prevention/Good Housekeeping for Municipal Operations</b>		
<b><u>BMP</u></b>	<b><u>Measurable Goal</u></b>	<b><u>Status of Implementation</u></b>
<b>A. Litter Control Programs</b>		
Adopt-a-Highway	DeIDOT will continue the Adopt-a-Highway program and document all participants and solicit new volunteers through newspaper ads and DeIDOT website.	Continuous program since 2003
"Imagine a Litter Free Delaware"	DeIDOT will continue the program and solicit new volunteers through newspaper ads and DeIDOT website	Annually since 2005
Inmate Crews	DeIDOT will continue to utilize the inmate crew to assist current staff levels to reduce the floatables entering the storm sewer system.	Continuous program since 2002
<b>B. Storm Water Pollution Prevention Plans</b>		
	a. DeIDOT developed SWPPPs at all maintenance facilities. b. Update as needed.	a. Completed 2004 b. Revision of maps and plans began 2012
Quarterly Inspections	DeIDOT maintenance facility staff will complete a Dry and Wet Weather inspection each quarter.	Quarterly since 2004
Annual Inspections	DeIDOT NPDES staff will conduct annual compliance inspections at each maintenance facility	Annually since 2004
Outfall water quality monitoring	The Pollution Prevention Plans currently require wet weather stormwater monitoring at four maintenance facilities, one of which falls within the Phase II area.	Semi-annually since 2003
Purchase spill kits	a. The NPDES Section purchased wall mount spill kits for placement in vehicle shop buildings. b. Purchase as necessary	a. Completed 2003 b. Annually as needed following annual inspections
Security Fence	As part of the SWPPPs, DeIDOT enclosed all maintenance facilities with security fences and gates.	Completed 2005
<b>C. Statewide Vehicle Wash Water Practices for DeIDOT Maintenance Yards</b>		
	Treat all wash water through a treatment train prior to leaving the site.	Vehicle wash plan report completed and approved by DNREC July 2005
Dover, Magnolia, Cheswold maintenance facilities	Fully implement vehicle wash plan for three facilities within the Phase II permit area	Completed 2007

**Table A (cont.).** Minimum Control Measures , BMPs, Measurable Goals, and Status of Implementation for DeIDOT Phase II NPDES.

<b>D. Statewide Salt Best Management Practices for DeIDOT Maintenance Yards</b>		
Construct salt barns	DeIDOT developed a report that documents operational practices and strategies for salt delivery, stockpiling, and mixing. DeIDOT constructed 3 salt barns	Completed 2004 Completed 2005
Upgrade snow equipment	Ground-speed spreader controls, anti-icing, pre-wetting, plow balanced valves	Began 2004; continuous through permit
<b>E. Spill Prevention and Response</b>		
Spill Kits for Vehicles	DeIDOT to purchase 450 vehicle spill kits for use on the roadway	Completed 2007
Spill Prevention, Control and Countermeasures Plans (SPCC)	a. DeIDOT developed a SPCC plan for each maintenance facility. These plans include proper procedures for spill response. b. Update as necessary.	a. Completed 2007 b. Revision of maps and plans began 2012
Drainage Maintenance	DeIDOT will maintain the system as issues are discovered through inspections and complaints.	Continuous program since 2001; reinspect on a 5/10 year schedule
Storm System Inventory and Inspection	DeIDOT will perform a detailed inventory and inspection of the MS4 system.	Completed 2007
Inspection and Preventative Maintenance Program	DeIDOT will determine the appropriate re-inspection schedule for the stormwater system	Completed 2007
	DeIDOT will begin the re-inspection program	Began 2009, ongoing
<b>H. Sweeping Program</b>		
	a. DeIDOT upgraded the sweeping program to a full time operation with the addition of new sweepers. b. Install AVL units to track sweepers	a. Completed 2002, continuing through permit. b. Completed 2011; install on new equipment as needed.
<b>I. Training</b>		
PPP training videos	Develop 3 videos entitled (1) Facility and Vehicle Maintenance, (2) Stormwater Contamination and Spill Prevention, (3) Vegetative Control and Pollution Prevention on Public Roads.	Completed 2003; annual requirement for all maintenance staff
Maintenance Bulletins	Develop informative bulletins for District staff to educate them on stormwater management and pollution prevention BMPs	Continuous program since 2003
Spill Prevention and Response Videos	DeIDOT to develop and use three training videos on Spill Prevention and response.	Completed 2007, annual requirement for all maintenance staff

**Table B.** Projection of Work to be performed during Calendar Year 2013.

### **Public Education and Outreach**

- Participate and distribute education materials at outreach events: Delaware Rural Water Association Conference, DNREC's Make-a-Splash, Agriculture Day, and the Delaware State Fair.
- Place storm drain markers, carrying a water quality message, on DelDOT owned inlets.
- Routine updates to web site and make available all outreach material and training presentations.
- Network and coordinate educational efforts with other state and local organizations through participation in the newly formed Delaware Association for Environmental Education.
- Continue Phase I of the Delaware Livable Lawns project to commercial lawn care companies.

### **Public Involvement and Participation**

- Recruit new volunteers for Adopt-a-Highway.
- Solicit public participation for reporting illegal dumping through DelDOT's door hanger campaign.
- "Imagine a Litter Free Delaware" cleanup day.
- Begin development of Phase II of Delaware Livable Lawns, an educational/outreach campaign to reduce fertilizer application for home owners.

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

- Continue inventory and inspection of outfalls and drainage structures in Kent and Sussex Counties. Since Kent County was mostly completed by the end of 2011, inspections will be focused in Sussex County during 2013.
- Inspect all stormwater ponds and BMPs in Kent and Sussex Counties; add collected data to the existing inventory database.
- Perform dry weather screening on newly inventoried outfalls and continue to investigate potential illicit discharges as they are discovered or reported.
- Use Center for Watershed Protection guidance to revise dry weather screening protocol.

- Continue door hanger campaign to residents where illegal discharges/dumping has occurred.

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

- Delegation of the sediment and stormwater program is granted through the year 2015. DelDOT will comply with all state requirements.
- Use third party consultant services to conduct erosion and sediment control inspections on DelDOT projects.

### **Post-Construction Stormwater Management in Newly Developed Areas and in Redeveloped Areas**

- Delegation of the sediment and stormwater program is granted through the year 2015. DelDOT will comply with all state requirements.

### **Pollution Prevention and Good Housekeeping**

- Update the Pollution Prevention Plans for DelDOT maintenance facilities.
- Continue requiring maintenance staff to view pollution prevention and spill prevention training videos annually.
- Continue to develop and distribute Stormwater Pollution Prevention Bulletins to each maintenance yard statewide on a quarterly basis.
- Continue 4:2:1 sweeping frequency. Finalize installation of GPS units in sweepers to conduct a pilot test of sweepers as a means of tracking and confirming compliance.
- Continue implementation of the “Statewide Vehicle Wash Water Practices for DelDOT Maintenance Yards” plan.
- Continue implementation of the Integrated Roadside Vegetation Management (IRVM) manual developed in 2009.
- Continue to update the statewide guardrail inventory, as needed.
- Use data from the guardrail inventory to develop a strategy for continued reduction of pesticide use.
- Continue the guardrail vegetation management study initiated in 2008 through the growing season of 2013 to test new plots of zoysia grass.

## SWPP&MP Assessment

This section is an annual review of the current SWPP&MP, which was revised in June 2007.

### Public Education

#### Partnerships

The NPDES Section contracts with several non-profit organizations to assist with development of education and outreach programs. During the permit term, we have partnered with The Partnership for the Delaware Estuary, the Appoquinimink River Association (ARA), the Delaware Nature Society, and the Delaware Nursery Landscape Association. They have specialties in watershed and water quality education. Partnering with these organizations has proven to be an effective means of expanding our limited staff resources in a cost effective manner.

With many watersheds facing TMDLs for nutrients and bacteria, we decided to pilot an outreach effort in a two-phased approach to commercial lawn care companies and property owners. We therefore executed an agreement with the ARA to (1) develop a program called “Delaware Livable Lawns” that certifies commercial lawn care companies for their efforts that reduce fertilizer runoff through educating their clients on best practices, soil testing, and reporting fertilizer quantities while meeting homeowners needs. (2) In Phase II of the program, we will be targeting individuals in housing developments to be demonstration lawns for various types of fertilizer applications and organic products. We have an advisory committee consisting of 9 stakeholder groups from government and state agencies, University staff, private non-profit, plus a member of a commercial lawn care company. This diversity with varying perspectives has proven to be an effective combination to move this program forward quickly capturing a multitude of ideas without the idea of the government trying to regulate the commercial lawn care industry.

Our Phase I NPDES permit requires DelDOT to meet a minimum 250,000 “impressions” about stormwater quality to the general public. We are under agreement with the University of Delaware to assist the co-permittees in achieving the education requirements of the permit and making these efforts more effective and meaningful for New Castle County, DelDOT and the six municipalities regulated under the permit. This project will also strive to get the public and businesses involved in NPDES stormwater quality education. We will therefore use the results of this effort in modifying our Phase II SWMP. The University of Delaware prepared a final recommendations report detailing a stormwater education plan that address major pollutant problems for eight target areas (Appendix B).

#### Public Events

Part of our public outreach effort is participating in public events. Because we have limited budget and staff, we focus on large, multi-day events where there is substantial foot traffic. The biggest event each year is the Delaware State Fair, where we participate for 10 days serving over 30,000 visitors through our building. Our theme in 2012 focused on the “Delaware Livable Lawns” project to reduce fertilizer runoff through smaller lawns and

container growing. Since the landscape display was so popular we will again use the University of Delaware horticulture staff to design a landscape display in 2013.

### **Public Participation/Involvement**

#### **Door Hanger**

Our door hanger campaign has brought awareness to the public and allows them to be proactive in reporting illicit discharges in their neighborhood. When illegal substances are found in storm inlets through DelDOT inspections or are reported by the public, we distribute door hangers to the surrounding neighborhood. We have found this to be a very effective program for generating public awareness and public involvement. This typically generates phone calls to our office where we explain the program and direct them to our web site. In 2012, we distributed 15 door hangers New Castle County, but none were required in Kent and Sussex County Phase II areas.

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

#### **Outfall Screening**

Very few illicit connections have been found over the years through dry weather screening. The majority of the illicit discharges or connections that actually have been confirmed were discovered either through routine MS4 maintenance inspections or were reported to the NPDES Section by maintenance staff or the public. That pattern continued through 2012.

Following the recommendations of the Center for Watershed Protection's IDDE Guidance Manual (2004), we have already begun to plan revisions to DelDOT's IDDE protocols. An assessment of the chemical data from our previous dry weather screening activities has suggested that some of the parameters that we have measured, such as phenols and chlorine, are of limited value in detecting illicit discharges in the Phase II area. Therefore, beginning in 2013, we will begin to modify our protocols to include a suite of parameters more closely aligned with those recommended by the Center for Watershed Protection.

In assessing the dry weather data, we also uncovered a need for a database for the inspections that will allow querying on water quality data. Although the current NPDES database and map viewer allows one to view the data for a particular outfall, the database structure did not permit us to perform queries. KCI Technologies was tasked to revise the IDDE database to allow queries.

#### **Map Viewer**

We completed the map viewer and provided training to DelDOT employees. Based on comments received during the training workshops, we continue to modify the viewer functionality and querying capabilities. The map viewer and database have proven to be very useful tools for maintenance staff. In 2011 we offered training on use of the map viewer to engineering, design and planning staff to extend its use within the department. To date we have 152 users with 15 added in 2012.

## Pesticide, Herbicide, Fertilizer

DelDOT's Roadside Environmental section manages PHF applications applied by contractors and DelDOT staff. The NPDES Program has the responsibility to develop programs and implement controls through training, policy changes resulting from research, development of SOPs, education, etc. to reduce the pollutants associated with their application and to track trends that can document anomalous spikes in usage or declines in usage due to implementation of programs.

We have implemented several pesticide reduction programs as described below:

1. Guardrail pilot study – DelDOT currently treats approximately 310 miles of guardrail with herbicide. We developed a program in conjunction with the University of Delaware to investigate methods to reduce the use rates of pesticides and carriers used to treat guardrail vegetation without compromising safety and aesthetics. We selected and applied several treatment methods along several guardrail sections to compare the effectiveness, ease of implementation, aesthetics, cost and longevity. Treatments included weed control barriers, low-growing vegetation and hand-cutting existing vegetation. Herbicides will be used on treatment plots as a measure against non-chemical treatments. Based on preliminary results, one commercial weed control barrier treatment type will be eliminated from testing and two new seed mixes will be added in 2012.
2. Guardrail inventory – Treating guardrail accounts for a significant percentage of DelDOT's herbicide treatment program. The NPDES Program saw guardrails as a relatively simple way to reduce herbicide usage. Our consultant inventoried all guardrails statewide and collected attribute data that included material under guardrail and surrounding landscape and environmental features. We are looking for areas where alternative treatment measures (e.g. hand control, weed barrier, low-grow fescues) can be used in lieu of herbicides.

We have an agreement with a consultant to maintain and update this statewide guardrail inventory. As we receive notification of new projects and review as-built plans for the addition of new guardrail, a list is compiled and sent to our guardrail consultant on a quarterly basis. This continuous process saves the department money by not having to repeat the entire statewide inventory every several years.

3. Record keeping – We are continuing to keep records of herbicide quantities to establish baseline herbicide usage. By tracking herbicide quantities we hope to be able to identify the cause of spikes or declines in usage and use the data to assess pesticide reduction programs we have implemented.

## **Construction Site Runoff**

### E & S Plan Compliance and BMP Performance

Erosion and sediment control at DelDOT construction sites falls under the purview of the Division of Transportation Solutions (DOTS). However, the NPDES Program, through its permit and consent decree, is responsible for ensuring E & S control compliance.

1. Since 2007, the contractor provided the CCR for major construction jobs. This has proven to be, on occasion, ineffective. Reports are not completed weekly or after storm events and often contractors do not provide a daily crew to maintain and/or correct deficiencies for E & S. We therefore executed two agreements with consultants to conduct the daily CCR construction duties in lieu of the contractor. This has improved compliance with the required weekly and rain event reporting. The consultant also has the authority to hire a third party contractor to correct E&S deficiencies if the prime contractor refuses.
2. Changes to the DelDOT Standard Specifications, as well as new E & S control requirements and BMP standard details, have made the current version of the *DelDOT Erosion and Sediment Control Field Guide* somewhat obsolete. Therefore, the NPDES Program executed an Agreement with Whitman, Requardt and Associates to completely rewrite the *Field Guide* and put it into a more user-friendly format. The field guide was finalized and distributed to 199 DelDOT employees in 2012 and is available for purchase to consultants and contractors. It is available for viewing at [http://www.deldot.gov/stormwater/ES\\_fieldguide.shtml](http://www.deldot.gov/stormwater/ES_fieldguide.shtml).
3. Sediment and Stormwater Regulations: The Governor's Surface Water Task Force recommended revision of the Sediment and Stormwater Regulations to address volume management, flooding, and plan review process improvement. Federal requirements for water quality improvement (e.g. TMDL) are being addressed as well. As a delegated agency, DelDOT is required to follow these regulations.

### **Pollution Prevention and Good Housekeeping for Municipal Operations**

#### **Street Sweeping Program**

Under the current NPDES permit, DelDOT sweeps an annual 4:2:1 frequency on primary, secondary and tertiary roads. In order to assist DelDOT in quantifying the expected pollutant load reductions from all controls (e.g. sweeping) to meet the TMDL (Total Maximum Daily Load) and Waste Load Allocation goals, DelDOT has implemented two changes to its sweeping program: (1) we equipped all sweepers with automatic vehicle location (AVL) devices. We are testing the feasibility of using the AVLs to verify that the required sweeping frequency has been met, as well as obtain better estimates of pollutant load reductions resulting from sweeping activities; (2) separation of sweeper waste from other material so it can be weighed before deposited at the landfill.

#### **Vehicle Wash Plan**

The use of the *Statewide Vehicle Wash Water Practices for DelDOT Maintenance Yards* manual, developed in July 2005, has resulted in designated locations for vehicle washing that are treated via a stormwater treatment train series of BMPs. We completed the last retrofit at the Harrington maintenance facility in summer 2010.

## Pollution Prevention Plans

In assessing the PPP's, we determined that many of the plans need to be updated to include new maps of facilities and drainage systems, new BMPs, and new staff responsible for PPP implementation. We have begun the process of updating the facility maps and will update the PPPs as facility use changes.

## Salt Plan

DelDOT's *Statewide Salt Best Management Practices for DelDOT's Maintenance Yards* has resulted in the purchase of salt structures to comply with storing salt under roof. Quarterly inspections and increased training through SWPP&MP videos and maintenance bulletin posters have also resulted in greater awareness of and compliance with the provisions of the salt plan by maintenance staff.

NPDES staff has served as part of a road salt working committee with DNREC and drinking water suppliers in New Castle County. Although DelDOT has implemented many salt reducing strategies into its snow/ice program, intake water often has high chloride levels due to salt runoff into surface waters that supply their customers following snow/ice events. Through this partnership, DelDOT was given the opportunity to clarify our efforts at minimizing salt application to the roadways.

## Other

### Storm sewer system inventory and inspection

Although not a permit requirement, we extended the storm sewer system inventory and inspection program to Kent and Sussex Counties. This program assists the Districts with maintenance and pollutant tracking statewide through the map viewer database.

We made a programmatic change to the inspection schedule. We added additional inspection teams in Sussex County in an effort to complete the entire state on an accelerated schedule.

Stormwater Retrofits: Partnering on stormwater retrofits provides a cost saving benefit and increases the ability to leverage grant money.

- **Agriculture Museum:** DelDOT is partnering with DNREC on a stormwater retrofit in the Phase II area in Dover adjacent to the Agriculture Museum. The retrofit would treat currently untreated road runoff and reduce ponding along State Street before it enters Silver Lake/St. Jones River.
- **Inland Bays:** Although not in the Phase II permit area, we took advantage of a grant opportunity through DNREC's Nonpoint Source Program to partner with the Center for the Inland Bays to construct a multi-phase project that includes vegetated wet swales next to the roadway shoulder, bioretention areas in the medians, and bioretention in roadside swales of Delaware Highway 1 located within portions of unincorporated Sussex County, Middlesex Beach, and the Town of South Bethany in Sussex County, Delaware. The bioretention areas are designed to achieve calculated reductions of surface water runoff and nitrogen and phosphorus loads entering stormdrains that flow to residential canals on Little Assawoman Bay. There are also

plans to construct a median pond when funding is available.

## 1. Public Education and Outreach

### Requirement:

DeIDOT shall implement a public education program to distribute educational materials to the community, or conduct equivalent outreach activities about the impacts of stormwater discharges on local water bodies and the steps that can be taken to reduce stormwater pollution. In addition, DeIDOT shall determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

### Performance/Measurable Goals:

- We continued our door hanger campaign to residents in subdivisions where an illicit discharge or illegal dumping activity was discovered or reported as part of our outreach program to residents. The front side of the door hanger lists the date and type of pollutant found and what water body affected. On the back, the door hanger describes stormwater pollution and guidelines to reduce pollution at the home or workplace (see Annual Report 2007, Volume 2 of 2, Figure 11- 3). In 2012 only two Potential Illicit Discharges were identified and investigated. In both these cases, door hangers were not required.
- Websites
  - DeIDOT developed a stormwater quality website ([www.deldot.gov/stormwater](http://www.deldot.gov/stormwater)). A “Report a Problem” link allows the public to email or call to report illegal discharges or dumping and stormwater maintenance problems. We continually update the “Hot Topics” section on the home page. In 2012, Google Analytics reported an average of about 403 visits per month (range 329-485), up from 332 in 2011.
  - The Delaware Livable Lawns website had 1,977 visits in 2012 for an average of 165 per month (range 48 in December – 516 in May).
- As part of the storm drain inventory and inspection, KCI Technologies is continuing to label each inlet with a storm drain marker that carries a water quality message.
- DeIDOT distributed several hundred activity booklets to schools and the general public that highlight stormwater pollution, the water cycle and watersheds.
- Appoquinimink River Association
  - “Delaware Livable Lawns” Project:

DeIDOT is continuing the Delaware Livable Lawns program that provides information to the public on ways to reduce nonpoint source pollution. This educational/outreach campaign is designed to reduce fertilizer application by changing watershed residents’ lawn care practices. The Delaware Livable Lawns Program certifies lawn care companies that follow environmentally-friendly best practices in fertilizer application while educating homeowners on the benefits of timely and proper fertilizer management with the goal of reducing fertilizer runoff from residential lawns. Phase I of the program targets commercial lawn care

companies recognizing them for environmentally friendly lawn care plans (e.g. soil tests, organic products, low or no nitrogen fertilizers, only fall applications, annual reporting, distribution of educational materials, etc.) while also meeting homeowners' needs and educating them on best practices. To date, five companies have applied for certification and have been accepted.

Phase II of the program has begun targeting individuals in housing developments to be demonstration lawns for various types of fertilizer applications and organic products.

Updates for 2012:

- 28 companies expressed interest with 26 of those being viable companies that fit within the program parameters.
- Five commercial contractors are certified.
- The website is available to the public at [www.DelawareLivableLawns.org](http://www.DelawareLivableLawns.org).
- Developed a brochure that will be available to the certified companies to supply their customers and to residential DIY applicators describing the benefits and the parameters of the program.
- Provided vehicle signage for certified companies.
- Printed business cards for certified companies to distribute to potential customers.
- Developed a monthly newsletter as an opportunity to capture the residential customer.
- Developed three how-to videos on taking a soil sample, interpreting a soil test report, and purchasing and applying fertilizer.
- Designed and printed advertisements in two community publications.

Additional work accomplished by the ARA is documented in their 2012 annual progress report (Appendix A).

- DelDOT partnered with the University of Delaware computer science lab and the art department in the development of interactive computer games. The computer science semester course consists entirely of students working in teams to develop interactive touch screen games with the 'Delaware Livable Lawns' theme for use at the Delaware State Fair.
- As part of the storm drain inventory and inspection in the Dover and Camden/Wyoming area of Kent County, KCI Technologies is continuing to label each inlet with a storm drain marker that carries a water quality message.
- We participated in and/or distributed educational materials including bookmarks, brochures, calendars and promotional give-a-ways, that carry a water quality message, at the following public events and conferences:

- The Delaware Rural Water Association Annual Conference, held in Harrington on February 29 – March 1, 2012.
  - Delaware State Fair held in July 2012. NPDES staff participated for 10 days and evenings.
- We have begun development of an education/outreach management plan for both Phase I and Phase II NPDES permits. We executed an agreement with the University of Delaware Water Resource Agency, to investigate cost effective social marketing options that are feasible in Delaware to achieve the education requirements of the permits while making these efforts more effective and meaningful. The University of Delaware prepared a final recommendations report detailing a stormwater education plan that address major pollutant problems for eight target areas (Appendix B).
- DelDOT staff has been active participants in the founding and development of the Delaware Association for Environmental Education (DAEE). The DelDOT NPDES Environmental Scientist serves on the Board of Directors, assists the group with its communications and outreach, and serves on the planning committee for DAEE's annual statewide conference.
- The DelDOT Environmental Scientist also serves as a member of the Communications and Outreach committee of the Delaware Chesapeake Bay WIP Program. The committee formed in 2012 and is providing water quality education in the Chesapeake watershed through social media and public events.
- NPDES staff served as judges in the Technology Students Association (TSA) April 2012 State Conference.

## **2. Public Participation/Involvement**

### Requirement:

DelDOT shall include the public in developing, implementing and reviewing the stormwater program. DelDOT shall make opportunities for members of the public to participate in program development and implementation and will comply with all applicable State, Tribal, and local public notice requirements. DelDOT shall determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

### Performance/Measurable Goals:

#### *A. Budget Process*

As part of the DelDOT budget process the community has the opportunity to suggest projects for the following year.

#### *B. Adopt-a Highway*

Adopt-a-Highway is a cooperative program between DelDOT's Division of Public Relations and volunteers to reduce litter along State roadways and subsequent discharge to waters of the State. This program supplements efforts by DelDOT's maintenance forces to control litter. This has a water quality benefit because it reduces floatable debris entering streams. The volunteer groups are required to collect litter a minimum of twice per year and submit activity reports following each cleanup for inclusion in the program. Each group maintains approximately two miles of roadway. DelDOT maintains an Adopt-a-Highway website ([www.deldot.gov/information/community\\_programs\\_and\\_services/](http://www.deldot.gov/information/community_programs_and_services/)) and submits press releases to solicit volunteers. There are currently 849 volunteer groups (577 in Kent and Sussex Counties) statewide maintaining 1,698 lane miles.

#### *C. Litter Control Programs*

DelDOT held its eighth annual "Imagine a Litter Free Delaware" cleanup day along roads, highways and community areas in October 2012. Public participation was solicited via newspaper ads and DelDOT's website.

#### *D. Door Hanger Campaign*

Since it is often difficult or impossible to catch someone in the act of improperly disposing of yard waste, oil, paint, etc. into the storm drain, DelDOT began a door hanger campaign to residents in subdivisions where an illicit discharge or illegal dumping activity was discovered or reported as part of our outreach program to residents. This effort solicits public participation to anonymously report illegal dumping and serves as a "neighborhood watch."

The front side of the door hanger lists the date and type of pollutant found and what water body affected. On the back, the door hanger describes stormwater pollution and guidelines to reduce pollution at the home or workplace (See Annual Report 2006, Figure 2-1). In 2012, two Potential Illicit Discharges were investigated, but no door hangers were required in Kent and Sussex County Phase II areas.

#### *E. Stream Watch*

Delaware Stream Watch is a grassroots volunteer waterway protection program focusing on citizen involvement through monitoring, education, and advocacy. Stream Watch is co-sponsored by the Delaware Nature Society and DNREC, representing a unique partnership of government, environmental interests, and industry.

The Stream Adoption program allows people and groups of all ages to adopt and monitor a local water body of their own choosing. Typical assessments include visual, macroinvertebrate and chemical surveys. Interested participants can download a form from the Delaware Nature Society website.

#### *F. Tributary Action Teams*

The Delaware Department of Natural Resources and Environmental Control coordinate teams of citizens known as Tributary Action Teams (TAT), who develop strategies for reducing water pollution in impaired watersheds. DeIDOT staff participated in TAT meetings of the Christina River and Appoquinimink River in New Castle County, St. Jones River and Murderkill River in Kent County, and the Nanticoke River, Broadkill River, and Inland Bays in Sussex County to assist in the development of Pollution Control Strategies (PCS) for those watersheds and to determine the effect of TMDL implementation on DeIDOT projects.

#### *G. Website*

DeIDOT developed a stormwater website ([www.deldot.gov/stormwater](http://www.deldot.gov/stormwater)). A “Report a Problem” link allows the public to email or call to report illegal discharges or dumping and stormwater maintenance problems.

### **3. Illicit Discharge Detection and Elimination**

#### Requirements:

- A storm sewer system map, showing the location of all outfalls and the names and locations of all waters of the United States that receive discharge from those outfalls.
- Through an ordinance, or other regulatory mechanism, a prohibition (to the extent allowable under State, Tribal or local law) on non-storm water discharges into the MS4, and appropriate enforcement procedures and actions.
- A plan to detect and address non-storm water discharges, including illegal dumping into the MS4.
- The education of public employees, businesses and the general public about the hazards associated with illegal discharges and improper disposal of waste.
- Determine the appropriate best management practices (BMPs) and measurable goals for this minimum control measure.

#### Performance/Measurable Goals:

During 2012, KCI Technologies, Inc., and their subconsultant Century Engineering, Inc. (CEI), performed MS4 inventory and inspection tasks for DeIDOT throughout the state to ensure compliance with the NPDES Phase II requirements for illicit discharge detection and elimination. This work was conducted under Agreement 1591. The work includes expanding the MS4 inventory and inspection program to parts of Kent and Sussex Counties beyond the permitted areas, as well as performing inspections of new structures, reinspections and screening of the MS4 in the Phase I and Phase II permitted areas. These consultants also perform annual BMP inspections for DeIDOT and conduct dry-weather screening of outfalls. The dry-weather outfall monitoring is conducted under Agreement 1495 with KCI Technologies.

Specific progress during calendar year 2012 included the following:

#### *A. Inventory and Mapping*

As reported in previous years, we completed the initial inventory and inspection of all parts of the DeIDOT-owned stormwater conveyance system in the Phase II urbanized area in 2007. Stormwater ponds and other BMPs also have been inventoried and receive annual inspections. During the inspection process, each structure was opened and evaluated for material construction and condition, and physical measurements were made. Digital photographs of the structure and each associate pipe were taken and connectivity between structures verified. At the completion of the inspection process an “Only Rain Down the Storm Drain” marker was placed on each structure to encourage residents to not dispose of waste down the inlet. If a structure is found to have a material deficiency, a Maintenance Work Order (MWO) is generated and forwarded to DeIDOT. All of these data are incorporated into a comprehensive GIS database, designed for DeIDOT by KCI

Technologies, that enables users to view the entire stormwater system, corresponding inspection data and photographs.

KCI and CEI completed the Initial Inventory and Inspection work in Kent County in early 2012. One KCI Field Team and one CEI Field Team moved to Sussex County in February 2012. In 2012, the teams inventoried and inspected DelDOT storm systems in 22 subdivisions and along 424.2 miles of non-subdivision roadways, for a total of 16,927 structures in Kent and Sussex Counties (Table 3-1).

Starting in 2012, KCI and CEI concentrated on completing the inventory & inspection of Sussex County within three years. CEI previously inventoried/inspected Sussex County subdivisions during Agreement 1354. The KCI field team is inventorying/inspecting drainage north of State Route 20 (from Millsboro west) and north of State Route 24 (from Millsboro east); CEI is inventorying south of these routes and the major roadways such as Sussex Highway (State Route 13) throughout the County.

**Table 3-1.** 2012 inventory and inspection totals for the MS4 in Kent and Sussex Counties.

<b>Month (2011)</b>	<b>Subdivisions</b>	<b>Non-Subdivision Roadway Miles</b>	<b>Structures</b>
January	3	22.4	1,152
February	0	36.4	1,484
March	0	27.0	887
April	1	54.2	1,707
May	11	38.4	1,552
June	6	49.3	1,740
July	0	19.0	784
August	0	45.0	1,971
September	0	40.6	1,533
October	1	46.6	1,837
November	0	24.2	1,204
December	0	21.1	1,076
<b>TOTAL</b>	<b>22</b>	<b>424.2</b>	<b>16,927</b>

The goal is to complete Sussex County by December 2014. KCI has implemented a process where two field staff travel to Sussex County and act as two independent field teams. Each person has a Panasonic Toughbook and digital camera to inventory and inspect open drainage along the same stretch of roadway; one field staff on each side of the roadway. At the end of the week, the data collected on the two

toughbooks is merged and cross pipes are connected. We have found that this method has significantly improved production. CEI has focused on Sussex Highway (State Route 13) in addition to minor roadways in the southern half of the County. A complete summary of work performed by KCI and CEI through the end of calendar year 2012 is included in this report as Appendix C.

In 2012 we began implementing a new process for inventorying and inspecting newly accepted subdivision streets and storm drain systems throughout the state. Once subdivision streets (and storm drain systems) are accepted by DelDOT, there is a three-year warranty period, during which the developer is responsible for maintenance of the street and storm drain systems. KCI will aim to inventory and inspect these storm drain systems during the third year of the warranty to help ensure that these systems are in good condition when the warranty period ends.

The mapping requirements of the Phase II Permit are met through an existing GIS viewer developed for the storm sewer system inventory statewide. The viewer is available to all DelDOT employees with access to the intranet. This satisfies the requirements of 40 CFR Part 122.21(f)(7) or Part 12.34.(b)(3)(i). This statewide map shows the location of all outfalls, the names and location of all waters of the United States that receive discharges from those outfalls, condition assessment data, and photographs.

In 2012, KCI continued to add some refinements to the Map Viewer and assisted DelDOT in formal training sessions to educate DelDOT design and maintenance staff on the use of the Map Viewer. KCI and DelDOT also developed a method for conducting desktop inventory for new drainage structures along roadway improvement projects, by overlaying electronic construction plans on the DelDOT NPDES Database.

#### *B. Outfall Screening in Urbanized Areas of Kent County*

Dry weather screening of all outfalls in the Phase II permitted area of the state was completed in 2007 (see the 2007 Annual Report). Thus we have fulfilled the permit requirements.

Each new outfall that is inventoried and inspected is screened for dry weather flow. In calendar year 2012, a total of 1,854 DelDOT-owned outfalls were inventoried and screened. 442 of these were in New Castle County and 1,412 were in Sussex County, all outside of the permitted urbanized area. Of these outfalls, 71 were found to have dry weather flow. No evidence of illicit discharges was found in any of these flows, and all are assumed to be intruded groundwater.

During 2012, two potential illicit discharges (PIDs) in Kent and Sussex Counties were reported to DelDOT by inspection crews. Neither was discovered through dry weather screening. Each was investigated by KCI crews, and follow-up action was taken where appropriate (Table 3-2). More details about the circumstances, location and investigation of each PID can be found KCI's 2012 Outfall Screening Report (Appendix D).

### *C. Prevention of Illicit Discharges and Illegal Dumping*

Since it is often difficult or impossible to catch someone in the act of improperly disposing of yard waste, oil, paint, etc. into the storm drain, DelDOT has for several years conducted a door hanger campaign to residents in subdivisions where an illicit discharge or illegal dumping activity was discovered or reported. This campaign is part of our outreach program to residents. It solicits public participation to anonymously report illegal dumping and serves as a “neighborhood watch.”

The front side of the door hanger lists the date and type of pollutant found and what water body affected. On the back, the door hanger describes stormwater pollution and guidelines to reduce pollution at the home or workplace.

No such incidents were reported in Kent or Sussex Counties during 2012, so no door hangers were distributed in these counties.

In an effort to encourage Delaware citizens to dispose of hazardous household materials properly, the DelDOT NPDES Section helped publicize Delaware Solid Waste Authority (DSWA)’s Household Hazardous Waste Collection Program. This included distribution of DSWA brochures that announced the dates and locations of collections in each county.

Another public outreach program aimed at eliminating illegal dumping of trash, debris and hazardous wastes along the state’s highways, is DNREC’s “TrashStopper” Program. The public is asked to notify DNREC about any roadways or streets used for illegal dumping so the sites can be put under surveillance by digital cameras now effectively used for identifying trash dumpers. The public is also asked to identify the trash dumpers who are caught in the act in photos posted on the DNREC web site as part of the TrashStoppers campaign (<http://www.awm.delaware.gov/Enforcement/Pages/TrashStoppers.aspx>).

**Table 3-2.** Summary of potential illicit discharges into the DeIDOT MS4 investigated in Kent and Sussex Counties in 2012.

Structure No.	Field Visit Date	Neighborhood	Address	Reported By	Issue Reported	Investigation Results	Determination	Action	
<b>KENT COUNTY</b>									
520110114081352	03/24/11	N/A	2777 Andrewsville Road Greenwood, DE	Agr 1354 Field Crew	Possible sewage connection into stormdrain system	Clumps toilet paper in bottom of catch basin with strong sewage odor. Sample tested high for ammonia, detergents and turbidity.	Possible septic tank overflow.	Forwarded to DeIDOT. DNREC investigated-recommend having pipe closed by DeIDOT. 05/20/11: Attempted to send DeIDOT Illicit Discharge notice by US Certified Mail-Returned by Post Office "No Mail Receptacle-Unable to Forward" 06/14/11:	
	04/07/11					Strong sewage odor. Sample tested high for ammonia, detergents, turbidity and phenols.			
	04/13/11					DNREC investigated/spoke w/resident; recommended to have pipe closed.	DNREC recommends pipe closure.		Schedule push camera inspection.
	06/29/11					Tri State Grouting push camera inspection.	Junction box discovered connecting to what appears to be an additional sewage pipe.		Will continue to try to notify homeowner of the requirement to correct within 30 days.
	11/22/11					DNREC contacted homeowner (Tim Carrington 302-382-9649) and recommended he call DeIDOT. DeIDOT confirmed with Mr. Carrington that DeIDOT intends to plug pipe; and any potential problems that may occur from back-ups would be homeowner's responsibility. M	DeIDOT to plug pipe.		
	10/22/12					DeIDOT contractor plugged pipes and placed aluminum plate in front of each pipe. In junction box, there was no active residue or waste; however odor was present; therefore other pipes plugged as well.	No Further Action.		
<b>SUSSEX COUNTY</b>									
420121101135958	12/04/12	N/A	32772 Bi-State Blvd.	CEI	Illegal connection to storm drain; stagnant water with sewage smell	No flow from 4" illegal connection; discharge ponded in bottom catch basin smelled like sewage, had disintegrated paper, and tested high for turbidity, detergents and ammonia; 4 hour re-test: high turbidity, ammonia and detergents.	Notified DeIDOT; requested KCI sent Illicit Discharge Notice	Mailed Illicit Discharge Notice via 2-day FedEx 12/12/12; will revisit site in 30 days	

#### **4. Construction Site Stormwater Runoff Control**

##### Requirement:

The permittee shall continue to implement and enforce a program to reduce, to the maximum extent practicable, the discharge of pollutants from construction sites.

##### Performance/Measurable Goals:

###### *A. Delegated Agency*

The Department of Natural Resources and Environmental Control has delegated the authority to administer a sediment and stormwater program to DelDOT. The delegation is reviewed every three years. In 2012, DelDOT received delegation extension from DNREC through June 30, 2015. The components of the Delaware Sediment and Stormwater Regulations delegated to DelDOT are: review and approval of construction plans, review of construction sites, and inspection and maintenance of completed stormwater management facilities. Satisfactory performance of the delegated responsibilities will be considered compliance with this component of the SWPP&MP (see Annual Report 2003, Appendix F).

Enforcement of construction site erosion and sediment controls is accomplished through each construction contract. Section 110, Erosion, Sediment Control and Water Pollution, of the Delaware Department of Transportation Standard Specifications lays out a progressive step-wise approach to gaining compliance with approved plans, regulations, and laws. This section was significantly rewritten to demonstrate positive movement toward improving the Erosion & Sediment Program (See Annual Report 2007, Appendix F). In 2012 we fully implemented a consultant agreement with two (2) firms, relieving the Contractor of CCR inspection duties.

1. Instead of the contractor providing the CCR, we executed agreements to hire two consulting firms to perform the weekly CCR inspections. This has improved compliance with the required weekly and rain event reporting. The consultant also has the authority to hire a third party contractor to correct E&S deficiencies if the prime contractor refuses.
2. Required pre-construction meeting specifically designed to address E&S compliance.
3. Better defined division of responsibilities among site reviewers, contractor engineer, project engineer, stormwater engineer
4. Strengthening of actions to gain compliance
5. Environmental Compliance Supervisor – This position at DelDOT has the responsibility to regularly track and review the construction site reviews submitted on a weekly basis from Notice of Intent (NOI) to Notice of Termination (NOT) and annually assess CCR's performance. The purpose of the Performance Evaluation Program is to better assure that CCRs considered for contract either possess, or will likely possess at the time

contract performance is set to begin, all qualifications necessary to successfully complete the project on time. Getting the contractor CCRs to submit timely reports to DelDOT has been inconsistent. We therefore determined that annual reviews may increase reporting compliance. The implementation of a mandatory, standardized system of evaluating CCR's performance is expected to yield consistency, objectivity, fairness, and accountability.

We executed an agreement with two consulting firms to perform the weekly CCR inspections in lieu of contractor provided CCRs as described in number 1 above. This has improved compliance with the required weekly and rain event reporting. The consultants also have the authority to hire a third party contractor to correct E&S deficiencies if the prime contractor refuses.

The CCR reporting form was changed as a result of our delegation review with DNREC. Added were slots for the plan expiration date, rain event box, and a page dedicated to Pollution Prevention. All uncorrected deficiencies must show a reason for remaining incomplete.

DelDOT staff involved with erosion and sediment issues (E & S inspections, designing stormwater systems or review of stormwater plans) is required to complete DNREC's 3-day Certified Construction Reviewer (CCR) course.

We finalized a rewrite and reformatting of DelDOT's Erosion and Sediment Control Field Guide. The purpose of the field guide is to provide easily accessible information on installation and maintenance of best management practices (BMPs) for erosion and sediment control and stormwater pollution prevention on construction sites. The field guide was distributed to 199 DelDOT employees and is available for purchase to consultants and contractors. It is available for viewing at [http://www.deldot.gov/stormwater/ES\\_fieldguide.shtml](http://www.deldot.gov/stormwater/ES_fieldguide.shtml).

The Environmental Protection Agency (EPA) has proposed new turbidity effluent guidelines. Construction sites that have greater than 10 acres of disturbed area would be required to maintain turbidity levels at, or below, 280 NTU for all storms events up to the 2-yr frequency. Owners/operators would be required to monitor the discharge from their sites to ensure compliance. However, the ruling was challenged and EPA was sued. The EPA discovered after promulgation that the data used to calculate the numeric limit was misinterpreted. The Agency initiated a stay for the numeric limit for turbidity until the limit can be recalculated.

#### *B. Inspection and Operation of BMPs*

DelDOT has an annual obligation to inspect its constructed best management practice (BMP) devices, structures and stormwater management facilities. The purpose of this statewide program is to: (1) inventory, inspect, measure water quality performance, identify noxious and/or invasive species and maintain functionality of DelDOT's stormwater BMPs such as stormwater ponds, sand filters, bioswales, bioinfiltration trenches, etc., (2) maintain a comprehensive database, (3) coordinate with the Districts on the submittal of work orders as needed, and (4)

provide technical assistance and guidance to the Department regarding appropriate maintenance strategies for stormwater BMPs.

A field inspection manual and forms were developed to effectively perform field inspections to evaluate BMP performance and identify maintenance requirements. The procedures outlined in this manual assist DelDOT with decisions on inspection, maintenance, repair, and retrofit of BMP facilities. Overall performance and functionality are graded A-D. Table 4-1 describes the BMP rating system used by DelDOT.

Annual BMP inspections are conducted throughout the state by KCI Technologies, under Agreement 1354. KCI inspected 339 BMPs in 2012. Table 4-2 shows the 2012 rating summary by each maintenance district.

### *C. BMP Maintenance*

BMPs are evaluated and placed on contract for maintenance as necessary and as money permits. Maintenance functions are performed by the Districts or through contractors specializing in noxious and invasive species control, or maintenance of specific BMP types.

In 2012, 27 BMPs were inspected in the Phase II permitted area (Table 4-3). None of these BMPs warranted major maintenance. Invasive species control, where it affects BMP performance, occurs in the spring and fall by specialized contractors. In 2012, 8 BMPs were treated for Canada thistle and 18 for cattail/Phragmites. District Maintenance staff performed preventative maintenance on 10 BMPs that required contracted maintenance.

**Table 4-1.** DelDOT's stormwater BMP rating system.

<b>Rating</b>	<b>Description</b>
A	<b>No Performance Issues</b> BMP with no issues affecting performance.
B	<b>Minor Maintenance</b> BMP with minor maintenance required; repaired by DelDOT Maintenance District or third-party herbicide contractor.
C	<b>Major Maintenance</b> BMP with major maintenance required; repaired by third-party contractor, with oversight by DelDOT NPDES Engineer.
D	<b>Retrofit</b> BMP with retrofit requirements; BMP is failing; needs to be redesigned or rebuilt with input from DelDOT Stormwater Quality Program.

**Table 4-2.** 2012 BMP Inspection Ratings Summary.

DISTRICT	# INSPECTED	A	B	C	D
NORTH DISTRICT	<b>81</b>	<b>36</b>	<b>43</b>	<b>2</b>	<b>0</b>
CANAL DISTRICT	<b>131</b>	<b>59</b>	<b>69</b>	<b>3</b>	<b>0</b>
CENTRAL DISTRICT	<b>42</b>	<b>28</b>	<b>14</b>	<b>0</b>	<b>0</b>
SOUTH DISTRICT	<b>85</b>	<b>62</b>	<b>21</b>	<b>1</b>	<b>1</b>
TOTAL NO.	<b>339<sup>1</sup></b>	<b>185</b>	<b>147</b>	<b>6</b>	<b>1</b>

<sup>1</sup> This table reflects annual routine inspections by KCI Technologies in 2012. BMPs with existing work orders or on contract for maintenance were inspected by DelDOT staff prior to contracted work.

**Table 4-3.** BMPs inspected in the Phase II permit area in 2012.

<b>BMPNUMBER</b>	<b>COUNTY</b>	<b>MAINT. DISTRICT</b>	<b>WATERSHED</b>	<b>DISTRICT</b>	<b>BMP_TYPE</b>	<b>YEAR_BUILT</b>	<b>ADC_GRID</b>
5	Kent	8 - Cheswold	St. Jones River	CENTRAL	Wet Pond	2008/05/21	17B03
10	Kent	8 - Cheswold	Leipsic River	CENTRAL	Dry Pond	1990/11/07	11F11
17	Kent	8 - Cheswold	Little Creek	CENTRAL	Wet Pond	2003/04/30	18A04
18	Kent	8 - Cheswold	Little Creek	CENTRAL	Wet Pond	2003/04/30	18B04
77	Kent	8 - Cheswold	St. Jones River	CENTRAL	Wet Pond	2001/02/16	17A04
81	Kent	7 - Magnolia	St. Jones River	CENTRAL	Wet Pond	2002/05/15	24A06
167	Kent	8 - Cheswold	Little Creek	CENTRAL	Wet Pond	1991/11/19	17H01
176	Kent	8 - Cheswold	St. Jones River	CENTRAL	Sand Filter	2002/09/11	17H03
177	Kent	8 - Cheswold	Leipsic River	CENTRAL	Dry Pond	1990/11/07	11D09
197	Kent	8 - Cheswold	St. Jones River	CENTRAL	Biofiltration	2001/04/03	10K12
203	Kent	7 - Magnolia	St. Jones River	CENTRAL	Wet Pond	1997/10/05	17G09
204	Kent	7 - Magnolia	St. Jones River	CENTRAL	Wet Pond	1997/10/05	17H08
205	Kent	7 - Magnolia	St. Jones River	CENTRAL	Wet Pond	1997/10/05	17J08
206	Kent	7 - Magnolia	St. Jones River	CENTRAL	Wet Pond	1997/10/05	17J08
207	Kent	7 - Magnolia	Little Creek	CENTRAL	Wet Pond	1997/10/05	18A07
209	Kent	7 - Magnolia	Little Creek	CENTRAL	Wet Pond	1997/10/05	18A07
210	Kent	8 - Cheswold	St. Jones River	CENTRAL	Wet Pond	1997/09/12	17B02
211	Kent	8 - Cheswold	St. Jones River	CENTRAL	Wet Pond	1997/09/12	11A13
212	Kent	8 - Cheswold	St. Jones River	CENTRAL	Wet Pond	1997/09/12	11B12
216	Kent	8 - Cheswold	St. Jones River	CENTRAL	Biofiltration	1998/09/08	11E13
312	Kent	8 - Cheswold	St. Jones River	CENTRAL	Biofiltration	1998/09/08	11E13
328	Kent	8 - Cheswold	St. Jones River	CENTRAL	Biofiltration	1998/09/08	11E13
401	Kent	8 - Cheswold	Little Creek	CENTRAL	Filter Strip	2005/03/18	17J01
402	Kent	8 - Cheswold	Little Creek	CENTRAL	Biofiltration	2005/03/18	17K01
403	Kent	8 - Cheswold	Little Creek	CENTRAL	Biofiltration	2005/03/18	11H13
439	Kent	7 - Magnolia	Little Creek	CENTRAL	Wet Pond	1990/11/07	18A04
487	Kent	8 - Cheswold	Little Creek	CENTRAL	Filter Strip	2005/03/18	11H13

## **5. Post-Construction Stormwater Management in Newly Developed Areas and in Redeveloped Areas**

### Requirement:

The permittee shall continue to implement and enforce a program to address stormwater runoff from new development and redevelopment projects that disturb areas greater than or equal to one acre, including projects that disturb less than one acre that are part of a larger common plan of development, and that discharge to the storm sewer system.

### Performance/Measurable Goals:

#### *A. Delegated Agency*

The Department of Natural Resources and Environmental Control has delegated the authority to administer a sediment and stormwater program to DelDOT. Satisfactory performance of the delegated responsibilities, through triennial reviews, will be considered compliance with this component of the SWMP.

#### *B. Design and Construction of BMPs*

In 2012, DelDOT received a delegation extension from DNREC through June 30, 2015. The components of the Delaware Sediment and Stormwater Regulations delegated to DelDOT are: initial plan review and approval of proposed designs for land disturbances greater than 5,000 S.F.; weekly inspections of active construction sites; and maintenance.

Approximately 300 design plans are reviewed each year by the Stormwater Section for their adherence to the Delaware Sediment and Stormwater Regulations. About a third of those projects are residential subdivision and commercial plans. DelDOT's subdivision manual regulates development in Delaware that will be turned over for State Maintenance. Before a subdivision street is accepted, DelDOT conducts a final inspection to ensure the structural integrity of the stormwater system. A pipe video inspection using Closed Circuit Television (CCTV) is performed.

## 6. Pollution Prevention and Good Housekeeping

### Requirement:

DelDOT shall develop and implement an operation and maintenance program with a goal of preventing and/or reducing discharges of pollutants associated with our operations as described in the Application page 13, Permit page 10, Part II.A.6.

### Performance:

The following sections describe ways the Department practices source control at its facilities and how we manage and minimize transport of pollutants associated with road repair and maintenance activities.

#### A. *Road Repair and Maintenance*

There are various ways in which the Department maintains the roadways that help reduce the discharge of pollutants. Routine maintenance and improvements reduce the pollutants coming from the roadway in several ways. The patching of potholes and sealing of cracks reduces the amount of pavement that will break away and be transported into the nearest waterway. Repairing potholes also decreases the wear and tear on vehicles, thus reducing the fluids, miscellaneous sediments, and tire particles that could be dislodged from vehicles. Money for roadway maintenance activities is programmed into the District's Maintenance funds.

All road projects are required to follow the Delaware Sediment and Stormwater Regulations. Projects designated as minor, medium or major must have an approved sediment and stormwater management plan. Medium and major projects must also have a site reviewer who is a Certified Construction Reviewer (CCR).

DelDOT staff and contractors continue to implement the practices set forth in Section 110 of the Standard Specifications for Erosion, Sediment Control and Water Pollution, modified in 2007. This Section addresses practices to control stormwater runoff from soil disturbance activities, spill prevention, material management and good housekeeping practices. Details may be found in Section 4 of this report (Construction Site Stormwater Runoff Control).

DelDOT follows the manual of Standard Operating Procedures developed for responding to and managing spills on the roadways classified as **Category E, Type E-1** incidents (Traffic Hazards, Fuel, Oil or other HAZMAT spills on or near the roadway). Most DelDOT vehicles have been equipped with spill kits in the event of an accidental spill or as a first responder to a vehicle accident, and maintenance employees are trained annually on spill response and protection of water quality.

#### B. *Sweeping Program*

DelDOT's sweeping program reduces pollutants by maintaining the cleanliness of the roadway. The street sweeping program includes the roadways, shoulder, intersections, and toll plaza lanes on primary, secondary and tertiary roads. The roadways are swept on the following cycle: roads with ADT (Average Daily Traffic) greater than 20,000 are swept 4 times a year, roads with ADT between 5,000 and 20,000 are swept 2 times a year and roads with ADT less than 5,000 are swept once a year.

DelDOT currently has 36 sweepers in its fleet statewide. Seven of the vehicles are assigned in Kent County and nine in Sussex County.

DelDOT's NPDES Section is trying to quantify the expected pollutant load reductions from controls such as sweeping. In 2011, DelDOT's Equipment Management Section installed automatic vehicle location (AVL) devices on all sweeper vehicles. This will assist the Department in verifying that the required sweeping frequency has been met, as well as obtain better estimates of pollutant load reductions resulting from sweeping activities.

To calculate pollutant removal rates from roadways, DelDOT weighs sweeping material. A total of 485 tons of street sweeping residuals were collected from Kent County roadways in 2012. Using the formulas recommended by the Chesapeake Urban Stormwater Group (memo "Street Sweeping/BMP Era Recommendations, dated 3/1/2011), the estimated pounds of nutrients removed from runoff in 2012 by DelDOT's street sweeping program were 1,698 lbs total nitrogen and 679 lbs total phosphorus (Table 6.2)

### *C. Litter Program*

DelDOT's Litter Program reduces the discharge of floatables to the MS4.

#### DelDOT maintenance staff and prison crews

DelDOT's maintenance staff and prison crews help reduce the discharge of floatables to the MS4 through routine pick up of trash and debris from the roadways, medians and right-of-way. DelDOT staff is also responsible for removal of dead animals and clean up of illegal dump sites from the roadside.

#### Adopt-a-Highway

Adopt-a-Highway is a cooperative program between DelDOT's Division of Public Relations and volunteers to reduce litter along State roadways and subsequent discharge to waters of the State. This program supplements effort by DelDOT's maintenance forces to control litter. The volunteer groups are required to collect litter a minimum of twice per year and submit activity reports following each cleanup for inclusion in the program. Each group maintains approximately two miles of roadway. DelDOT maintains an Adopt-a-Highway website ([www.deldot.gov](http://www.deldot.gov)) and submits press releases to solicit volunteers. There are currently 849 volunteer groups statewide (577 in Kent and Sussex Counties) maintaining 1,698 lane miles.

#### Roadside Clean-up

DelDOT held its eighth annual "Imagine a Litter Free Delaware" cleanup day along roads, highways and community areas in October 2012.

#### TrashStoppers

DNREC's campaign is an outward appeal to the public for help in stopping illegal trash dumping along Delaware roadways to stop illegal dumping of garbage, debris, and hazardous wastes. The "TrashStoppers" program relies upon the placement of numerous surveillance cameras.

#### D. Snow and Ice Program

Effective salt management practices can help reduce the amount of road salt that enters the environment. This translates into savings for DelDOT, and minimization of impacts of salt on our environment. DelDOT has many practices in place, both for the roadway and all maintenance facilities.

DelDOT has developed and instituted advanced snow fighting practices that began during the 2004-2005 winter season to include ground speed spreader controls, anti-icing, pre-wetting, and plow balance valves. These advanced techniques in snow and ice removal help DelDOT meet its goal of improved service to customers, reduce the impact to the infrastructure, and conserve salt which helps meet the goals of the NPDES Program by reducing the impact on the environment:

- Ground speed spreader controls provide accurate control of material usage.
- Anti-icing is the application of liquid deicers (Salt Brine) to road surfaces prior to a precipitation event to prevent the formation or development of bonded snow and ice. The Department uses 6000 gallon tanker trucks and 1300- and 1800-gallon capacity units that slide into the bed of a dump truck.
- Pre-wetting adds moisture to salt to “jump start” the melting action of the salt and causes the salt to stick to the road and prevent scatter or bouncing.
- Plow balance valves decreases the amount of weight that the plow cutting edge bears on the road surface decreasing damage to the road surface.

Salt application rates can vary depending on storm conditions, but the goal is 100 - 400 pounds of salt per lane mile as recommended by AASHTO. The rate is achieved by calibrating the equipment annually. Maintenance staff received training by Certified Power on proper use of the ground speed spreader equipment.

All salt stored at the maintenance facilities is under roof. Only during loading and unloading does the potential exist for salt to enter the stormwater system. DelDOT is following the salt management practices established by the “Statewide Salt Best Management Practices for DelDOT Maintenance Yards” plan developed for area maintenance facilities (see Annual Report 2004, Appendix U).

#### E. Stormwater Conveyance Systems

Maintenance of the stormwater conveyance system ensures proper functioning of the stormwater system and BMPs and thereby reduces the pollutants that are carried to nearby waterways. Money for this is programmed into the Districts’ Maintenance funds. The MS4 and BMP inspections performed for DelDOT by KCI Technologies and Century Engineering continually generate and prioritize maintenance work orders.

This maintenance work includes three components:

- *Open system drainage* – General work to control erosion, as well as cleaning and reshaping of ditches. Stabilization of ditches reduces the amount of sediment that enters the local stream and waterways.
- *Closed system drainage* - Work performed on the components themselves, including general maintenance or replacement. This includes tasks such as

drainage pipe repair and cleaning, catch basin/manhole repair and maintenance, and general maintenance on stormwater detention ponds.

- *Ponding problems* - Draining water off the roadways. This is usually the result of calls from citizens after a rain event.

#### *F. Roadside Vegetation Management*

All herbicide applications that are applied to DeIDOT rights-of-way by contract applicators are reviewed prior to the award to the lowest bidder to insure that selected herbicides are labeled for the intended use, and when feasible, an herbicide is selected that can be applied at a low-use rate. This review frequently reduces the total load of herbicide applied to DeIDOT's rights-of-way.

DeIDOT does not routinely fertilize its roadsides. The only nutrients applied to DeIDOT's rights-of-way come as a result of leaving grass clippings on the ground after mowing. Degradation of this vegetative material results in the slow release of organic constituents, which are mineralized to plant nutrients by microorganisms and made available to turf grasses. This natural process results in minimal leaching of nutrients. Also this practice results in minimal surface runoff of nutrients from ground with a slope of 3 horizontal to 1 vertical or less.

Fertilizers are used in establishing turf grasses from seed on freshly prepared bare ground. This is generally done under contract with a firm using a hydroseeder. DeIDOT's specifications require that 50% of the nitrogen product be a slow release form of ureaformaldehyde. The amount of nitrogen applied is 78 kg/ha. Phosphorous pentoxide is applied at 47 kg/ha of available P that is the sum of water soluble and citrate-soluble phosphate. Potassium oxide is applied at 31kg/ha of water soluble potash. In all cases areas that are seeded are covered with a recommended mulch.

Pesticides applied on DeIDOT's rights-of-way are done according to label recommendations that are on the product and filed with EPA at the time of product registration. Pesticides applied on DeIDOT's rights-of-way are done by contractors that are certified Delaware pesticide applicators. DeIDOT employees that apply pesticides to DeIDOT's rights-of-way are certified Delaware pesticide applicators or work under the supervision of a DeIDOT employee that is a certified Delaware pesticide applicator. Typically, the only pesticides applied by DeIDOT fall under the category of herbicides. DeIDOT, however, may use other pesticides such as insecticides under certain circumstances.

DeIDOT employees take required training courses that serve as credit toward renewal of their Delaware pesticide applicators license. Roadside Environmental Specialists attend conferences and working sessions on pest control technologies that are open to all DOT employees. Opportunities to use reduced amount of pesticides by using new low rate pesticides, adjuvants or surfactants that can enhance efficacy of pesticides and thus reduce rate, or alternatives to chemicals that are cost effective and efficacious are often topics of various sessions these specialists attend.

The following are active programs being initiated as part of the NPDES pesticide reduction strategy:

- *Guardrail Inventory* – DeIDOT has the responsibility of maintaining a 4' clear zone around the guardrail for both public safety and structural integrity via mowing, hand trimming and herbicides. We executed an agreement with Wallace

Montgomery & Associates, LLP in May 2008 to inventory all guardrails statewide. The project was completed in June 2009 and inventoried 310 guardrail miles. Attributes collected included material under guardrail, guardrail type, surrounding environmental features and identification of sensitive/no spray zones. The inventory and attributes collected will be used in development of a pesticide reduction strategy to limit the use of herbicides, particularly around environmental sensitive areas (e.g. streams, wetlands, drinking supply, etc.).

Since DelDOT is continually upgrading, replacing, or adding new guardrail, we executed a new agreement to update and maintain DelDOT's existing guardrail inventory database. The consultant will compile a field-verified inventory of the new and modified guardrail sections on all DelDOT-maintained roadways in Delaware, to include GPS location data for the beginning and end of each section. At least twice per year, DelDOT's NPDES Section will provide information to the consultant on the locations of new guardrail installations. These will be integrated into the existing guardrail inventory database.

- *Guardrail Vegetation Management study* – DelDOT and the University of Delaware developed a controlled research study to test the effectiveness of treatment types under guardrail for weed control. Two types of weed block material, asphalt, low-grow fescue, zoysia seed and sod, and natural growth with periodic trimming will be monitored against a control. The results of this study will determine if these materials are effective at reducing herbicide application and can be used in specific locations such as environmental sensitive areas and drinking water supply reservoirs. We have extended this study through at least the next growing season to collect additional data on weed block materials and to test new plots of zoysia grass. An article summarizing the study and major results to date was written for the trade journal *Roads and Bridges* and is included with this report as Appendix E. A detailed technical report is being prepared by the University for release in 2013.
- *Training* – In addition to the required training for pesticide license renewal, DelDOT holds or attends periodic training to further educate staff. In 2011, DelDOT Roadside Environmental staff attended two workshops.
- *Contract language* – Since DelDOT outsources most of the herbicide spraying, DelDOT has strengthened its herbicide contract language to reduce the environmental impact of herbicide treatment. We now require contractors to:
  - a. Use an EPA-approved drift control agent as part of the mix.
  - b. Use only formulations of glyphosate with a full aquatic label.
  - c. Be aware of the locations of “Sensitive” or “No spray” zones and avoid applications within the limits of these areas. These zones will be identified through the guardrail inventory and made available to the contractor.
- *Record keeping and pesticide usage* – Contractors and DelDOT applicators are required to submit records of spraying activities to DelDOT's Environmental Roadside Section. The NPDES Program tracks and reports herbicide quantities to establish herbicide usage. By tracking herbicide quantities we will be able to

identify the cause of spikes or declines in usage and use the data to assess pesticide reduction programs we have implemented.

#### *G. Spill Prevention and Response on Roadways*

DelDOT's Transportation Management Center (TMC) coordinates operations and shares information among its own personnel as well as various other transportation and public safety-related agencies, serving as the transportation interface among all such agencies in the state. They operate 24-hours per day/7 days per week. The TMC serves as the central communication point for DelDOT during major incidents, special events, and emergencies, and coordinates transportation management activities with other agencies. The TMC has special instrumentation that has been used to develop incident management capability.

The type of incident detected or called in has a direct effect on the notification process and steps that must be taken in order to be able to respond, assist, and document the incident in an expeditious manner. Incidents have been classified into one of seven categories, and then into sub-categories that further specify the type of incident that has occurred. These categories are listed below:

- Category A: Accidents (Emergency)
- Category B: Vehicle Fire (Emergency)
- Category C: Disable Vehicles (Emergency)
- Category D: Police Activity (Emergency)
- Category E: Traffic Hazards (Emergency)
- Category F: Roadway and Signal Operations (Traffic)
- Category G: Delay or Congestion (Traffic)

In June 2001, the TMC developed a manual of Standard Operating Procedures (SOP) that acts as a guideline for handling incidents and systems problems; as a training tool/resource for new employees and as a reference guide for the operations staff. *Category E: Traffic Hazards (Emergency)*, of the SOP describes the notification and documentation procedure involving fuel, oil or other HAZMAT spills on or near the roadway.

In the event of a spill such as fuel, oil, or HAZ-MAT, the TMC is required to notify the respective police agency since they are responsible for arranging for the particular traffic hazard to be removed. Generally, the police will contact the following agencies: Fire Board, DNREC (Department of Natural Resources and Environmental Control), tow company, and all other agencies that are required to attend such incidents.

In the event of a non-hazardous materials spill DelDOT mobilizes, responds and directs the clean up effort to prevent the material from entering the storm drain system or receiving waters. If the spill is of questionable material, DelDOT uses procedures as describe for HAZ-MAT spills. Most DelDOT maintenance vehicles have been supplied with spill kits, and maintenance staff are regularly trained on their use.

In addition to the TMC's Standard Operating Procedures, the NPDES Program has completed the Spill Prevention Control and Countermeasures Plans for DelDOT facilities that met the above ground storage tank minimums. These are described in section H below.

## *H. Pollution Prevention at the Maintenance Facilities*

### Pollution Prevention Plans

DelDOT's NPDES Program continues to manage a Stormwater Pollution Prevention Program (SWPPP) at each of the 16 DelDOT maintenance facilities. Development, implementation, and maintenance of the SWPPP provides the maintenance yards with 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.

Facilities that need updated PPP plans will be reviewed in 2013. In 2012 we created new maps for each maintenance yard.

### Facility Inspections

Pollution Prevention Plan Team members are required to conduct quarterly inspections during dry and wet weather events to look for evidence of stormwater contamination. These inspections continued through the 2012 calendar year.

In addition, DelDOT NPDES Program staff annually conducts thorough SWPPP compliance inspections of each facility. Annual inspections were completed for all DelDOT maintenance facilities on November 26, 29<sup>th</sup> and December 4<sup>th</sup>. A "Summary of Action Items," if any, is noted on the inspection form and gives specific instructions to the facility team and supervisors for corrective action. Follow-up correspondence with District managers will be conducted to ensure the action items were corrected.

### Spill Prevention Control and Countermeasures (SPCC)

Maintenance facilities that met the above ground storage minimums requiring a SPCC plan were developed in order to comply with EPA's Oil Pollution Prevention regulations (40 CFR 112) contained within the Clean Water Act. An SPCC Plan discusses how the maintenance facility conforms to oil spill prevention and containment procedures. Each SPCC Plan is unique to the facility. As reported previously, the initial plans were completed and distributed in 2007. Because of the addition of new above ground storage tanks at Harrington and Cheswold maintenance facilities, SPCC plans were also prepared for these areas in 2008.

Facilities that need updated SPCC plans will be reviewed in 2013. In 2012 we created new maps for each maintenance yard.

### Training

Training videos were developed for maintenance staff. The videos provide training on protection of stormwater quality in the following areas:

1. Facility and vehicle maintenance
2. Stormwater contamination and spill prevention
3. Vegetation control and pollution prevention on public roads and highways
4. The regulatory requirements of the Spill Prevention Control and Countermeasures (SPCC) plans developed for each maintenance yard
5. Spill response and emergency procedures

6. The proper procedures for responding to facility and non-facility (roadway) based emergency events.

Each maintenance facility has copies of the videos, and current DelDOT personnel and new hires are required to view them. In addition, the NPDES Program also prepares training posters on elements of the PPP and SPCC Plans and distributes them to the yards several times per year.

### Monitoring

The Pollution Prevention Plans currently require wet weather stormwater monitoring at four maintenance facilities. These facilities were chosen as representative of the 16 facilities located throughout the state. The four yards are: Kiamensi, Bear, Cheswold, and Harrington.

Monitoring was conducted during 2012 at each of the pond outfalls. Sampling techniques were performed in accordance with the Environmental Protection Agency (EPA) Stormwater Sampling Guidance Document, EPA 833-B-92-001 (July 1992). Semi-annual samples were collected once in each of the following six-month periods: January through June, and July through December.

The wet weather monitoring protocol includes 72 hours of antecedently dry conditions, minimum predicted rainfall depth of 0.10 inches, and two full days of standard maintenance yard operations since the last rainfall event. A first flush sample was collected within 30 minutes from the first noticeable flow, and delivered to the laboratory for analysis of total suspended solids, surfactants, chloride, pH, and total petroleum hydrocarbons: gasoline and diesel range organics. Measurements of flow, air temperature, water temperature, pH and turbidity were recorded on-site at the time of sample collection.

Table 6-1 displays the first flush concentrations measured during 2012 for all parameters at each of the four sites.

The total suspended solids (TSS) levels measured in samples collected at Cheswold (Area 8) and Bear (Area 10) yard outfalls slightly exceeded the benchmark value of 100 mg/L. Operations at both yards were investigated shortly after the test results were received in order to determine the source(s) of the excess sediment discharge. In addition, detailed annual inspections were conducted by NPDES and DNREC staff in the autumn of 2012. No specific sources were found at Bear yard, although stockpiling and movement of materials by construction contractors were thought to be contributing factors. An eroding channel on the pond side slope was also found, and the Area 10 Supervisor was directed to stabilize this slope. Inspections of Cheswold yard revealed a lapse in maintenance of catch basin filters and wash pad area. NPDES staff directed the Area 8 Supervisor to clean all catch basins and the wash pad, as well as clean and replace the riprap in the spillway will continue to inspect the yards periodically to determine if any additional BMPs are needed at these sites.

### Vehicle Wash Water Plan

In July of 2005, DelDOT received approval from DNREC for a plan entitled *Statewide Vehicle Wash Water Practices for DelDOT Maintenance Yards* (Section V, DelDOT NPDES Phase I MS4 Permit Stormwater Management Plan, revised September 2010). This plan outlined the Department's proposal for treating vehicle wash water on-site at our sixteen (16) maintenance facilities. Our goal was to develop options to treat vehicle

wash water and stormwater to acceptable levels before it exits our site and 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 treat the vehicle wash water. In other cases, there is a need to design and construct retrofits at the facilities.

### *I. Employee Training Program*

The following is a list of training workshops and conferences attended by DelDOT staff and training material produced in calendar year 2012:

- All statewide district maintenance staff are required to view the following videos as part of Pollution Prevention Plans: Stormwater Contamination & Spill Prevention, Vegetative Control & Pollution Prevention, and Facility & Vehicle Maintenance.
- All maintenance staff are required to view videos as part of the Spill Prevention Control and Countermeasures Plans. The three topics include: SPCC regulatory requirements, spill response and emergency procedures and roadside events.
- NPDES staff are members of the Nonpoint Source Advisory Committee and attend the annual workshop.
- As part of the NPDES industrial permit, the NPDES Section issues training bulletins to each maintenance facility statewide. These bulletins support DelDOT maintenance staff in its efforts to achieve and maintain compliance with the stormwater pollution prevention regulatory requirements. The bulletins are placed in a visible location at each yard. During the 2012 calendar year, one issue describing DelDOT’s street sweeping program was distributed.
- The following training/workshops were attended by NPDES or DOTS stormwater staff:

#### Workshops

- Work Process Improvement Tools and Techniques
- GIS- TUG Meeting, Bentley Asset management with AssetWise.
- Annual Transportation Research Board Conference.
- 2012 Delaware Wetlands Conference, Protecting Our Communities & Coasts for the Future

#### Web casts

- U.S. EPA Webinar on the 2012 Construction General Permit (CGP)
- FHWA Webinar on Consultant Services Procurement Requirements
- EPA’s Stormwater Pollution Prevention Series: Stormwater, Coal-Tar Sealcoat and Polycyclic Aromatic Hydrocarbons
- Winter Maintenance – Snow & Ice

- U.S. EPA Watershed Academy Webcast: Using the Clean Water Act State Revolving Fund for Nonpoint Source and National Estuary Projects
- Water Environment Research Foundation (WERF) refining Expectations for Urban Stormwater BMP Performance in the Chesapeake Bay
- U.S. EPA Watershed Academy Webcast: Recovery Potential Screening – A Tool for Comparing Impaired Waters Restorability
- U.S. EPA Watershed Academy Webcast: ‘How’s My Waterway’ and Other Water Quality Apps
- U.S. EPA Watershed Academy Webcast: New Recreational Criteria to Better Protect Public Health
- The Roadside Environmental Section staff attended various courses and workshops for re-certification, pesticide credits, and International Society of Arboriculture credits including:
  1. Horticulture Industry Expo and Pesticide Conference, Dover, DE
  2. Summer Turf and Nursery Expo, Georgetown, DE
  3. Delaware Ornamental and Turf Workshop, Hockession, DE

**Table 6-1.** 2012 wet weather monitoring results from DeIDOT maintenance facility BMP outfalls. The samples were collected once in each of the following six-month periods: January through June, and July through December. All results are reported in mg/L.

PARAMETER	KIAMENSI		BEAR		CHESWOLD		HARRINGTON	
	2/29/12	8/14/12	2/29/12	8/14/12	4/22/12	9/18/12	4/22/12	11/7/12
<b>Total Suspended Solids</b>	52.0	90.8	122.8*	113.0*	163.0*	221.0*	17.2	<4.0
<b>Surfactants, MBAs</b>	0.99	0.17	0.13	0.13	0.35	0.23	0.11	0.09
<b>Chloride</b>	9660	1190	2420	30.0	1050	45.4	1130	37.1
<b>TPH-Gasoline Range Organics</b>	<0.05	<0.10	<0.05	<0.10	<0.05	<0.10	<0.05	<0.10
<b>TPH-Diesel Range Organics</b>	0.49	<0.5	0.43	<0.5	1.13	<0.5	<0.5	<0.5
<b>pH</b>	7.45	7.34	7.18	7.30	6.94	7.80	7.39	7.27

\*Exceeds benchmark value.

---

**Benchmark Values:**

**TSS** – 100 mg/L

**Surfactants** – 1.0 mg/L

**Chlorides** – no benchmark exists

**Oil and Grease** – 15 mg/L

**pH** – 6 to 9 s.u.

---

**Table 6-2.** Estimates of nitrogen and phosphorus removed from Kent County roadways by street sweeping. The weights reflect tons of material delivered to the DSWA landfill. Calculations are based on based on the recommendations published in the Chesapeake Urban Stormwater Workgroup memo, “Street Sweeping/BMP Era Recommendations,” dated 3/1/2011. A factor of 0.7 was used to calculate dry weight.

	<b>Tons of Waste Collected</b>	<b>TN Removed (lbs.)</b>	<b>TP Removed (lbs.)</b>
Central District	485	1,698	679
<b>Total for Kent Co.</b>	<b>485</b>	<b>1,698</b>	<b>679</b>

**Appendix A.** Appoquinimink River Association summary report for 2012.

## *Appoquinimink River Association 2013 Report*

**Livable Lawns Campaign** – Improper fertilization of lawns and open spaces is a huge problem in the entire state. The Appoquinimink River Association, Department of Natural Resources and Environmental Control, Department of Transportation NPDES Program, Delaware Nursery and Landscape Association, Delaware Grounds Management Association, University of Delaware, USDA-Natural Resource Conservation Service, Nutrient Management Commission, Delaware Nature Society and New Castle Conservation District continued meeting and created a system to recognize those commercial applicators that are being environmentally friendly. The campaign also started its homeowner education portion of the campaign including advertising, outreach materials and events.



2012 brought the following accomplishments:

### Livable Lawns Presentations/Outreach Events:

- 1/26/2012 – Dover, DE – DE Horticulture Industry Expo - 289 attendees
- 2/28/2012 – Dover, DE – John Deere Sales Meeting – 35 attendees
- 3/5/2012 – Newark, DE – UD Cooperative Extension Short Course
- 3/9/2012 – Georgetown, DE – UD Cooperative Extension Sussex County Turf Conference
- 3/20/2012 – Felton, DE – DNREC Nonpoint Source Program – 30 attendees
- 4/23/2012 – Stanton, DE – Del Tech Earth Day event
- 7/30/2012 – Carvel Center, Georgetown – MG & General Public presentation - 23 attended
- 8/8/2012 – Wilmington, DE – Green Jobs Students
- 8/16/2012 – Georgetown, DE – DNLA Summer Turf & Nursery Expo – 102 attendees

### Promotional Materials:

- Residential brochures developed and printed -2/12
- Brochures were distributed at 4/23, 4/28 (AgDay), State Fair, 7/30
- Business cards certified companies developed 3/12/12
- Three “how to” videos filmed – 1/18/12 and 3/21/12
- Display booth was purchased and display materials developed – 4/12
- Commercial brochures (2,000) were reprinted – 6/12
- Ads designed by Janet Hughes & Associates – 9/12
- DE State News ad & Gatehouse (Community pubs. 30,000 exposures) Ad Campaign – 10/12

### Companies:

- 28 companies expressed interest with 26 of those being viable companies that fit w/in the parameters
- To date, 5 are certified (2 have recertified + 3 new certified companies)

**Pet Waste Education** – Alongside the Departments of Natural Resources and Environmental Control and Transportation, the Appoquinimink River Association continued an intensive pet waste education campaign throughout southern New Castle County. Over 3,400 portable pet waste collection bag holders were distributed to training facilities (300), shelters (3,000) and at outreach events (100) including the Blackbird Fall Festival.



**Appendix B.** *“NPDES and Education on Stormwater Pollution”* report.

# ***NPDES and Education on Stormwater Pollution***

***May 2012***

written by  
***Martha Corrozi Narvaez and Andrew Homsey***

with  
***Erin McVey***

of IPA's  
***Water Resources Agency***



*This project is funded by the  
Delaware Department of Transportation  
and the  
Delaware Center for  
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***Institute for Public Administration  
School of Public Policy & Administration  
College of Arts & Sciences  
University of Delaware***

*servicing the public good, shaping tomorrow's leaders*

***[www.ipa.udel.edu](http://www.ipa.udel.edu)***

# ***NPDES and Education on Stormwater Pollution***

***May 2012***

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## Preface

It is the mission of the Institute for Public Administration's Water Resources Agency (WRA) at the University of Delaware to provide water-resources policy and planning assistance to governments and entities throughout Delaware and the region. In keeping with WRA's mission, IPA presents this report to provide guidance to DeIDOT, New Castle County, and six municipalities in meeting the National Pollutant Discharge Elimination System (NPDES) education and outreach requirements.

As authorized under the Clean Water Act, the NPDES controls water pollution by regulating stormwater, which discharges directly into surface waters. New Castle County, DeIDOT and six municipalities—Bellefonte, Delaware City, the Town of Elsmere, the City of Middletown, the City of New Castle, and the City of Wilmington—are Phase I co-permittees for the discharge of stormwater from and through all portions of the municipal separate storm-sewer system (MS4) in New Castle County, as authorized under the NPDES and the laws of the State of Delaware. This report provides guidance for DeIDOT and the co-permittees to achieve the education and outreach requirements of the NPDES permit. It intends to make the education and outreach efforts more effective and meaningful for New Castle County, DeIDOT and the six municipalities regulated under the permit.

This report discusses the following project components:

- Stormwater-education initiatives undertaken by DeIDOT;
- Stormwater-education campaigns conducted by government and nongovernment organizations in Delaware and throughout the country;
- Workshop held for the co-permittees and the key concepts learned to develop an effective education campaign; and
- Recommendations on how to achieve the stormwater-education requirements in the eight Target Areas defined in the permit.

The information contained in this report provides guidance toward the development of a refined Stormwater Education and Outreach Plan, as required by the NPDES Phase I permit.

I would like to acknowledge the project team members. While a research assistant at IPA, Erin McVey researched and collected data for this report. Associate policy scientists Martha Corrozi Narvaez and Andrew Homsey led the project team and authored this important document. This report demonstrates a collaborative effort among IPA's Water Resources Agency, DeIDOT, and New Castle County to assist DeIDOT and co-permittees in meeting the education requirements as set forth in the NPDES in an effective and efficient manner. DeIDOT and the Delaware Center for Transportation provided the funding for this project.

It is our hope that this partnership will continue and will result in an informed public, reduced pollution, and cleaner rivers and streams throughout Delaware.

Jerome R. Lewis, Ph.D.  
Director, Institute for Public Administration

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## Executive Summary

Controlling and managing stormwater that runs off roadways—impervious surfaces—into the state’s surface waters are a major part of DelDOT’s responsibilities. As authorized under the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) controls water pollution by regulating stormwater that discharges directly into surface waters. New Castle County, DelDOT, and six municipalities—Bellefonte, Delaware City, the Town of Elsmere, the City of Middletown, the City of New Castle, and the City of Wilmington—are Phase I co-permittees for the discharge of stormwater from and through all portions of the municipal separate storm-sewer system (MS4) in New Castle County as authorized under the NPDES and the laws of the State of Delaware. In order to meet the requirements of the NPDES permit, the co-permittees (named above) must meet specific education and outreach requirements outlined in the NPDES permit.

This report provides guidance for DelDOT and the co-permittees for achieving the education and outreach requirements of the NPDES permit. It intends to make the education and outreach efforts more effective and meaningful for New Castle County, DelDOT and the six municipalities regulated under the permit.

Though the University of Delaware served as the lead agency, this project was conducted using a team approach, with direct consultation provided by representatives from DelDOT and New Castle County. This report discusses the following project components:

- Stormwater-education initiatives undertaken by DelDOT
- Stormwater-education campaigns conducted by government and non-government organizations in Delaware and throughout the country
- Workshop held for the co-permittees and the key concepts learned to develop an effective education campaign
- Recommendations on how to achieve the stormwater-education requirements in the eight Target Areas defined in the permit

DelDOT currently undertakes a variety of education and outreach efforts surrounding stormwater issues. Augmenting and enhancing existing resources and programs are crucial tools in the development of any further educational efforts. Additionally, there are a number of nationally recognized stormwater education programs that can be used as a model for DelDOT to implement Delaware-specific programs based on those which have proven most successful and cost-effective elsewhere.

At a workshop hosted by Water Words that Work, LLC, the project team and co-permittees learned about effective outreach and marketing techniques for environmental issues. DelDOT, the co-permittees, and the project team came to understand the importance of the following concepts for an effective education campaign:

- Know your target audience.
- Use new data and innovative web tools to focus in on your target audience.
- Ensure effective design of all outreach materials (e.g., graphics and slogans).
- Be aware of “the slope,” or the rate of conversion of people whose behavior is actually changed.

- Keep in mind the costs versus the benefits of any campaign.
- Leverage existing resources (don't "reinvent the wheel").
- Conduct surveys to assess the effectiveness of your message.

Using this information, a set of eight recommendations was developed for each of the following Target Areas, which are derived from the educational requirements of the NPDES permit:

1. Illicit Discharges
2. Motor Oil/Hazardous Waste
3. Yard/Pet Waste
4. Lawn Irrigation/Car Washing
5. Lawn Care
6. Public Participation/Stream Clean-Ups
7. BMP Maintenance
8. LID/Green Technology

In this report each of the eight Target Areas is addressed. For each one of these the goal, target audience, recommended approach, scale of impressions, and costs are discussed in detail. Each one of these recommended approaches provides guidance toward the development of a refined Stormwater Education and Outreach Plan, as required by the NPDES Phase I permit.

## Chapter 1 – Project Introduction

### 1.1 Overview

DelDOT owns and operates nearly all the roadway systems in Delaware, comprising over 5,000 miles of roads and associated storm drainage systems. Controlling and managing stormwater that runs off these impervious surfaces into the state's surface waters are a major part of DelDOT's highway construction budget.

Impervious cover is any surface in the landscape that cannot effectively absorb or infiltrate rainfall. This includes driveways, roads, parking lots, rooftops, and sidewalks. When natural landscapes are intact, rainfall is absorbed into the soil and vegetation. These natural mediums, or pervious cover, naturally slow down, spread out, and soak up precipitation and runoff. Water percolating into the soil becomes a stable supply of groundwater, and the runoff is naturally filtered of impurities before it reaches creeks, streams, rivers, and bays. A growing body of scientific literature has shown that groundwater recharge, stream base flow, and water quality measurably degrade as impervious cover increases.

As authorized under the Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) controls water pollution by regulating point sources that discharge directly into surface waters. New Castle County, DelDOT, and six municipalities—Bellefonte, Delaware City, the Town of Elsmere, the City of Middletown, the City of New Castle, and the City of Wilmington—are co-permittees for the discharge of stormwater from and through all portions of the municipal separate storm-sewer system (MS4) as authorized under the NPDES and the laws of the State of Delaware. The Delaware Center for Transportation's (DCT) 2007 Transportation Education, Research and Security Forum identifies NPDES and education of nonpoint source pollution for the public as important issues related to the transportation system in Delaware and the Northeast Corridor.

In order to meet the requirements of the NPDES permit, the co-permittees (named above) must meet the education and public outreach requirements outlined in the NPDES permit. This report proposes to assist the co-permittees in achieving the education requirements of the permit and making these efforts more effective and meaningful for New Castle County, DelDOT and the six municipalities regulated under the permit while addressing important issues named in DCT's 2007 forum.

### 1.2 Project Details, Methodology, and Outcomes

This project, NPDES and Education on Nonpoint-Source Pollution, was led by the University of Delaware with funding provided by DCT and DelDOT.

The University of Delaware's Water Resources Agency (WRA), a unit of the School of Public Policy & Administration's Institute for Public Administration (IPA), served as the lead entity. However, the project was conducted using a team approach, with consultation provided by DelDOT and New Castle County representatives. WRA staff—associate policy scientists Martha Corrozi Narvaez and Andrew

Homsey served as the project leads. While an IPA research assistant, Erin McVey conducted valuable research for this project. Marianne Walch served as the lead contact on behalf of DeIDOT. Additional team members who provided feedback and consultation throughout the project include Randy Cole (DeIDOT), Ellie Mortazavi (New Castle County), and Michael Harris (New Castle County).

The project team met on a regular basis to discuss project progress, research findings, workshop information, and the final report. Below is a list of project meeting dates and times:

- October 10, 2010
- November 15, 2010
- July 12, 2011
- September 28, 2011
- January 31, 2012

The project methodology comprised four distinct tasks:

*Task 1:* Research stormwater-education initiatives that have been undertaken by DeIDOT for NPDES compliance and related to nonpoint-source runoff.

*Task 2:* Conduct a literature review of education campaigns about stormwater runoff that other municipalities and towns in Delaware and throughout the country have implemented both for general education and to meet the requirements of the NPDES permit.

*Task 3:* Host a workshop for the co-permittees to discuss critical components of developing an education campaign, such as identifying the target audience, selecting the best communication method, using the right tools, and turning simple actions into meaningful results.

*Task 4:* Compile a report that brings together the information collected in Task 1 and 2, the lessons learned at the workshop, and the feedback provided at the workshop. With this information and further analysis, provide a recommended path forward to meet the education requirements in the NPDES permit.

Through the expertise of the project team and the established methodology there are several expected outcomes for this project. These include the following:

- Identify NPDES and non-NPDES stormwater-quality education programs.
- Determine the applicability of specific stormwater-education programs in Delaware.
- Coordinate key stakeholders and NPDES co-permittees (public-private partnerships).
- Recommend an implementation plan for DeIDOT and the NPDES co-permittees to achieve the NPDES education requirements and conduct the most effective stormwater-quality-education program.

This report will provide information on each one of the above project outcomes.

## Chapter 2 – NPDES Program and Education Requirements

### 2.1 NPDES Summary

The NPDES permit program is an effort to improve the quality of water running off into waterways of the United States. Discharge from a point source into federal waters always requires a NPDES permit, and discharge into a municipal stormwater system may require a permit, depending on the contents of the discharge. There are two phases (Phase I and II) of the NPDES program, which are designated by the size of the population in the area covered by the permit. In 1990 the Phase I Regulations were issued to include municipalities with a population of 100,000 or more. The Phase I permit program requires industries and municipalities to acquire a permit for the water discharged into a waterway. In 1999 Phase II permit requirements were issued to smaller municipalities with municipal separate storm-sewer systems (MS4s). Not all smaller municipalities with MS4s require a NPDES permit, and this is determined by the “quantity and nature” of the runoff and the “nature of the receiving water” (Part 122.26 of Chapter 1, Title 40). The NPDES program requires a permit if the discharge is associated with an industrial activity, is from a large municipal MS4, or is from a medium MS4. The EPA defines a large MS4 as located in an incorporated place with a population of 250,000 or more. A medium MS4 is located in an incorporated place with a population of 100,000 or more but less than 250,000 (Part 122.26 of Chapter 1, Title 40). If an industrial activity does not generate runoff into an MS4, an individual permit is needed.

DelDOT has a Phase I permit, issued in 2001, that covers all of New Castle County and a Phase II permit, issued in 2003, that covers heavily populated areas of Kent and Sussex Counties. The Phase I permit requires DELDOT to work with New Castle County and the municipalities included in the permit to develop a Stormwater Pollution Prevention and Management Program.

### 2.2 DelDOT’s Phase I Public-Education Requirements

As authorized under the Clean Water Act, New Castle County, DelDOT, and six municipalities—Bellefonte, Delaware City, the Town of Elsmere, the City of Middletown, the City of New Castle, and the City of Wilmington—are co-permittees for the discharge of stormwater from and through all portions of the MS4 under the NPDES and the laws of the State of Delaware. In order to meet these requirements, these entities must meet specific public education and public involvement requirements outlined in the permit.

According to the permit, the permittees must develop and implement an education and outreach program utilizing available media to

1. Increase the knowledge of the target communities regarding MS4s, impacts of urban runoff on receiving waters, and potential BMP solutions,
2. Change the behavior of target communities to reduce pollutant releases to MS4s and the environment, and
3. Decrease the discharge of pollutants to the MS4 by engaging the public.

The Stormwater Pollution Prevention and Management Plan developed and implemented by the co-permittees must include the following components:

- Clear goals and objectives
- Identified target audiences
- Message(s) specific to the target audiences
- Packaging and distribution of the message(s)
- Evaluation of the outreach plan

With the above objectives in mind, there are specific topic areas, or pollution sources, where the co-permittees must focus their public education and outreach efforts. Based on the language in the permit, these include

1. Public reporting of the presence of illicit discharges or improper disposal of materials, including floatables, into the MS4;
2. Proper management and disposal of used motor-vehicle fluids and household hazardous wastes;
3. Proper management and disposal of grass clippings, leaf litter and domestic animal wastes;
4. Proper use of water to limit excess non-stormwater water discharges from activities such as washing cars and lawn irrigation, from entering the storm-sewer system;
5. Proper use, application, and disposal of pesticides, herbicides, and fertilizers by commercial and private applicators and distributors;
6. Public participation events, such as stream cleanups, drain stenciling, etc.
7. Proper maintenance of BMPs directed toward private- and commercial-property owners, and state or municipal entities responsible for maintenance; and
8. Opportunities for residential installation of low-impact development (LID) practices, and the use of Green Technology best management practices (BMPs) that reduce runoff and mimic natural hydrology.

In addition to reaching the public and target audiences about these topic areas the permit requires that the education and outreach program shall include at least two public workshops each year and shall ensure that a minimum of 250,000 impressions per year are made on the general public about stormwater quality via print, local TV access, local radio, Internet, or other appropriate media.

Finally, the co-permittees are required to carry out a statistically valid public-education survey to evaluate the effectiveness of the education and outreach program in increasing public awareness and changing behaviors about stormwater pollution. The baseline survey must be conducted within 18 months of the effective date of the permit with the results submitted to the Department six months after the survey starts. A second survey will be conducted beginning within approximately 3.5 years of the permit (two years after the first survey). Survey results must be submitted to DNREC six months after the survey begins. According to the permit, the two surveys shall be consistent so that results are comparable, and if, upon comparison of the two surveys, no measurable difference in public awareness and behavior is evident, the permittees shall reevaluate their public education and outreach program in order to determine more effective methods of conveying their message.

No later than 12 months from the effective date of the permit, DelDOT and the co-permittees must develop and implement a process for the public to review and comment on the draft Stormwater Pollution Prevention and Management Plan (SWPP&MP). The permittees must also develop and implement a process for consideration of public comments on the SWPP&MP. The education and outreach program must be updated as necessary to remain effective and relevant to current conditions.

Based on the education requirements described above, DelDOT and the co-permittees will need to work cooperatively to develop an effective education campaign. The following chapters provide information on programs that have been implemented statewide and nationwide that the co-permittees can gain insight from or possibly use information from so that new efforts are not redundant or the co-permittees don't "re-invent" the wheel. Recommendations on approaches that focus on the eight Target Areas and achieve the NPDES education requirements, incorporating some of the previous efforts as well as key concepts learned from the workshop, is detailed in Chapter 5.

## Chapter 3 – Existing Efforts Toward Stormwater Education

### 3.1 Introduction and Data Collection

When considering strategies to educate the public about issues related to controlling stormwater, it is important to be aware of similar efforts currently or previously undertaken. In this way one can avoid “reinventing the wheel” and ensure that any new efforts complement or enhance existing programs. The process of educational-outreach review also necessarily includes an assessment of the efficacy of these programs. By evaluating public feedback and speaking with those involved in implementation or assessment, it is possible to determine which approaches are the most effective, both from a cost perspective and in terms of influencing behavior. For the current study, efforts by DeIDOT as well as other groups regionally and nationally were considered.

To gather information about DeIDOT’s current or past efforts in stormwater education and outreach, members of the project team were consulted. Similar canvassing was performed to determine efforts on the part of DeIDOT’s co-permittees in the NPDES stormwater-permitting process. In addition, on annual report review and online searches were performed to find additional programs not discussed and to augment the understanding of the nature of each identified educational effort. Detailed information on these programs is included in Section 3.2.

Information on stormwater-education efforts beyond Delaware was also considered. Information on these programs was found through online searches, the professional expertise of the project team, and discussions with DeIDOT and New Castle County personnel. A series of programs for comparable educational and outreach efforts was identified. Contact was made with individuals at those programs, which included other departments of transportation and local or regional government public works departments. A list of these departments and contacts are included in Appendix A. A series of questions was put to the representative(s) of each comparable program. The questions touched on the following key areas:

- Reason for implementation
- Difficulty of implementation
- Problem areas
- Cost
- Number of impressions
- Public Feedback

The detailed list of questions is provided in Appendix B, and the information gathered specific to each program is provided in detail in Section 3.3.

### 3.2 DeIDOT Public Education Programs

Over time, DeIDOT has engaged in numerous public education programs to reduce stormwater pollution. DeIDOT has worked independently on numerous initiatives yet has also had the foresight to

partner with organizations throughout the state to accomplish its stormwater-education goals in an efficient and effective manner.

DelDOT is currently active in promoting stormwater education and outreach efforts to citizens. It has created a website with several useful and important links and actively seeks to disseminate information about the importance of keeping pollutants out of the storm-sewer systems through various programs and outreach campaigns. This website and many other education and outreach efforts go toward meeting the requirements of the NPDES permit. An inventory of these efforts was compiled from annual reports (2002-2011), Internet research, WRA staff expertise, and correspondence with DelDOT staff. This information is described in detail below, and Table 1 provides an abbreviated list of the programs.

### **Stormwater Website**

DelDOT's stormwater website ([www.deldot.gov/stormwater](http://www.deldot.gov/stormwater)) provides a central point for the public dissemination of information about stormwater and the NPDES program. The site outlines the major components of DelDOT's stormwater system and the importance of protecting it from contamination. There is information on regulations, efforts underway to control contaminants and monitor problems, BMP descriptions for stormwater control, and many links to educational materials for teachers and educators. The site is a repository for publications about stormwater-related topics and for steps individuals can take to protect the watershed, including tips on waste disposal and contacts for reporting problems or illicit discharges. Many of the resources on the site are available for download, including those that are distributed by DelDOT and may be downloaded and used by educators and the public.

This site also includes a link, "Report a Problem," to report problems with the stormwater system (e.g., clogs, illicit discharges, maintenance, etc.). This link, while combined with reporting for other DelDOT issues such as road conditions, is an easy way to connect with the public and enhance feedback and responsiveness.

### **Stormdrain Inventory and Marking**

To support operation and maintenance efforts by DelDOT, a system-wide inventory of stormwater assets, including inlets, outfalls, pipes, swales, and manholes was compiled in GIS and spatially located with GPS. DelDOT has worked in cooperation with URS Corporation and KCI Technologies on the program to inventory and mark the stormdrains. Such asset inventory provides a critical basis for designing education and outreach programs. Stormdrain marking requires a detailed inventory so that the decals can be applied and maintained in the most efficient manner.

DelDOT worked with the Partnership for the Delaware Estuary to design the stormdrain markers. The markers display the phrase "only rain down the drain" and have been placed on stormdrains to provide a cohesive visual reminder that the storm-sewer system is an interconnected network that leads to Delaware waterways. In 2003 a storm drain marker event was held to kick-off the storm-drain marking.

### Tax Bill Insert

With the Delaware Nature Society and New Castle County, DelDOT placed an insert in New Castle County residents' tax bills. This tax bill insert reaches a broad cross-section of households and is likely to be read since it is included with a high-priority mailing.

### Doorhangers

Doorhangers (Figure 1) are passed out to homes where an illicit discharge or illegal dumping has occurred. The front side of the door hanger lists the pollutant found, and the back provides information about stormwater pollution and suggestions on how the homeowners can help minimize the problem. This is an important effort because it educates citizens on how to become aware of potential problems in the future.

### Tipcards

DelDOT developed tipcards containing information on how to improve water quality and help reduce the negative impacts of stormwater runoff. These materials are printed in bulk and distributed at various public outreach events (such as the State Fair, Coast Day, Community Days, etc.). The tipcards are also disseminated in state employee paychecks.

### Public Events

DelDOT is active in disseminating stormwater information throughout Delaware at various public events. Activities at these events include displayed material (boards), an interactive touch-screen stormwater slideshow, an interactive stormwater quiz, and giveaways for visitors. These venues include, but are not limited to, the Delaware Rural Water Association, University of Delaware Coast Day, and the Delaware State Fair.

### Anti-Litter-Education Program

In 2005 DelDOT developed an anti-litter-education program for elementary school students across Delaware to educate them about the harmful effects of littering and encouraged participation in the Adopt-A-Highway program. As part of this campaign, DelDOT publishes anti-litter, quarter-page newspaper advertisements in the *Delaware State News*.

### Book Covers

DelDOT distributed 4,000 book covers to schools and the general public that highlight stormwater pollution, the water cycle, and watersheds.

### Media Outlets

DelDOT has disseminated stormwater-education information through various media outlets, including:

- Public service announcements and ads in several local newspapers, including *Delaware State News*, *Cape Gazette*, and the *Dover Post*.
- TV commercials through Clear Channel Broadcasting and radio spots on WGMD-FM.
- Ads that appear on DART First State buses with the Partnership for the Delaware Estuary.



**Figure 1. Illicit-discharge doorhanger**

### Appoquinimink River Association

An important component to DelDOT's outreach efforts is working with organizations such as the Appoquinimink River Association (ARA) to help promote its message. With DNREC, DelDOT funded and hired a BMP Outreach and Implementation Specialist for the Appoquinimink River watershed. The role of ARA is to lead and execute an education and outreach program to provide information to the public on ways to reduce nonpoint source pollution. ARA has assisted DelDOT in the following ways:

- Developed a "Nonpoint Source Public Events and Programs" manual, printed CDs and hard copies, and distributed (Figure 2).
- Organized a watershed cleanup and DelDOT supported this with manpower, equipment and payment for disposal.
- Developed a watershed presentation for schools and community groups. Once delivered, a follow-up survey was distributed to determine the effectiveness of the presentation.
- Developed an education education/outreach campaign to reduce fertilizer application by changing watershed residents' lawn-care practices. The target audience is both lawn-care companies and residents. This program, established in 2009, is now known as *Delaware Livable Lawns*.
- Implemented a pet-waste campaign. Using the dog-license database, residents in Middletown were sent dog-waste bags, "Bags on Board," and tip cards to help reduce bacteria loads in the watershed.

### Adopt-A-Highway Program

DelDOT has established an Adopt-A-Highway program to reduce litter on Delaware's roadways. In-line with this program, Delaware hosted an "Imagine a Litter Free Delaware" day, which was a cleanup day along roads, highways, and community areas in 2005 and 2006.

### Interactive Water-Quality Games

DelDOT has developed interactive water-quality games that are used at public events, such as the Delaware State Fair. These games help convey key nonpoint-source-pollution-reduction messages in a fun and hands on way to the public, specifically aimed at children and adults.

### Watershed Clean-up

DelDOT supports watershed clean-ups in the Appoquinimink River, Christina River, White Clay Creek and Red Clay Creek watersheds. DelDOT provides manpower and equipment and in the Appoquinimink River watershed it pays for disposal.

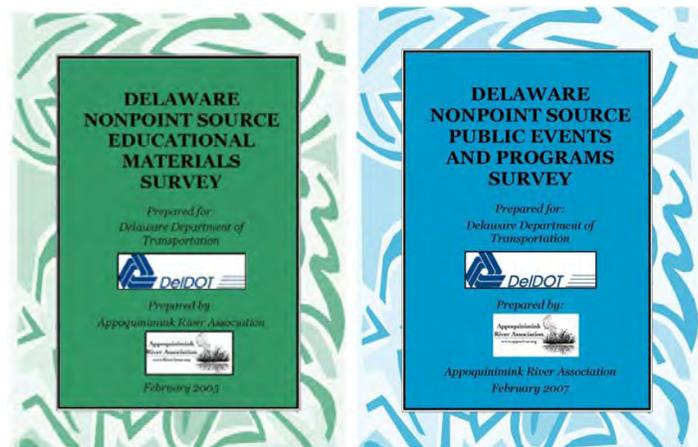


Figure 2. Compilation of Nonpoint-Source Education Materials and Programs

### Activity Books and Placemats

With the Partnership for the Delaware, DeIDOT developed activity books and placemats that provide information about topic such as watersheds, stormwater pollution, and the water cycle (Figure 3). The activity books and placemats are distributed to schools, restaurants, and the public.

### Watershed Training Course

With the Delaware Nature Society, DeIDOT has developed and delivered a watershed training course to DeIDOT and New Castle County employees.

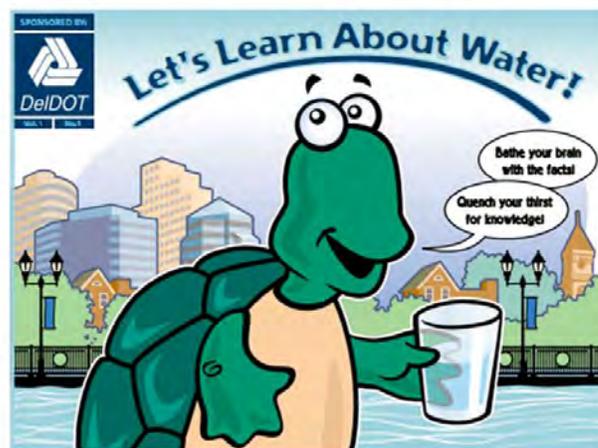


Figure 3. Stormwater Activity Book

### Clean Water Begins and Ends with You

With the Partnership for the Delaware Estuary, DeIDOT hosts an annual stormwater drawing contest. Sixteen winners are selected and their drawings are compiled into a calendar. The first place winner's drawing is displayed on a DART First State bus and used as a public-education piece.

### Dog Waste–Collection Program

With the Partnership for the Delaware Estuary and the Appoquinimink River Association, DeIDOT has developed a dog waste collection program to reduce the bacteria input to the Pike Creek watershed and multiple watersheds in the state. Activities related to implementing this program include the following:

- Purchase pet waste–bag dispensers (Dogipots).
- Conduct outreach and education effectiveness.
- Conduct microbiological monitoring.
- Produce and distribute a brochure/tipcards.
- Install dispensers in neighborhoods and New Castle County parks.
- Purchase pet-waste bags, “Bags on Board.”

### Stormwater FYI Brochure

DeIDOT developed an outreach brochure describing stormwater-drain efforts, this was distributed to approximately 20,000 New Castle County residents and at venues including, but not limited to:

- Bear Glasgow Civic Council-Rutledge Community
- DNREC's Watershed Assessment Section for distribution at Peach Festival
- DNREC Nonpoint Source Program

### Stormwater Display Board

In 2006 DeIDOT hired a graphic designer to create a new display, which includes ten placards, each depicting a water quality message. DeIDOT purchased a 10-foot poster display board, graphics, and a watershed model to be used at outreach events. It has been used at over 30 events from 2002-2011, including, but not limited to, the following events:

- Delaware State Fair
- Delaware Rural Water Association

- Harvest Moon Festival
- Delaware Water Festival
- University of Delaware Coast Day
- Earth Day events

### Technology Students Association (TSA) State Conference

DelDOT staff have served as judges in the TSA State Conference (2002-2011). In 2002 as part of this event, students competed in the development of a children's coloring book and a restaurant placemat related to NPDES and water quality.

### Educational Bookmark

With the Delaware Nature Society, DelDOT developed bookmarks for distribution to early education students (Figure 4). The bookmarks serve as a complement to the state-mandated Delaware-watershed curriculum and Delaware Nature Society programs where they were also distributed.

### Articles

DelDOT staff have authored articles in publications such as Estuary News, DelDOT Dispatch, and the Nonpoint Education for Municipal Officials (NEMO) publication.

### Stormwater-Education Presentations

DelDOT presents stormwater-education information to various groups, including:

- Pike Creek Civic Association
- Brandywine Rotary Club
- Camden-Wyoming Rotary Club



Figure 4. Stormwater Bookmark

### DSWA Brochure Distribution

DelDOT coordinates with the Delaware Solid Waste Authority (DSWA) to receive and distribute their "Household Hazardous Waste Collection" program brochure. The brochure is distributed at public events and educates citizens on the proper disposal of household hazardous materials.

### Water Resources Agency

In 2010 through the Delaware Center for Transportation, DelDOT funded the University of Delaware's Water Resources Agency, a unit of the School of Public Policy & Administration's Institute for Public Administration, to investigate cost-effective social-marketing options that are feasible in Delaware to meet the minimum general public "impressions" required by the new NPDES Phase I permit. This project proposes to assist co-permittees in meeting the education requirements of the NPDES permit.

**Delaware Association for Environmental Education**

DelDOT staff have been active participants in founding and developing the Delaware Association for Environmental Education (DAEE). The DelDOT Environmental Scientist serves on the Board of Directors, assists the group with its communication and outreach, and served on the planning committee for DAEE’s first annual statewide conference (February 2010).

**Environmental-Education Consultant**

Since 2002, DelDOT has hired an education consultant every year. For several years the Partnership for the Delaware Estuary served in this role, followed by the Appoquinimink River Association, and the University of Delaware’s Water Resources Agency. The role of this consultant has varied but in general it provides assistance related to meeting the education goals outlined in the NPDES permit.

*Table 1. DelDOT Programs and Initiatives*

Stormwater Website
Stormdrain Inventory and Marking
Tax Bill Insert
Doorhangers
Tipcards
Public Events
Anti-Litter Education Program
Book Covers
Media Outlets
Appoquinimink River Association
Adopt-A-Highway Program
Interactive Water-Quality Games
Watershed Clean-up
Activity Books and Placemats
Watershed Training Course
Clean Water Begins and Ends with You
Dog Waste–Collection Program
Stormwater FYI Brochure
Stormwater Display Board
Technology Students Association State Conference
Educational Bookmark
Articles
Stormwater-Education Presentations
DSWA Brochure Distribution
Water Resources Agency
Delaware Association for Environmental Education
Environmental Education Consultant

### 3.3 Stormwater-Education Programs in Delaware

There are numerous programs throughout Delaware with for curbing nonpoint-source pollution and reduce stormwater runoff. It is valuable to have an inventory of these programs in order to work in a coordinated fashion and avoid duplicating existing efforts. Understanding the existing programs also enables DelDOT and the co-permittees to work with these partners and enhance the existing programs and make more efficient use of resources. Many nonprofit organizations in Delaware, such as the Appoquinimink River Association, Delaware Nature Society, and the Partnership for the Delaware Estuary, have multiple stormwater-education programs that are implemented throughout the state. As such these organizations are valuable partners in this effort. In addition, there are many stormwater-education programs throughout the state that will enhance DelDOT and the co-permittees stormwater-education efforts in the future. A summary table of stormwater-education programs in Delaware is provided in Table 2 at the end of this section. The Appoquinimink River Association has also developed a valuable resource that inventories all pertinent nonpoint source programs and events in Delaware. The inventory, developed in 2007 at the request of DelDOT, focuses on nonpoint-source programs and events available and applicable for participation in Delaware. This survey brings focus to all the programs and events available and illustrates specific topics of programs and events of need that are absent. This publication, viewable at [www.apporiver.org/projects/PastProjects/Projects\\_P\\_Stormwater\\_Materials\\_Survey.html](http://www.apporiver.org/projects/PastProjects/Projects_P_Stormwater_Materials_Survey.html), provides a comprehensive review of Delaware's stormwater-education programs. For the purposes of this report, a select group of stormwater-education programs, based on the newness of the program, comprehensiveness, and applicability to the NPDES permit requirements are discussed in more detail in this section.

#### Livable Lawns

The goal of Delaware Livable Lawns is simple—reduce fertilizer and pesticide runoff from lawns. This goal is achieved through extensive education that:

- Certifies lawn-care companies that follow environmentally friendly practices in fertilizer application while educating property owners.
- Provides homeowners with the necessary information to make small changes in their lawn-care practices so that they can be better stewards of the environment.

Educating applicators (homeowner and commercial) is the lynchpin to adopting a new approach to lawn care. Delaware Livable Lawns initiative is a partnership among the following organizations:

- DNREC's Division of Watershed Stewardship
- Department of Transportation's NPDES Program
- Department of Agriculture Nutrient Management Commission
- Delaware Grounds Management Association
- USDA's Natural Resource Conservation Service
- New Castle Conservation District
- Appoquinimink River Association
- University of Delaware's Water Resources Agency
- University of Delaware's Cooperative Extension
- Delaware Nature Society

The requirements for a lawn-care company to be certified as part of the Delaware Livable Lawns program are as follows (certification will be administered and managed by the Delaware Nursery & Landscape Association):

- Keep fertilizer and grass clippings off any impervious surfaces (for example, sidewalks and driveways).
- For all new accounts (individual lawns previously not treated), test the soil for phosphorus, potassium, and pH prior to application. For established accounts (individual lawns that have been treated within a year or are currently treating), test the soil once every three years to determine the specific needs of the lawn.
- Apply nutrients based on the requirements outlined in the program.
- Calibrate spreaders for correct application rates and record the pounds of nutrients applied to each lawn.
- Have a certified Commercial Nutrient Handler employed within the company.

Once certified, companies will receive recognition through free newspaper advertising, listings on the initiative's website ([www.delawarelivablelawns.org](http://www.delawarelivablelawns.org)), and other publications. Companies will have complimentary use of the program logo for their own marketing materials. They will receive free leave-behind educational materials, truck decals, and signage.

Property owners will be provided with the information they need to apply the right product, in the correct quantities, at the ideal time. By implementing these lawn-care practices, they can maintain their healthy, beautify lawns and partner in protecting the environment. Point-of-sale signage will be developed incorporating QR Codes (scannable codes used by smartphones) linking to the Delaware Livable Lawns website and other resources. Mobile applications for smartphones will be developed with the State of Delaware's assistance, giving property owners easy access to program information, a fertilizer calculator, and a listing of certified applicators. Doorhangers will be designed and produced that will feature fertilizer facts and tips.

The recently developed Delaware Livable Lawns website ([www.delawarelivablelawns.org](http://www.delawarelivablelawns.org)) provides a plethora of information to assist both commercial applicators and homeowners with product selection, calculations, application instructions, and soil sampling instructions. It also offers links to other resources, publications and videos.

### **City of Wilmington Green Jobs Program**

The City of Wilmington's Green Jobs Program engages the city's youth (14-18 years old) by providing green-collar work opportunities. In this six-week program (25 hours/week), the youth earn minimum wage and participate in hands-on work experience and classroom environmental education that introduces them to environmental issues and careers. By participating in this program, Wilmington's youth can help to transform the city into a greener, cleaner, safer community while experiencing meaningful employment and education opportunities.

Projects the Green Jobs Program's interns participate in include

- Maintaining street and park trees throughout the city (watering, pruning, mulching)

- Labeling storm drains to prevent pollution
- Learning essential professional expertise (public speaking, resume writing)
- Carrying out outreach
- Installing rain gardens
- Removing invasive plant species
- Learning about environmental careers
- Discovering and working with GIS
- Exploring the city's water and wastewater systems
- Gardening in community gardens

The success of this project is dependent upon the host organizations and the partnerships formed within the Green Jobs Program. Project partners for the 2011 and 2012 programs:

- City of Wilmington, Department of Parks and Recreation
- City of Wilmington, Public Works Department
- Delaware Center for Horticulture
- Delaware Department of Natural Resources and Environmental Control (DNREC)
- Partnership for the Delaware Estuary
- University of Delaware's Water Resources Agency
- Urban Environmental Center
- The Challenge Program
- Delaware Nature Society

### **Delaware's Seventh-Grade Watershed Curriculum**

The State of Delaware's Department of Education requires that all schools that are Science Coalition members teach a watershed unit as part of the seventh-grade science curriculum. This watershed curriculum was designed by the State Department of Education and covers key concepts of watersheds. This includes the impacts of stormwater runoff and sources of stormwater pollution.

### **White Clay Creek Watershed Management Committee**

The White Clay Creek is one of only two National Wild and Scenic Rivers protected in its entirety. National Wild and Scenic River designation encourages the appropriate development of land that can coexist with the river. This federal designation helps to preserve watershed features that enhance water quality, natural resources, and the overall quality of life. This approach takes into account changing land uses and the effects they can have on river habitat.

The White Clay Creek Watershed Management Committee is made up of local citizens, representatives of conservation organizations and other interested parties, and delegates from state and local governments, including all 13 watershed municipalities. The National Park Service provides staff to help link the committee to other agencies and the public, and it also provides technical and financial support.

Together the National Park Service, Management Committee, and partner organizations work to implement the goals and objectives of the Management Plan:

- Improve and conserve water quality and water quantity.
- Conserve open space, woodlands, wetlands, and geologic features.
- Protect native plant and animal species.
- Preserve cultural, historical, and archaeological sites.
- Enhance outdoor-recreation opportunities.
- Encourage environmental education and watershed awareness.

In addition to the broad goals of the management plan listed above, the White Clay Creek Management Plan Coordinator has pledged assistance to DelDOT and the co-permittees in the following areas:

- Development of outreach and education programs and coordination/selection of stakeholders for educational activities and outreach
- Scheduling and conducting educational and outreach events, workshops, and seminars for stakeholders
- Development of a path forward pertaining to the evaluation of the programs and outreach to gage impressions

Each one of these programs discussed in detail above can be a useful program supplement in meeting the NPDES requirements. Each program has a captive audience and an established message related to reducing stormwater pollution. It would be to the benefit of DelDOT and the co-permittees to develop a partnership or maintain the existing partnership with these programs and those listed in Table 2.

*Table 2. Stormwater-Education Programs in Delaware*

<b>Delaware Livable Lawns</b>
<b>City of Wilmington Green Jobs Program</b>
<b>Seventh Grade Watershed Curriculum</b>
<b>Christina River Watershed Cleanup</b>
<b>Delaware Department of Agriculture Education Programs</b>
<b>New Castle Conservation District Education Programs</b>
<b>DNREC Education Programs</b>
<b>Envirothon</b>
<b>White Clay Creek Watershed Management Committee</b>
<b>New Castle County Programs</b>
<b>Statewide Workshops and Seminars</b>
<b>City of Newark Community Habitat</b>
<b>Municipal and Local Government Programs</b>
<b>Appoquinimink River Association</b>
<ul style="list-style-type: none"> <li>• Water-friendly Interactive House</li> <li>• Gardening for the Environment</li> <li>• Townsend Community Habitats</li> <li>• Water Education in the Classroom</li> </ul>
<b>Raingardens for the Bay</b>
<b>Delaware Nature Society</b>

• Backyard Habitat
• Stream Watch
• Summer Camps
• Education Programs
<b>Delaware Center for Horticulture</b>
• Green Skills and Jobs Training
• Community Trees
• School Gardens
<b>Partnership for the Delaware Estuary</b>
• Art contest
• Schoolyard Habitat
• Stormdrain Marking
• Dog Waste Control
• CESP Program (Corporate & Community Environmental Stewardship Program)
• Teacher Training
<b>Public Education and Outreach Events</b> (specifically focused on water)
• Earth Day
• Creekfest
• Ag Day
• Coast Day
• “Make a Splash” Festival
<b>DNREC’s Delaware National Estuarine Research Reserve</b>
• TYDB (Thank You Delaware Bay)
• School Programs
• Community Programs
• Teacher Professional Development Training
<b>Center for the Inland Bays</b>
• Schoolyard Habitat
• James Farm Outdoor Education Program
• 1,000 Raingardens for the Inland Bays

### 3.4 Stormwater Public-Education Efforts Nationwide

Nationwide, state, county, and local governments and organizations have undertaken efforts to address the importance of controlling nonpoint-source pollution from stormwater runoff. Many of these programs seek to fulfill the education and outreach requirements of the NPDES permitting process, but have wide reaching benefits beyond simply meeting regulatory requirements. To effectively assess the nature of a representative sample of these programs, a Web survey was conducted to identify organizations that were actively developing and promoting outreach efforts. Based on assessment of the comprehensiveness of such programs, as well as their direct applicability to the NPDES permitting requirements, several program managers were contacted to further assess their nature, scope, and measured effectiveness.

The intent of this analysis was not to perform an exhaustive national search but to take a sampling of programs from which lessons and information could be gleaned. The programs focused on in this section include those that are considered comparable to DelDOT's in terms of scope and scale, have a presence on the Web, and we were able to make contact and discuss the programs. There were several programs that are not included in this analysis because we were unable to make contact or the information was not available or current via the web or through contact with the organization.

A review of some of these programs follows. Entries with an asterisk (\*) were based primarily on telephone interviews. The questions posed to the organization's contact are provided in Appendix B.

### ***3.4.1 Programs Through State Departments of Transportation***

#### **Maryland State Highway Administration\***

The Maryland State Highway Administration (SHA) is currently operating under an NPDES permit that has a stormwater-education requirement. The formal program has largely been limited to an Earth Day conference but there have been other programs which SHA has been involved in::

- Adopt-a-Highway, which seeks to limit litter.
  - Highway plantings: SHA administers the Federal Transportation Fund to create a Transportation Enhancement Program (TEP). Under this program funding, is distributed to counties and municipalities to support environmental programs.
- The SHA has partnered in the "Maryland Bay Game," a summer activity for kids to play while in the car.

Program effectiveness has never been investigated. The Maryland SHA does not have a formal way of measuring success, other than quantifying the amount of money spent on stormwater-education programs. To date, the SHA has not received feedback from the public.

#### **California Department of Transportation (Caltrans)**

Caltrans has implemented several programs and used several tools to reduce nonpoint source pollution, including:

- The "Don't Trash California" campaign, which aims to discourage citizens from littering the roadways.
- Using mass media, hosting special events, and reaching out to communities to spread the message, the following mediums have been used:
  - Radio (30- and 60-second spots) and 30-second television ads
  - Highway billboards
  - Theater slides
  - Trash can wraps
  - Online advertising

#### **Connecticut Department of Transportation (ConnDOT)**

ConnDOT's Stormwater Management Plan includes public education and outreach. ConnDOT uses brochures, posters at bus and train stations, public service announcements for radio, television, and print,

storm-drain markers, and tributary signage (e.g., “entering public drinking water protection area”) to distribute the stormwater-education message.

### **Texas Department of Transportation “Don’t Mess with Texas” Anti-litter Campaign**

Since 1985, the Texas Department of Transportation (TxDOT) has sponsored the “Don’t Mess with Texas” campaign to educate the public and fight litter on state roads. This effort has proven to be one of the nation’s most highly recognized, longest running, and most successful efforts at using outreach to affect behavior. Beyond a beautification campaign, effective litter reduction can save money on highway maintenance and reduce the volume of floatables and other debris that get into the stormwater system. By tapping into the existing image of Texas as a proud and independent state, the marketing campaign was able to reach a very wide audience. The primary motto of the program (“Don’t Mess with Texas”) is a federally registered trademark. The phrase has proven so popular that it is often used without permission, requiring TxDOT to periodically take legal action to maintain its “ownership” of the brand.

Some salient features of the program:

- Highly interactive website including children’s games
- Partnerships with major private entities such as McDonald’s, Southwest Airlines, and Coca Cola
- Merchandising efforts such as provision of free bumper stickers, decals, and trashbags to Texas residents
- Electronic media including desktop icons, e-cards, and smart-phone applications
- A Facebook group with over 14,000 followers
- Community programs such as Adopt-a-Highway, photo contests, annual competitive clean-up days (“Trash-Off”)
- School-based programs around anti-litter education
- Scholarships for high school seniors sponsored by the program
- Celebrity endorsements including from Willie Nelson, Stevie Ray Vaughn, Lee Ann Womack
- Long-running research efforts to assess the types and amount of litter on the roads as well as surveys of public attitudes and behaviors to monitor the effectiveness of the campaign

This program is a model for other, similar programs. Its success can be attributed at least in part to its narrow focus, use of excellent marketing tools, emphasis on partnerships and community buy-in, and use of research tools to measure efficacy.

### **3.4.2 Municipal, County, and Regional Programs**

#### **Washington, D.C.**

Washington, D.C., has implemented programs on stormwater-education in schools, including teacher training. They have supported environmental/conservation programs, including Project Learning Tree, Water Education for Teachers (WET), Project WILD, Pollution Prevention (P2), and Schoolyard Habitats.

### City of Los Angeles

The City of Los Angeles hosts a comprehensive stormwater-education website targeted at meeting NPDES permitting requirements. Materials and programs highlighted on the website include:

- Distributable materials such as brochures, magnets, posters, and a refrigerator dry-erase board with stormwater facts and important phone numbers/contacts (for instance, see Figure 5 showing a storm-drain medallion)
- “Adopt-a-Beach School Assembly Program”
  - The city sponsors 45-minute school assemblies for elementary schools. The assembly topics cover the stormwater/stormdrain system and how it relates to the city and beach, how recycling promotes healthy stormwater, and how each student can make a difference by not littering and passing along the message to family and friends. The city also shows a slideshow explaining how pollution harms plants and animals.
  - Before the assembly, teachers are encouraged to participate in a workshop. The teachers are given a review of what will be taught during the assembly and are supplied with in-classroom activities to use before and after the assembly.



**Figure 5. City of Los Angeles Storm-drain Medallion**

### City of Chesapeake, Va.\*

The City of Chesapeake has implemented several programs to increase stormwater awareness under the Virginia Stormwater Management Program. Most efforts were not undertaken specifically to meet the requirement of the NPDES permits, but more specifically to meet the regulation’s education and outreach provisions. Some of the efforts include

- Education programs: Education programs in schools in which technicians are sent to schools for 40-minute sessions as part of a third-grade science class. The program is not directly related to managing stormwater, but is about educating children about the importance of soil, water, and the environment. The program considers reaching a young audience a very important component of public education. The program reaches 1,200 students a year over the course of 2½ months, with the average class size around 20-25 students. It is important to note that there are more classrooms requesting the program than the program is capable of visiting.
  - To implement a similar program, it is suggested that a science coordinator be identified who will serve as a liaison between the program and the teachers at the schools. This coordinator would maintain contact with teachers and work out the logistics of setting up the program at the schools, a step that is critical but often difficult.
- Adopt-a-Highway program: This program has grown in the past few years, and 70 active groups are currently participating in it. The effort is focused on decreasing ditch litter.
- Portable ashtrays: This program provides portable ashtrays that fit in the cup holder of a car. They are marketed at city events, and are intended to keep cigarette filters out of the storm sewer system.

- Distributable materials include drain markers, bill inserts, and printed ads designed by elementary and middle school students.

### **Seattle, Wash., Public Utilities\***

In Seattle, public education programs were implemented to meet NPDES permit requirements. One area in particular that needed attention was automotive maintenance and runoff related to car washes.

- Three specific BMP programs have been implemented:
  - Car-wash program
  - Pet-waste program
  - Automotive-maintenance program
- The City actively identifies the target audience and seeks them out.
- The City is developing a survey to determine if the target audience has received the message. The city is not required to meet a set number of impressions, but it does have to measure behavior change.

### **Baltimore County, Md.\***

Baltimore County has implemented several programs to address stormwater and NPDES permitting issues. The County has developed a set of standards that it notes are more restrictive than what is required by the EPA. Significant programs implemented include:

- Maryland Green Schools Program: the statewide nonprofit Maryland Association for Environmental and Outdoor Education works towards teaching schools and ideally has them implement BMPs. In addition to implementing BMPs, it is the hope that the schools will work stormwater education and water conservation into the curriculum. The goal is that schools will make connections to each student's watershed and will educate them about the watershed, specifically about water conservation and stormwater-pollution prevention.
- Storm drain–stenciling program: the County at one time coordinated efforts to stencil drain markers but found that these had to be reapplied every few years. Currently plastic disks are affixed with glue. The markers inform readers that water entering the drain flows directly to a stream, not a treatment plant.
- Community events: Representatives from Baltimore County attend various community events where they assist local watershed groups in educating the public, for instance handing out brochures and other educational material.

### **Gwinnett County, Ga.\***

Stormwater-education programs are implemented to meet NPDES requirements and requirements set by the Metropolitan North Georgia Water Planning District. The county is currently in the process of creating a stormwater-education plan, and the goal is to be proactive, rather than reactive, to problems. To fulfill this goal, the county has initiated several programs and events:

- Six distinct workshops are held throughout the year. The County advertises and organizes the workshops and invites outside presenters to speak on various topics. The workshops are broadcast on local government–access TV. Workshop topic areas include:
  - Septic-tank maintenance (presented two times/year)
  - Detention-pond maintenance

- Fall gardening/composting
- Rain gardens
- Spring cleaning/waste management
- Lawn-care/integrated pest management (Gwinnett County Cooperative Extension, in collaboration with the University of Georgia, makes this presentation)
- Brochures have been created by both the county and the Clean Water Campaign for various workshops, for example:
  - Gardening/lawn care for both the public and the lawn-care industry
  - Auto repair
  - “Clean Water Begins with You” and “When it Rains, It Drains”
- The Stormwater Department consistently has at least one article in the “County Connections” newsletter on subjects such as watershed health or the adopt-a-stream program. The newsletter is inserted into the water bills.
  - Requests are made for contributions to the internal county newsletter and education on the county’s efforts and goals.
- The County hosts an essay contest in conjunction with the Metropolitan North Georgia Water Planning District.
  - All jurisdictions were welcome to participate.
  - The Stormwater Department presents an award at the winner’s school.
- Radio announcements have been developed, for which there has been positive public feedback.
- Stormwater Department personnel conduct “tours” to senior centers and community centers to talk about their activities and aims.

The County relies on the Planning District to gauge public awareness and program effectiveness.

### **Metropolitan North Georgia Water Planning District/Clean Water Campaign**

The Metropolitan Water District’s campaign is different from many other programs around the country because it covers a region, not just one government or municipality. There are over 100 local governments that make up the district. The local governments pay dues, and in return the Clean Water Campaign, which is the outreach effort in the district, helps the co-permittees meet the public-education requirements of the municipalities’ MS4 permits. The District provides brochures and other materials to the municipalities, and the municipalities hand them out to schools or communities at various events.

Each local government must meet the NPDES permit’s number of impressions criteria as administered by the Georgia Environmental Protection Division. The Water District conducts a regional telephone poll to assess how effectively it reaches the residents. Efforts include:

- Three primary areas of outreach: public-awareness campaigns, outreach and education to key target groups, and primary and secondary education.
- The public-awareness campaign has included ads on cable television and radio, highway billboards, press releases, bus-stop signage, utility-bill inserts, and websites.
- In 2010 the District conducted an essay contest titled “Water—Use it Wisely.”

More specific information on particular programs is maintained by the individual member localities.

## Chapter 4 – Workshop Overview/Lessons Learned

### 4.1 Workshop Overview

On September 28, 2011, WRA hosted a workshop to discuss stormwater education and public outreach. This workshop specifically involved discussion of tools and methods to meet the stormwater-education requirements of the NPDES permit. The workshop was funded through an award from the Delaware Center for Transportation (DCT).

This workshop was an interactive approach to educate the participants about the tools that are available to help meet the public education and outreach requirements in the NPDES permit. There were 18 participants from a variety of organizations, including DeIDOT, New Castle County, the City of Wilmington, Delaware City, the Town of Elsmere, the Town of Middletown, the University of Delaware, and the White Clay Wild and Scenic Management Committee. Eric Eckyl (of Water Words That Work, LLC) led the workshop. Names and affiliated organizations of the workshop attendees are included in Appendix C.

The workshop participants learned about several essential components of marketing and educating the public about specific topics that relate directly to the stormwater goals of the permit. Eckyl discussed the importance of creating a focused message and targeting a specific audience or group with this message. Eckyl discussed a multitude of available information sources about the audience one is targeting. For example, he provided statistics on the population of New Castle County, one specific area in which the outreach and education campaign will be focusing. Eckyl noted that according to the 2010 U.S. Census, New Castle County's population is 538,479, it is 66 percent white, and the demographic information of those who are age 25 and older is as follows:

- 32% have earned a four-year degree or higher.
- 88% have a high school degree or higher.
- 12% did not complete high school.
- Per capita income is \$31,071.
- Home ownership rate is 71%.
- 10% live below the poverty level.

Each of these factors is critical in developing a campaign that will reach and be meaningful to the residents in New Castle County. This type of information was also provided for the state of Delaware, City of Newark, and Town of Middletown.

In addition to knowing one's target audience, Eckyl discussed the importance of making a "real" impression and changing behavior based on the message one develops. For example, how many people had read the newspaper ad or heard the commercial and then volunteered at the event or signed the pollution-prevention pledge? Moving people to act based on an ad or commercial or some other marketing tool is critical to getting the message out and achieving a successful education and outreach campaign.

## 4.2 Workshop Recommendations and Lessons Learned

As discussed in Section 4.1, the workshop held on September 28th discussed tools that are available to help meet the public education and outreach requirements in the NPDES permit. At the workshop, Eric Eckyl provided expertise on critical concepts that must be considered when developing an education campaign to meet the NPDES requirements. This section briefly summarizes these concepts discussed.

### **Know Your Target Audience**

The take-home advice is that most messages should go to a very limited interest group. Precision in a message is important. The universe of interested/affected parties (the target) is typically very small in comparison to the general population receiving the message. Focusing on a targeted group saves money and effort. Outreach efforts that are “big & sloppy,” such as newspaper ads and PSAs may reach a wide audience, but if the topic only pertains to a select group of people it is a wasted effort. Use a targeted approach to minimize collateral/non-target audiences. Targeting a specific audience requires forethought to define the target group.

### **Use New Data and Web Tools to Focus on Your Target Audience**

Fortunately, many Web-based tools and powerful data sources are available to assist in refining the target audience. For example, readily available U.S. Census information, Agricultural Census data, Bureau of Labor Statistics, offer information such as per capita income, homeownership rates, vehicle ownership, education levels, race, etc., all of which might guide where marketing should occur. Facebook provides powerful tools to assess individuals’ particular political leanings, environmental interest, hobbies, etc. With these tools, it is possible at no cost to determine the number of users that fit a particular profile. To distribute messages to your target audience, ad space can be purchased that is charged on a per-click basis, so that the only messages that incur a cost are those that are actively sought. Google also provides similar tools to help refine the target audience and message. Private marketers can also be retained to assist in refining methods for most effectively finding your audience.

### **Ensure Effective Design (i.e., Marketing Aspect)**

Once a target population is identified, it is important to be aware of the types of marketing strategies that will be effective based on the known demographics and interest areas of your audience. Be aware that different approaches will be necessary based on the audience, the medium used, and the message itself. Retaining the services of professional graphics or advertising agencies can be a worthwhile investment.

### **Be Aware of “The Slope”**

Once a marketing strategy is developed for your target audience, it is important to understand the need to ensure that the message is not simply heard but is likely to affect behavior. Eric Eckyl has described a four-step process that a message undergoes, which he calls “The Slope”:

1. Impression – The message is made public.
2. Conversion – The audience is aware of the message, and responds in some way.

3. Retention/Cultivation – For audience members who have become aware of the message and follow-up (e.g., by visiting a website or making contact), this relationship is encouraged and a next step presented.
4. Commitment – The individual message recipients take positive action based on the intent of the message. Ideally, there is lasting behavior change on the part of the individual.

### **Cost/Benefit**

Since it might be deemed that different campaign tactics are appropriate in different situations, a close consideration of the costs involved compared to the expected outcome is paramount. For example, a low-cost campaign that does not have a high “conversion rate,” might be less cost-effective than a much higher-priced effort that reaches fewer people but changes their behavior.

### **Leverage Existing Resources**

- Identify key organizations and individuals – There are many people and groups across Delaware working to reduce the effects of stormwater runoff. Establishing contact with these groups and their activities is one of the most effective means to reach the widest group of people with the least effort. For instance, a list of associations working in the field of water resources in Delaware is contained in Appendix D.
- Coordinate the message – By working closely with these groups, a unified message on particular topics can be coordinated across disparate groups. DelDOT is in a unique position to provide this type of leadership and coordination.
- Leverage existing programs – Many groups (towns/townships/watershed teams, etc.) have well-developed campaigns. The effective approach to foster these activities might often be to participate materially (through in-kind service or direct funding).
- Maintain contact lists – An up-to-date list of contacts is vital to retain communication with these groups as well as a wider target audience. This can be achieved in a variety of ways, either by maintaining spreadsheets in-house, or by using software and services that provide powerful tools for maintaining and contacting your audience. Careful maintenance and culling of these lists is important.

### **Survey**

Evaluation of effectiveness requires a survey of the population. There are two basic approaches that differ in level of effort and effectiveness at gauging the success of the stormwater-education efforts.

- Population survey – To see how widely your message is being disseminated in the public’s perception, large-scale survey methods must be used. This involves retaining the services of a marketing research group with experience conducting large-scale, statistically valid surveys (such as the University of Delaware’s Center for Applied Demography & Survey Research). This needs to be performed before the message is disseminated and within 18 months of the date of the permit. A second survey will need to be conducted beginning within approximately 3.5 years of the permit (two years after the survey).
- Group survey – A cost-effective way to gauge the effectiveness of specific messages is to conduct a survey on a targeted group getting a specific message, for instance, by administering a

survey before and after a stormwater workshop, stream cleanup, or other stormwater-related activity.

## Chapter 5 – Stormwater-Education Recommendations

### 5.1 Stormwater Recommendations by Target Area

In order to meet the requirements of the Phase I NPDES permit the education and outreach campaign must focus on specific areas related to stormwater pollution. According to the permit, these include the following:

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

This chapter provides a detailed approach for each one of the Target Areas listed above. Each approach specifically addresses the following categories:

- Goal
- Target Audience
- Recommended Approach
- Targeted Scale of Impressions (high, medium, low)<sup>1</sup>
- Cost (high, low)<sup>2</sup>

The recommended approach for each Target Area includes a variety of tools that will be effective in reaching the target audiences in order to change a specific behavior related to stormwater education. Existing resources and programs, such as those discussed in Chapter 3 and concepts learned at the workshop, laid out in Chapter 4, are used to develop the recommended approach for each Target Area.

<sup>1</sup>The targeted scale of impressions is a general estimate of the magnitude of individual impressions that should be made to reach the target population with the recommended approach. In general, educational campaigns targeted at a wider audience will have a higher value.

<sup>2</sup>Based on the recommendations the cost category reflects the magnitude of the time and money for implementing the recommendations.

**TARGET AREA 1****Illicit Discharges (Public Reporting)****Goal**

Public reporting of incidents of illicit discharges or improper disposal of materials, including floatables into the storm-sewer system.

**Target Audience**

Businesses and the public at large

**Recommended Approach**

Illicit discharges are defined by the EPA for the purposes of NPDES permitting as “any discharge to a municipal separate storm sewer that is not composed entirely of stormwater.” The nature of these discharges can be quite varied, and they include intentional routing of waste products, including sanitary-sewer outflow, wash water, or industrial waste products, to the storm-sewer system, unintentional spills or incidental runoff from industrial or other facilities, and intentional, episodic releases (so-called “midnight dumping”). Illicit discharges typically come from businesses or individuals. Incidents from businesses (particularly those that deal with large amounts of hazardous waste, such as automotive facilities or industrial processing operations) tend to be more persistent, while incidents from individual citizens are far more intermittent and widely dispersed.

Illicit discharges can introduce toxics, pathogens, nutrients, surfactants, and floatable debris into the stormwater system, ultimately degrading overall water quality. The effects can be quite large, especially since these discharges create dry-weather flow, so that concentrations, in the absence of high flows that dilute pollutants, are relatively higher.

DelDOT has applied considerable focus both to the detection and amelioration of illicit discharges and their effects, as well as campaigns to educate the public on the importance of reporting incidents that threaten the waters of the state, including:

1. Monitoring and inventory of outfall locations with indications of discharges (e.g., dry-weather flow, presence of detritus, oil sheens, odors, etc.). A complete inventory of all such outfalls and presence of evidence of illicit discharges was completed in 2007.
2. Door hangers passed out to homes in the vicinity of an illicit discharge or illegal dumping incident. The front side of the door hanger lists the pollutant found, and the back provides information about stormwater pollution and suggestions on how the homeowners can help minimize the problem. This is an important effort because it educates citizens on how to come to become aware of potential problems in the future.
3. Storm-drain markers with the phrase “only rain down the drain” placed on storm drains, which provide a cohesive visual reminder that the storm sewer system is an interconnected network that leads to Delaware waterways.

4. Participation in and support of public outreach such as presentations to civic groups and Adopt-a-Highway programs.
5. Online reporting form for problems with stormwater system (e.g., clogs, illicit discharges, etc.). This link, while combined with reporting for other DelDOT issues such as road conditions, is an easy way to connect with the public and enhance feedback and responsiveness.

Such efforts should be continued and enhanced. The existing website offers a comprehensive overview of these programs as well as educational and other material for distribution. Identifying problem areas and educating the sectors and individuals who help prevent or report illicit discharges will serve to reduce the overall costs for stormwater control, particularly by reducing the need for extensive retrofits.

Using data collected and maintained by DelDOT and its contractors on the location and nature of problem areas (i.e., “hot-spots” of discharge activity and dry-weather flows), DelDOT can develop a prioritized strategy for developing educational campaigns. Targets should include both the likely producers of illicit discharges as well as the public at large. Education should focus on the importance of protecting the stormwater system from discharges, as well as on encouraging the citizenry to be vigilant about potential problems.

Emphasis should be in areas where past or potential future violations can occur and can include training on the signs of illicit discharges and the avenues for reporting incidents. Institutional groups, and schools in particular, are an important target group, since they represent potential violators as well as a pool of individuals who can help monitor violations. Using innovative technology to help individuals report incidents, such as a smartphone app, will also make it easier for individuals to feel empowered. Convincing the people who might potentially pollute or report incidents that there is a shared responsibility will help effectively address this problem. Education efforts should help individuals realize that they can make a difference and that small improvements can cumulatively make a big difference.

The value of vigilance for the common good should be emphasized. The point that this is a public health issue, and one that disproportionately affects vulnerable populations such as children and the elderly, can increase awareness and the likelihood of reportage. Focus should be on areas of high population density and stable demographics near “hot-spots.”

The economic argument for stopping illicit discharges includes the fact that clean water encourages businesses development, lowers costs of cleanup, enhances recreation and recreation-related economic activities, increases property values, and fosters the desirability of an area as a place to live.

#### **Targeted Scale of Impressions (high, medium, low)**

High

#### **Cost (high, medium, low)**

Medium

**TARGET AREA 2**

Used Motor-Vehicle Oil and Household Hazardous Waste

**Goal**

Keep oil and hazardous waste produced by individuals/citizens out of the water bodies and stormwater system.

**Target Audience**

Homeowners, vehicle owners, business owners

**Recommended Approach**

These pollutants become a problem through intentional and unintentional introduction of oil and household hazardous wastes (paints, solvents, poisons, etc.) into stormdrains, improper vehicle maintenance resulting in leaked fluids that get washed into drains and waterways, and improper handling or disposal of solid waste (e.g., household electronics) that can leach hazardous materials such as mercury into the stormwater system.

In order to effectively educate the public about minimizing this risk, a wide-ranging approach is most effective, since its source can come from a broad range of people and activities. To achieve this broad effect, it is advisable to leverage existing information and programs. In fact, there are already many existing websites, fact sheets and other educational material that adequately cover the issues and recommended solutions to mitigate this type of environmental pollutant.

DNREC, New Castle County Conservation District, Partnership for the Delaware Estuary, Delaware Solid Waste Authority, and many MS4 municipalities, among other groups, provide a wide range of information addressing these issues. Materials already available on DeIDOT's Stormwater Quality website ([deldot.gov/stormwater](http://deldot.gov/stormwater)) address ways to keep oil and household hazardous wastes out of the storm-sewer system. These materials address a wide range of audiences and are distributable through many means.

To make the best use of existing resources to meet the NPDES permitting requirements for education and outreach, DeIDOT, as a primary permittee, can act as a coordinator for the many valuable resources produced by other agencies and organizations. Developing and maintaining communication channels with and among these stakeholder groups ensures that the messages are coordinated, complementary, and can thus be most effective.

In particular, DeIDOT should focus on the activities of their co-permittees, such as MS4 municipalities, many of which have developed education and outreach materials and programs, yet which might not have the resources to most effectively produce, implement, and distribute them adequately. One common approach many communities have taken to increase awareness about the dangers of dumping hazardous materials into the storm drain system is affixing stormwater medallions to intakes. These can be effective deterrents to illicit or unintentional introduction of hazardous materials but require an initial financial outlay and ongoing maintenance. DeIDOT could assist smaller MS4 communities in such

simple, yet effective, programs, for instance, by helping defray costs, assisting with the standardization of medallion design and application methods, and developing a maintenance strategy.

DelDOT can serve as the centralized “umbrella” organization to the implementation of stormwater marking (or other) efforts. Direct education and outreach about the medallions and storm drain–marking efforts can be achieved through newspaper articles, PSAs, billboard ads, bus-stop posters and other media. In this way, a variety of separate but similar initiatives can be presented under a unified outreach campaign.

Similarly, DelDOT can help coordinate other efforts related to educating the public about oil and hazardous household–waste disposal. Importantly, by maintaining contacts with and among stakeholders, DelDOT can respond specifically to the individual needs of the co-permittees and provide material support and guidance to a wide range of efforts aimed at a broad cross-section of the public.

**Targeted Scale of Impressions (high, medium, low)**

Medium

**Cost (high, medium, low)**

Low

**TARGET AREA 3**

## Yard and Pet Waste

**Goal**

To encourage the proper disposal of potential pollutants, including yard and domestic pet waste.

**Target Audience**

Homeowners and pet owners (children and adults)

**Recommended Approach**

It is recommended that yard- and pet-waste-reduction programs be addressed separately. These sources of pollution come from two distinct target audiences, and the approach would be most effective with campaigns targeting each behavior separately. As a starting point though, for both of these Target Areas, it is critical to inventory and assess the existing yard- and pet-waste-reduction programs in Delaware.

**Yard Waste**

Yard debris (grass clippings, plant matter, and tree and shrub trimmings) can be a significant source of stormwater pollution. Decomposing vegetative matter leaches excess nutrients. Excess yard waste and debris can clog culverts, storm drains, and pipes, resulting in flooding. Overall, it is a best practice to compost yard waste or dispose of yard waste via a public or private utility.

Since the yard-waste ban has taken effect in New Castle County, there have been several resources developed to educate homeowners about the best ways to dispose of yard waste. Websites, such as DNREC and the University of Delaware's Cooperative Extension, provide links to private and public drop-off locations and utilities that will dispose of your yard waste, as well as tips and tools for composting and disposing of your yard waste onsite. It is recommended that DelDOT and the co-permittees develop strategies to disseminate the existing educational material and information more effectively.

**Pet Waste**

When pet waste is left on the ground, rain and snowmelt wash this and the associated bacteria into storm drains and directly into local rivers and streams. There are several existing pet waste programs in Delaware. One of the most publicized programs is the Partnership for the Delaware Estuary's Dog Waste Control Program. This program reaches out to pet owners and communities to help reduce the negative impacts of pet waste by providing the necessary tools to handle it. This program provides signage templates, supplier information, and tip-card templates and solutions. It would be most effective if DelDOT and the co-permittees worked through the existing pet waste-control programs and provided funding support to make the program more well known and to get it into more communities throughout Delaware. By working through established programs like the Partnership for the Delaware Estuary's Dog Waste Control Program, DelDOT and the co-permittees would have a greater impact in carrying out its message.

In many homes, children play a major role in pet care; therefore, children are a critical target audience for a message. So, in addition to partnering with existing programs, the pet-waste campaign should be brought to schools where possible. As discussed in Chapter 3, several groups have school programs that target children with a specific stormwater message (Baltimore County, Md., City of Chesapeake, Va., and Gwinnett County, Ga.). For example, the City of Chesapeake, Va., has implemented education programs in schools in which technicians are sent to schools for 40-minute sessions as part of a third-grade science class. The program considers reaching a young audience a very important component of public education. The program reaches 1,200 students a year over the course of 2½ months. A program similar to this, yet with a focus on reducing pet waste, could be conducted in schools in New Castle County. This issue could also be incorporated into Delaware's seventh-grade Watershed Curriculum, which requires that all schools that are Science Coalition Members teach a watershed unit as part of the seventh-grade science curriculum. DelDOT also has a number of resources that have been used to educate students in the past, including activity books and bookmarks. These publications could be slightly altered to include information on the negative impacts of pet waste. Finally, one other method to reach young people is through the Green Jobs program. Within this program, which includes approximately 10 interns and during the six-week program, there could be a day dedicated to disseminating outreach material related to reducing pet waste. This would be an effective way of reaching the general public with this message as well as educating the Green Jobs interns during the process.

**Targeted Scale of Impressions (high, medium, low)**

Medium

**Cost (high, medium, low)**

Low

**TARGET AREA 4**

Lawn Irrigation/Car Washing

**Goal**

Reduce the amount of runoff entering the storm sewer system from irrigation of lawns and washing of cars on impervious surfaces.

**Target Audience**

Homeowners, vehicle owners

**Recommended Approach**

Runoff from residential lawn irrigation and the washing of cars represents a significant source of pollution to the stormwater system. While the nature of nonpoint source pollution such as runoff from residential water use makes the direct effects difficult to quantify, a best practices approach, using fairly simple and low-cost techniques will improve both the quality as well as reduce the quantity of water entering the stormwater system. DelDOT is already involved with a variety of programs that address these issues, such as the Delaware Livable Lawns initiative discussed in Chapter 3. DelDOT's stormwater website also has a variety of information on creating lower-impact lawns for homeowners and tips to reduce the loads on the storm sewer system and on water quality from washing cars.

**Lawn Irrigation**

The issue of limiting the watering of residential lawns to reduce the amount of runoff and associated pollutants that enter the system fits into a larger scheme of coordinated landscaping strategies which seek to mitigate the effects of pesticides, herbicides, and nutrients (fertilizers) applied to lawns and outdoor landscaping. The Delaware Livable Lawns program takes a comprehensive approach to this issue. Other programs, such as rain barrel promotions (by DNREC and many municipalities), Backyard Habitat designation (e.g., by the Delaware Nature Society), programs that promote native plants and healthy habitat (e.g., the Brandywine Valley Association's BasinScapes program) address a broad range of ways to reduce the harmful impacts of residential landscapes.

Strategies to address the problems of lawn irrigation, therefore, can best be developed within the framework of these broader initiatives. Coordination with stakeholder groups (such as local NGOs and Tributary Action Teams) as well as co-permittees is critical. Working with water purveyors and groups such as the Delaware Rural Water Association can be effective for developing strategies to reduce the application of irrigation water.

Since water use for irrigation of lawns is most intensive in the first few years after residential development occurs, dropping off sharply after that, emphasis should be placed on areas of most recent development. Approaches that educate about fertilizer and pesticide application (e.g., home-improvement stores) should be coupled with educational materials about proper water use and the handling of runoff (e.g., the use of rain barrels to capture, then reapply roof runoff, or the disconnection of downspouts from driveways and hardened surfaces).

**Car washing**

Car washing is a significant and often under-appreciated source of contaminants entering the stormwater system. The EPA estimates that perhaps 60 percent of U.S. households wash cars at home on a regular basis. Improper washing habits, including parking on a hardened surface with direct runoff to a storm drain, using non-biodegradable cleaning solutions, and over use of water (for example if the hose used lacks a shutoff nozzle), lead to the introduction of surfactants, metals, and hydrocarbons into the stormwater system. A barrier to reducing the effects of this is the lack of understanding polluting effects of this activity; people are often under the mistaken impression that the activity is innocuous from a water-quality perspective.

Education campaigns, therefore, are essential, but they can be very effective, since the solutions to the problem are relatively simple. The EPA recommends approaches such as using a commercial car-wash facility (automated or self-serve), which are required to properly handle their runoff, parking on permeable surfaces (gravel or grass), using eco-friendly cleaning products, and keeping rinse water to a minimum.

Typically, information about car washing is promulgated to the public through broader education campaigns (such as educational posters on how to reduce environmental impacts around the home). Targeted approaches that address car washing to a narrower audience could also be effective. Brochures or other outreach at auto-supply stores would target the automotive “do-it-yourself” population. Another concentrated source of car-washing activity stems from charity fundraiser groups who host carwashes, often at local gas stations or other business establishments. Concentrating on the groups that host the fundraisers and on the businesses where they operate is an effective way to efficiently reduce impacts. Since these ad-hoc car-wash fundraisers are often run by student groups, the opportunity for effective education is enhanced.

**Targeted Scale of Impressions (high, medium, low)**

Medium

**Cost (high, medium, low)**

Medium

**TARGET AREA 5**

## Lawn Care

**Goal**

Reduce herbicide, pesticide, and fertilizer use.

**Target Audience**

Homeowners, homeowner associations, golf courses, office parks, institutional entities with open space holdings, commercial and private applicators, and distributors of lawn care products

**Recommended Approach**

This issue has been a long-standing threat to the water quality in Delaware. The excessive use and misapplication of pesticides and fertilizer on residential and commercial properties results in increased toxins and nutrient loads in stormwater that runs off directly to the waterways.

In Delaware there is a group of nonprofit, state, and private stakeholders working together on this very issue. The goal of the Delaware Livable Lawns program is to reduce pesticide and fertilizer runoff from lawns. More specifically the Delaware Livable Lawns program aims to do the following:

- Certify lawn-care companies that follow environmentally friendly practices in fertilizer application.
- Provide homeowners with the necessary information to make small changes in lawn care practices so we can all be better stewards of our environment.

The most effective approach to achieving the goal set forth in the NPDES permit is for DelDOT and the co-permittees to participate in this partnership and fund specific efforts of this group, so that it can achieve the program goals.

DelDOT provided initial funding for this program, and it is supported by the efforts of many partners.

The Delaware Livable Lawns Program Advisory Group includes:

- Delaware Department of Transportation (DelDOT)
- Delaware Department of Natural Resources & Environmental Control
- Appoquinimink River Association
- Delaware Department of Agriculture Nutrient Management Commission
- New Castle Conservation District
- U.S. Department of Agriculture Natural Resources Conservation Service
- University of Delaware Water Resources Agency
- University of Delaware Cooperative Extension
- Delaware Grounds Management Association
- Delaware Nursery & Landscape Association
- Delaware Nature Society

Delaware Livable Lawns has currently undertaken the following efforts:

- Advocate for reduced pesticides and fertilizer in stormwater runoff.
- Develop and produce outreach materials (including brochures, magnets, store signs, etc.).

- Produce educational video.
- Held information session and workshop for commercial applicators.
- Develop a website.

This program will need additional funding to sustain and grow it as needed throughout the state of Delaware, and this is a critical role that the NPDES co-permittees can play in achieving the goals of this Target Area of the NPDES permit.

**Targeted Scale of Impressions (high, medium, low)**

Medium

**Cost (high, medium, low)**

Low

**TARGET AREA 6**

## Public Participation Events/Stream Clean-Ups

**Goal**

To encourage the general public's participation in stormwater-related public events (such as stream clean-ups and workshops).

**Target Audience**

The public at large

**Recommended Approach**

There are many public events related to pollution prevention, and specifically curbing stormwater pollution, throughout Delaware. Developing new public participation events and stream clean ups are not necessary, but conducting an inventory of and coordinating with existing events is the most effective approach for this Target Area.

As discussed in Chapter 4, nationally and locally, many state agencies and local groups host and participate in public outreach activities related to stormwater pollution (e.g., public lectures, workshops, and stream clean ups). It is critical that information about events related to stormwater pollution (e.g., DE AWRA symposia, University of Delaware lectures, nonprofit lecture series, stream clean-ups, etc.) is disseminated and highlighted. For these events, it is essential that DelDOT and the co-permittees play a key role in assisting in the dissemination of information, including advertising, mailings to existing contact lists, posting on DelDOT's website (e.g., through an events calendar), coordinating with co-permittees to encourage participation at the local level, and providing in-kind or direct funding (based on the needs of the organizing group). Additional ways to disseminate information about events is to revive methods previously utilized by DelDOT, such as:

1. Insert in New Castle County residents' tax bills—this method can be effective, because, as a high-priority mailing, it reaches a broad cross-section of households and is likely to be read.
2. Disseminate information throughout Delaware at various venues, such as:
  - Delaware Rural Water Association
  - Delaware State Fair
3. Disseminate information through various media outlets:
  - a. Public service announcements and ads in several local newspapers, including *Delaware State News*, *Cape Gazette*, and the *Dover Post*.
  - b. TV commercials through Clear Channel Broadcasting and radio spots on WGMD-FM.

The White Clay Creek Management Plan Coordinator has also pledged assistance to DelDOT and the co-permittees in the following areas:

- Development of outreach and educational programs and coordination/selection of stakeholders for educational activities and outreach.
- Scheduling and conducting educational and outreach events, workshops, and seminars for stakeholders.
- Developing a path forward pertaining to the evaluation of the programs and outreach to gauge impressions.

Recognizing this commitment of support and therefore utilizing this group to disseminate information about public events is important. Additionally, sponsorship (in-kind and direct funding) of White Clay Creek outreach programs will provide additional outreach opportunities for the public with little effort and at a lower cost.

### **Stream Clean-Ups**

The Christina River Clean-Up is a county-wide clean-up that began in 1992. The clean-up includes the Christina River, White Clay Creek, Red Clay Creek, and Brandywine Creek watersheds and other tributaries. More than 12,000 volunteers have participated in this event over the years. This clean-up is well established, and DeIDOT is an event sponsor. Continued support of this clean-up and other local clean-ups is highly recommended.

### **Targeted Scale of Impressions (high, medium, low)**

High

### **Cost (high, medium, low)**

Low

**TARGET AREA 7****BMP Maintenance****Goal**

Ensure the proper functioning (flow control and pollutant reduction) of stormwater-control BMPs through maintenance and monitoring.

**Target Audience**

HOAs, land holding companies, industries, office parks

**Recommended Approach**

Maintaining stormwater control BMPs is essential because a poorly maintained BMP negatively impacts the performance and decreases the pollution-reduction capacity of the BMP. Sediment accumulation, litter, and debris are often major factors in reducing the effectiveness of stormwater BMPs.

DelDOT's NPDES permit requires annual BMP inspection. DelDOT owns, inspects, and maintains all of its own BMPs. In 2007 DelDOT developed a statewide stormwater BMP-inspection/maintenance program that provides a consistent protocol for inventorying, inspecting, and maintaining its BMPs.

In New Castle County, the County is responsible for making sure that privately owned BMPs in the county are inspected and maintained. New Castle County will perform major maintenance (sediment removal and structural repair) for BMP's located in residential private open space when their maintenance corporation signs up for the County's Amnesty Program and agrees to perform minor maintenance. Additionally, New Castle County maintains BMPs located in public open space.

New Castle County holds workshops on BMP maintenance. The County also holds two maintenance seminars in the fall for commercial and residential BMP owners. There are several approaches to improve stormwater-BMP maintenance and to educate those who are responsible for BMP maintenance. The approaches recommended in this section apply primarily to the county and municipalities:

- Identify BMPs that have not been maintained due to communal or uncertain ownership/responsibility. Develop a database of these BMPs so they may be inventoried and tracked.
- Inventory the co-permittees' existing programs that monitor, inspect, and/or maintain BMPs within their jurisdictions. Review existing stormwater-BMP operation and maintenance ordinances. For jurisdictions without an ordinance, develop a stormwater-BMP operation and maintenance ordinance, based on existing prototypes. For those with an ordinance there may be a need to improve the ordinance. Education of the responsible parties (community or private group) that they are required to perform maintenance and adhere to the ordinance is also an important component.
- Develop an "Adopt-a-Pond" program that will establish a network of volunteers that will "adopt" stormwater BMPs and help perform annual inspections and maintenance. See the Center for Watershed Protection guidebook for detailed information, [www.cwp.org/documents/cat\\_view/78-other-center-publications.html](http://www.cwp.org/documents/cat_view/78-other-center-publications.html).

- Assess existing educational materials on stormwater-BMP maintenance and develop new ones as necessary. Education materials should be posted on DeIDOT's and the co-permittees' websites and distributed to the target audience (communities or businesses with BMPs).
- Actively publicize any existing workshops and educational efforts on BMP maintenance.
  - For existing workshops conducted, assess effectiveness through pre- and post-workshop participant surveys.
- Assess sufficiency of workshops by canvassing responsible jurisdictions or organizations.
  - If needed (or if there is a demand), develop educational workshops in coordination with partner organizations with topics that include technical and legal aspects, funding options, maintenance options (e.g., self-support, county, private contractor, etc.).

**Targeted Scale of Impressions (high, medium, low)**

Low

**Cost (high, medium, low)**

High

**TARGET AREA 8**

Residential Low-Impact Development (LID)/Green Technology BMPs that reduce runoff and mimic natural hydrology

**Goal**

To encourage homeowners to install LID and Green Technology BMPs to reduce stormwater runoff from their property by mimicking natural hydrology.

**Target Audience**

Homeowners

**Recommended Approach**

Low-impact development (LID) techniques and the use of “green technology” BMPs constitute part of the emerging trend of ecologically and socially friendly design (such as complete streets and other smart-growth approaches). These designs can be quite effective at reducing the negative impacts of stormwater runoff by reducing volume (through diversion, storage, infiltration, or evapotranspiration) and pollutant loads (through filtering, settling, bio-uptake, or mechanical removal).

Drawbacks or impediments to implementation include the cost involved in installing many of these measures (e.g., bioswales, bioretention basins, tree trenches, filters, green roofs, constructed wetlands, etc.) as well as the fact that to be most effective they must be large-scale or aggregated (e.g., there need to be many properties in an area to make an appreciable difference in flows or loadings). Most installations, therefore, are undertaken by large institutional or commercial enterprises or are included in initial designs of residential developments. Lower-cost approaches can be effectively implemented by individual homeowners, including small rain gardens, water cisterns or rain barrels, etc. Larger private groups such as homeowner associations (HOAs) are often able to implement more extensive, but still lower-cost, BMPs such as grass filter strips or roadside swales.

Emphasis on the education and outreach relating to LID and “green” BMPs can best be implemented by highlighting the benefits of the technologies and techniques to the public and encouraging institutions and businesses, as well as co-permittees, to adopt them where feasible. Existing outlets such as the website can be augmented with information on funding opportunities and cost sharing programs from federal, state, local sources and nonprofit foundations. In addition to consultant lists, engineering and design information can provide material information for groups seeking to initiate these projects. It is important to highlight ambitious, large-scale examples, such as the City of Philadelphia Water Department’s Green City, Clean Waters program, and regional examples of successful implementations by businesses.

To promote awareness in the public at large, it is important to emphasize the aesthetic appeal and environmental benefits, both of larger, highly engineered projects, as well as attractive, easy-to-implement residential-scale projects which are within the ability of homeowners to implement. An area of the website should be dedicated to such “green technologies,” highlighting BMPs, as is currently done, but also making the linkage to the green movement more explicit. If possible, compile examples

of case studies in which attractive and ecologically friendly design has led to increased property values or other benefits (including tax benefits) to homeowners and businesses. Develop a brochure for distribution at events such as Earth Day, Creek Fest, Delaware State Fair, Coast Day, Ag Day and other venues promoting these technologies. Inventory and highlight site-specific problems (such as persistent erosion or flow-volume issues) that these approaches have solved.

**Targeted Scale of Impressions (high, medium, low)**

Medium

**Cost (high, medium, low)**

High

## 5.2 Conclusions and Discussion

This report summarizes information from existing education and outreach campaigns throughout Delaware and the nation. Additionally, critical concepts and tools learned from the workshop held on September 28, 2011, are summarized and analyzed. Using this information, approaches have been developed for each of the eight NPDES Target Areas.

Using lessons learned from the marketing workshop, each component of the Target Area list was addressed specifically. Table 5.1 outlines these lessons, their associated strategies, and specific Target Areas where they apply.

Table 3. *Effective Strategies for Developing NPDES Education and Outreach Programs*

<b>Lesson Learned</b>	<b>Strategy</b>	<b>Target Area</b>
Prioritize	Understand the nature of a given pollution problem to allow assessment of the costs and benefits (i.e., reduction of contamination) involved.	This strategy applies generally to all thematic areas.
Leverage	Use existing programs developed by others; enhance or promote these to quickly and cost-effectively implement educational campaigns.	Lawn Care, Motor Oil, and Hazardous Waste Disposal
Participate	Get involved with initiatives such as stream cleanups, either by organizing or providing funding and personnel.	Stream Clean-up
Target	Focus outreach efforts at the smallest possible interest group to maximize message retention.	Lawn Irrigation/Car Washing, Pet and Yard Waste
Recruit	Involve citizens in the protection of stormwater quality to promote buy-in and give people in affected areas a sense of ownership of the problem.	Illicit Discharges (Public Reporting)
Provide Expertise	In some cases, DelDOT may have knowledge and expertise in specific technical areas of stormwater control and treatment. By providing direct outreach and technical support in these cases, affected populations are most effectively reached.	BMP Maintenance, Low-Impact Development

Table 5.2 summarizes the recommended approaches from Section 5.1 to provide a sense of the Target Areas that provide the highest number of impressions for the least cost (biggest “bang for the buck”). For example, the approach recommended in Target Area 6 (Public Participation/Stream Clean-Ups) gives the highest number of impressions at the lowest cost, whereas Target Area 7 (BMP Maintenance) gives relatively few impressions and generally requires a higher-cost approach to achieve these impressions. This does not imply that one Target Area is of lesser importance; it simply indicates that the number of impressions and cost are important components to consider when developing a campaign and trying to meet the NPDES requirements in the most cost-effective way.

Table 4. *Target-Area Impression and Cost Comparison*

Target Area	Impression	Cost
1 -Illicit Discharges (Public Reporting)	High	Medium
2 - Motor Oil/Hazardous Waste	Medium	Low
3 - Yard/Pet Waste	Medium	Low
4 - Lawn Irrigation/Car Washing	Medium	Medium
5 - Lawn Care	Medium	Low
6 - Public Participation/Stream Clean-Ups	High	Low
7 - BMP Maintenance	Low	High
8 - LID/Green Technology	Medium	High

The NPDES permitting requirements specify that a Public Education and Outreach Plan be developed that will incorporate the information collected in this project. This written plan will include measurable goals and constitute a component of the full Stormwater Pollution Prevention and Management Plan for DelDOT’s NPDES permit. The recommended approaches outlined in this report and the impression-versus-cost analysis will serve as starting points for the Public Education and Outreach Plan. In order to develop this refined plan, the approaches in this report will need further detail. For example, defined action items, specific organizations to work with, stakeholder groups to target, costs, campaign materials, and program areas to develop are critical components to a refined approach. The information in this report can be used to direct this further effort.

## Appendix A – Nationwide Programs Referenced

Organization	Contact	Website
<b><i>Programs Through State Departments of Transportation</i></b>		
Maryland State Highway Administration	Karen Kauffman, Highway Hydraulics Division (410)545-8407	
	Joan Armacost, Baltimore County (410)887-4488	
	Gale Engels, Carroll County (410)386-2756	
California Department of Transportation (Caltrans)		<a href="http://www.donttrashcalifornia.info">www.donttrashcalifornia.info</a>
Connecticut Department of Transportation (ConnDOT)		<a href="http://www.ct.gov/dot/cwp/view.asp?a=1383&amp;q=386458">www.ct.gov/dot/cwp/view.asp?a=1383&amp;q=386458</a>
Texas Department of Transportation		<a href="http://www.dontmesswithtexas.org">www.dontmesswithtexas.org</a>
<b><i>Municipal, County, and Regional Programs</i></b>		
Washington, D.C.	Evelyn MacKnight, U.S. EPA Region 3, Water Protection Division, Office of Watersheds, (215)814-5717	
City of Los Angeles	(800)974-9794	<a href="http://www.lastormwater.org/siteorg/education/genpub.htm">www.lastormwater.org/siteorg/education/genpub.htm</a>
City of Chesapeake, Va.	Tammy Barry; (757)382-6983	<a href="http://www.chesapeake.va.us/services/depart/pub-wrks/stormwatermanagement-publiceducation.shtml">www.chesapeake.va.us/services/depart/pub-wrks/stormwatermanagement-publiceducation.shtml</a>
Seattle, Wash., Public Utilities	Gretchen Muller (206)684-0570	
Baltimore County, Md.	Lamar Lewis, Stormwater Engineering (410)887-4488	
	Gene Armacost (410)887-4488	
Gwinnett County, Ga.	John Butler (678)376-6914, <a href="mailto:john.butler@gwinnettcounty.com">john.butler@gwinnettcounty.com</a>	
Metropolitan North Georgia Water Planning District/Clean Water Campaign	Charlene (404)463-3259	<a href="http://www.northgeorgiawater.com/html/159.htm">www.northgeorgiawater.com/html/159.htm</a>
	John Butler, Gwinnett County (678)376-6914	

## Appendix B – Representative Questions

1. Reason for implementing the stormwater-education/outreach program:
  - a. To meet NPDES permitting requirements?
  - b. Other reasons?
2. Relative difficulty of implementation:
  - a. What were the easiest programs or program components to implement?
  - b. What were the most difficult programs or program components to implement?
3. What were some specific challenges encountered?
4. Were there aspects that proved problematic that you did not anticipate?
5. Program effectiveness:
  - a. Is this program deemed effective?
    - i. If yes, to what degree, and why?
    - ii. If no, why not?
  - b. How is program effectiveness monitored and measured?
6. Program cost considerations:
  - a. What is the approximate cost of the program, if known?
  - b. If known, what are the relative costs of particular elements (e.g., proportions of materials, printing, time)?
7. Is the program required to meet a certain number of impressions?
  - a. If yes, how was the number of impressions measured?
8. Did you receive public feedback about the program?
  - a. If yes, was there any feedback related to how the program could be improved?
  - b. Were any such suggestions considered?
9. Additional program details:
  - a. Are there any additions/changes to the program that are not shown on the website?
  - b. Are there any additional programs that are not listed on the website that you use to educate the public about stormwater?
10. Is there any additional information that may be useful to DelDOT in implementing similar stormwater-education programs?

## Appendix C – NPDES Stormwater-Education and Public-Outreach Workshop Attendees

<b>City of Wilmington</b>
Mary Neutz
<b>Delaware City</b>
Richard Cathcart
<b>DeIDOT</b>
Randy Cole
Marianne Walch
LaTonya Gilliam
<b>Town of Elsmere</b>
John S. Giles, Jr.
Diana Poole
Tina Law
<b>Town of Middletown</b>
Tim DeSchepper
<b>New Castle County</b>
Ellie Mortazavi
Janice Catherman
Bernadette Casella
Carolyn Magnotti
Michael Harris
<b>University of Delaware's Water Resources Agency</b>
Martha Corrozi Narvaez
Andrew Homsey
<b>White Clay Wild and Scenic</b>
Jennifer Egan
Linda Stapleford

## Appendix D – Watershed Organizations in Delaware and Working in Delaware Water Resources

Watershed Organization	Town
Appoquinimink River Association	Middletown
Brandywine Valley Association	West Chester (Pa.)
Brandywine Conservancy	Chadds Ford (Pa.)
Christina Conservancy, Inc.	Wilmington
Chesapeake Bay Foundation	Annapolis (Md.)
Coalition for Natural Stream Valleys	Newark
Delaware Audubon Society	Wilmington
Delaware Bass Federation	-
Delaware Center for Horticulture	Wilmington
Delaware Center for the Inland Bays	Rehoboth Beach
Delaware Chapter of the Sierra Club	Wilmington
Delaware Greenways	Wilmington
Delaware Low-Impact Tourism Experiences (DLITE)	Salisbury (Md.)
Delaware Native Plant Society	Dover
Delaware Nature Society	Hockessin
Delmarva Ornithological Society	-
Delaware Riverkeeper Network	Bristol (Pa.)
Delaware Rural Water Association	Milford
Delaware Wild Lands	Odessa
Ducks Unlimited	-
Fairfield Watershed Association	Newark
Friends of Bombay Hook	Smyrna
Friends of the Delaware Bay	Sussex County
Friends of Lums Pond	Bear
Friends of Prime Hook National Wildlife Refuge	Milton

<b>Watershed Organization</b>	<b>Town</b>
Friends of the Nanticoke River	Nanticoke (Md.)
Friends of White Clay Creek State Park	Newark
Green Delaware	Wilmington
League of Women Voters of Delaware	Wilmington
Naamans Creek Watershed Association	Arden
Nanticoke River Watershed Preservation Group	-
Nanticoke Watershed Alliance	Vienna (Md.)
National Wildlife Federation	Annapolis (Md.)
Partnership for the Delaware Estuary	Wilmington
Red Clay Valley Association	West Chester (Pa.)
Save Wetlands and Bays	Millsboro
St. Jones River Greenway Commission	Magnolia
St. Jones River Watershed Association	Dover
Surfrider Foundation Delaware Chapter	Millsboro
The Academy of Natural Sciences	Philadelphia (Pa.)
The Conservation Fund	Centreville
The Nature Conservancy - Delaware Chapter	Wilmington
Urban Environmental Center	Wilmington
Waterfront Watch of Wilmington	Wilmington
White Clay Creek Watershed Association	Newark
White Clay Creek Watershed Management Committee	Newark
White Clay Flyfishers	Landenburg (Pa.)
Widener Environmental and Natural Resources Law Clinic	Wilmington



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**Appendix C.** 2012 Inventory and Inspection Report from KCI Technologies, Inc.



**DELDOT AGREEMENT 1591**  
**STATEWIDE MS4 / BMP INVENTORY & INSPECTION**  
**2012 ANNUAL REPORT**



The following is a summary of work performed by KCI Technologies, Inc. (KCI) and Century Engineering, Inc. (CEI) from January 1 to December 31, 2012 for Delaware Department of Transportation (DelDOT) Agreement 1591. The KCI/CEI Team was awarded Agreement 1591 in November 2011.

**A. PROJECT MANAGEMENT**

In 2012, KCI submitted an *Agreement 1591 2011 Annual Report* and a *2011 Annual BMP Inventory & Inspection Report*, as well as several Memorandums. In addition, KCI conducted six project status meetings (**Table 1**).

The project status meetings were held with DelDOT, KCI, and CEI to discuss work completed and outstanding issues. KCI distributed an agenda at least two days prior to each meeting and prepared meeting minutes for each meeting within 48 hours, including an Action Item List highlighting necessary actions, responsible parties, and target completion dates. These meetings have been highly effective in coordinating with DelDOT, identifying priority work, and resolving issues in a timely manner.

<b>TABLE 1 PROJECT STATUS MEETINGS</b>	
<b>Project Status Meetings</b>	
02/08/12 (#42)	
03/29/12 (#43)	
04/19/12 (#44)	
06/26/12 (#45)	
08/30/12 (#46)	
12/11/12 (#47)	

**Table 2** lists the deliverables transmitted to DelDOT in 2012. A majority of these deliverables related to BMP inspections and reports. Other deliverables pertinent to Agreement 1591 are included in the *Agreement 1495 Environmental and Water Quality Monitoring 2012 Annual Report*, which includes outfall screening and illicit discharge investigations, some of which originated from Agreement 1591 inventory and inspection.

**TABLE 2  
 DELIVERABLES**

<b>Date</b>	<b>Deliverable</b>
01/03/12	Map Viewer Log In Request Processing
01/05/12	Final MWOs for Loading into Maximo
01/12/12	Map Viewer Log In Request Processing
01/13/12	Map Viewer Updates: flow arrows on conveyances; red color for MWO submitted; green for MWO completed.
01/26/12	Map Viewer User List 01-26-12
02/08/12	2011 Individual BMP Inspection Reports/Summary Tables for each District
02/16/12	Canada Thistle Maps-Spreadsheets
02/27/12	Map Viewer User List 02-23-12
03/23/12	Notification that map of Bower's Beach DelDOT owned structures in need of maintenance was posted on KCI's FTP site
03/26/12	Map Viewer User List 03-26-12
04/24/12	North District Annual Report 2011 BMP Master List
04/25/12	Annual Report 2011 BMP Master List - All Districts
05/01/12	Map of DelDOT BMPs in Town of Middletown
05/02/12	Map Viewer User List 04-30-12
05/02/12	List and Map of North District SWP Ponds (Hardcopy-CD)
05/03/12	Map Viewer: Notification ability to turn structure labels on/off by checking/unchecking "Structure Layers"
05/29/12	BMP Field Inventory & Inspection Technical Manual (V6 May 2012)
06/22/12	Notification that Revised 2012 Canada Thistle Map posted on KCI's ftp site in DelDOT folder
06/26/12	Map Viewer User List 06-26-12
08/30/12	Newly Accepted Roadways and Drainage from Archive Drive
09/07/12	Total Number Structures and BMPs Inspected for FY 2012 (09/07/12 Email)
09/10/12	2006-2011 NCCo Drainage Project Plan List Annotated with Projects Needing Plans
09/25/12	09/25/12 Map Viewer User List
09/28/12	Complete List BMPs with Access Issues and Description of Problem
10/01/12	BMP Spray Location Map
10/08/12	Revised BMP Spray Location Map
10/09/12	BMP Inspection Reports for BMP Nos. 848, 850, 851, 853 and 855
10/30/12	Notification that BMP 225 has approximately 5000 sq. ft. cattails.
10/31/12	DelDOT BMP Data for DNREC Annual Submission to Chesapeake Bay Program
12/17/12	Submittal of Sussex Inventory-Inspection GIS Map November 2012
12/21/12	BMP 104 2012 Inspection Report

## B. NPDES DATABASE MANAGEMENT

In 2007, KCI's Technology Services division developed a field application using advanced hardware, redesigned the existing NPDES Database structure to allow for re-inspections, migrated all existing data into the new NPDES Database design, and began development of a new field application to fit the new NPDES Database design.

In 2008, KCI's Technology Services division completed the development of the Field Application, Version 2 and developed a Web-based Map Viewer to replace and upgrade DelDOT's existing Map Viewer. In 2009, DelDOT expressed a desire for KCI to simplify the Map Viewer, especially the querying capabilities.

In 2010, KCI completed the refinements to the Map Viewer including simplifying querying and report creation for BMPs, conveyances and structures, and adding a drainage area layer for BMPs and Major Outfalls. In addition, KCI developed a *Map Viewer User's Guide* to assist with the use of the viewer.

In 2011, KCI assisted DelDOT in formal training sessions to educate DelDOT design and maintenance staff on the use of the Map Viewer.

In 2011/2012, KCI updated the Map Viewer by migrating the ArcGIS Server 9.3.1 webADF codebase to ESRI's ArcGIS Server 10.0 SP2 Javascript API in preparation for the ESRI's webADF deprecation at ArcGIS Server 10.1. This The Javascript API version of the DelDOT NPDES web viewer will be put into production in early 2013. KCI and DelDOT developed a method for conducting desktop inventory for new drainage structures along roadway improvement projects, by overlaying electronic construction plans on the DelDOT NPDES Database.



## C. BEST MANAGEMENT PRACTICE (BMP) INVENTORY AND INSPECTION

In early 2013 under separate cover, KCI will submit the *2012 Annual BMP Inventory & Inspection Report*. The 2012 Annual Report will summarize the 2012 inspections for each BMP and provide recommended actions for BMPs in four categories:

- BMPs requiring **MAINTENANCE** by DelDOT maintenance staff (Maintenance Work Orders),
- BMPs requiring **INVASIVE SPECIES** to be eradicated by third party contractor,
- BMPs requiring **CONTRACTED WORK** by a third party contractor, and
- BMPs requiring **RETROFIT** evaluations by DelDOT's Stormwater Quality Program staff.

BMPs are assigned a summary rating based on the recommended actions identified during the inspections. These ratings are defined in **Table 3**. In 2012, KCI inspected only those BMPs that were rated A and B in 2011 as well as recently accepted BMPs. BMPs rated C and D are being scheduled for maintenance as part of a separate DelDOT maintenance contract. **Table 4**

summarizes the BMP inspections conducted in 2012 by KCI and CEI. A total of 339 BMPs inspections were conducted, 84 of which were new inspections. The ratings shown in **Table 4** are preliminary at this stage, and will be reviewed and finalized during DelDOT’s review and completion of the *2012 Annual BMP Inventory & Inspection Report*.

**TABLE 3  
OVERALL BMP RATING SYSTEM**

Rating	Description
<b>A</b>	<b>No Performance Issues</b> BMP with No Issues affecting performance.
<b>B</b>	<b>Minor Maintenance</b> BMP with Minor Maintenance required; repaired by DelDOT maintenance district or third party invasive spray contractor.
<b>C</b>	<b>Major Maintenance</b> BMP with Major Maintenance required; repaired by third party contractor.
<b>D</b>	<b>Retrofit</b> BMP with Retrofit requirements; BMP is failing; needs to be redesigned or re-built with input from DelDOT Stormwater Quality Program.

**TABLE 4  
2012 BMP INSPECTIONS AND RATINGS**

District	Total BMPs Inspected	BMP Performance Rating			
		A	B	C	D
North	<b>81</b>	36	43	2	0
Canal	<b>131</b>	59	69	3	0
Central	<b>42</b>	28	14	0	0
South	<b>85</b>	62	21	1	1
<b>TOTAL</b>	<b>339</b>	<b>185</b>	<b>147</b>	<b>6</b>	<b>1</b>

**D. NEW CASTLE COUNTY RE-INSPECTION**

KCI began re-inspection of DelDOT’s MS4 in New Castle County subdivisions in February 2008, based on KCI’s Subdivision Re-inspection Schedule (**Table 5**). The re-inspection schedule is based on a 5- and 10-year re-inspection cycle for subdivisions according to the acceptance date of the subdivisions. The subdivisions planned for re-inspection in 2009 (subdivisions accepted from 1951-1965) were completed in March 2010. In October 2010, DelDOT requested that KCI dedicate both KCI field crews to Kent County Initial Inventory and Inspection work. In 2012, KCI assigned a field crew to New Castle County to continue re-inspecting the 1966-1980 subdivisions; this work was completed in January 2013. KCI plans to complete the 1981-1995 subdivisions in 2013. **Table 6** summarizes the re-inspection work performed by one KCI field crew in 2012.



**TABLE 5  
 SUBDIVISION RE-INSPECTION SCHEDULE**

Year	Subdivisions	Cycle	Re-inspect?	Date Completed
1	Database Re-design	--	--	December 2007
2	1935-1950	5	Yes	December 2008
3	1951-1965	5	Yes	May 2010
4	1966-1980	5	Yes	December 2012
5	1981-1995	10	Yes	--
5	1996-2005	10	No	--

**TABLE 6  
 NEW CASTLE COUNTY RE-INSPECTION TOTALS**

Month (2012)	Number of Subdivisions	Number of Miles of Non-Subdivision Roadways	Number of Structures
January	1	0.0	116
February	9	0.0	400
March	15	0.5	503
April	18	0.0	434
May	16	0.0	546
June	11	0.3	334
July	9	0.0	331
August	3	0.0	429
September	0	0.0	668
October	5	0.0	644
November	9	0.0	491
December	11	0.0	682
<b>2012 Total</b>	<b>107</b>	<b>0.8</b>	<b>5,578</b>

**E. NEW CASTLE COUNTY INITIAL INVENTORY AND INSPECTION**

In 2012, KCI's field crew performed limited initial inventory and inspection work in (1.3 miles of non-subdivision roadway and 45 structures). In order to eliminate to cost and time associated with maintenance of traffic, KCI and DelDOT explored several options for conducting a desktop approach to the inventory of newly-accepted drainage associated with roadway improvement projects. In 2013, the plan is to use the Desktop methodology on non-subdivision roads that require maintenance of traffic in order to save time and money and to continue to have field crews perform initial inventory and inspection at recently accepted subdivisions having drainage warranties expiring in 2013.

**F. KENT / SUSSEX COUNTIES INITIAL INVENTORY AND INSPECTION**

KCI and CEI completed the Initial Inventory and Inspection work in Kent County in early 2012. One KCI Field Team and one CEI Field Team moved to Sussex County in February 2012. In 2012, the teams inventoried and inspected DelDOT storm systems in 22 subdivisions and along 424.2 miles of non-subdivision roadways, for a total of 16,927 structures in Kent and Sussex Counties (**Table 7**).



Starting in 2012, KCI and CEI concentrated on completing the inventory & inspection of Sussex County within three years. CEI previously inventoried/inspected Sussex County subdivisions during Agreement 1354. The KCI field team is inventorying/inspecting drainage north of State Route 20 (from Millsboro west) and north of State Route 24 (from Millsboro east); CEI is inventorying south of these routes and the major roadways such as Sussex Highway (State Route 13) throughout the County.

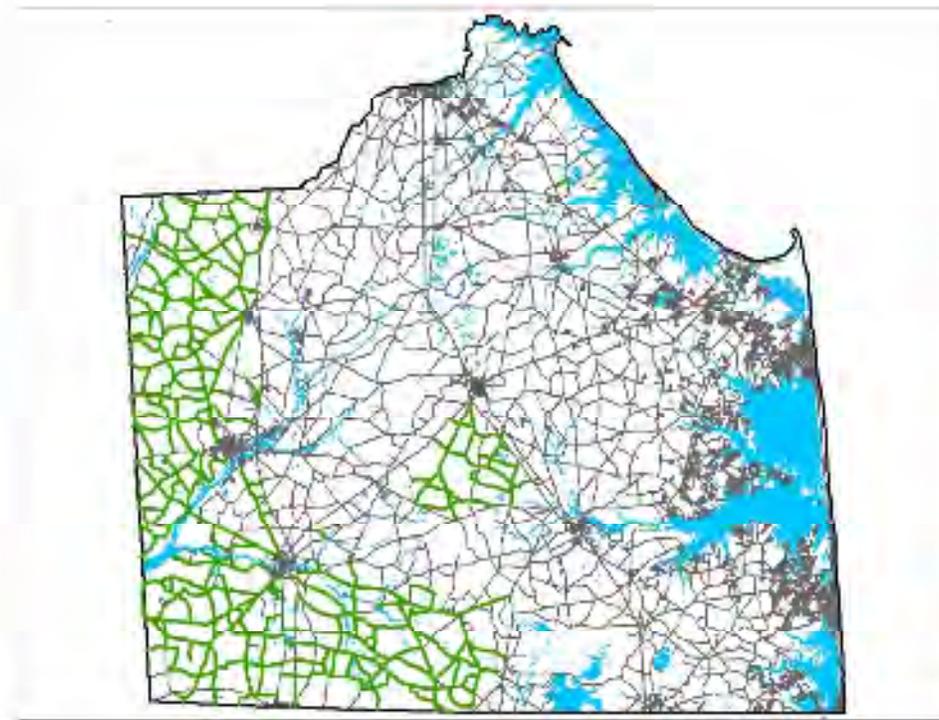
**TABLE 7  
2012 KENT / SUSSEX COUNTIES INITIAL INVENTORY / INSPECTION TOTALS**

<b>Month (2012)</b>	<b>Subdivisions</b>	<b>Non-Subdivision Roadway Miles</b>	<b>Structures</b>
January	3	22.4	1,152
February	0	36.4	1,484
March	0	27.0	887
April	1	54.2	1,707
May	11	38.4	1,552
June	6	49.3	1,740
July	0	19.0	784
August	0	45.0	1,971
September	0	40.6	1,533
October	1	46.6	1,837
November	0	24.2	1,204
December	0	21.1	1,076
<b>TOTAL</b>	<b>22</b>	<b>424.2</b>	<b>16,927</b>

The goal is to complete Sussex County by the end of Agreement 1591 (December 2014). KCI has implemented a process where two field staff travel to Sussex County and act as two independent field teams. Each person has a Panasonic Toughbook and digital camera to inventory and inspect open drainage along the same stretch of roadway; one field staff on each side of the roadway. At the end of the week, the data collected on the two toughbooks is merged and cross pipes are connected. KCI has found that this method has significantly improved production. CEI has focused on Sussex Highway (State Route 13) in addition to minor roadways

in the southern half of the County. **Figure 1** shows Sussex County roadway drainage that is completed (green) versus not completed (gray).

**FIGURE 1**  
**MS4 COMPLETED IN SUSSEX COUNTY**



**G. 2012 MAINTENANCE WORK ORDERS**

During the MS4 Inventory and Inspection process, storm drain system deficiencies identified by KCI are submitted to DelDOT for upload to their Maintenance Work Order system, MAXIMO. MAXIMO delivers the work order to the appropriate maintenance district, lists the concern, identifies a remedial action, and rates the concern (minor to severe). **Table 8** lists the maintenance work orders submitted to DelDOT and completed by DelDOT in 2012. Some issues related to safety (i.e., missing or broken catch basin grate) are considered Immediate Action concerns, and the appropriate maintenance district staff is notified as soon as these safety issues are identified. In 2012, DelDOT requested KCI to submit NPDES structure assets for loading into MAXIMO. This will permit the work orders in DelDOT’s NPDES Database to correlate to the work orders in DelDOT’s MAXIMO system, allowing better record-keeping for completed work orders.

**TABLE 8**  
**2012 MAINTENANCE WORK ORDERS (NO.)**

Type	North District	Canal District	Central District	South District
Submitted to DelDOT	222	24	142	8
Completed by DelDOT	242*	14	95	0

\* This number includes previously submitted MS4 work orders from 2011 that were not completed until 2012.

**H. STATEWIDE INVENTORY SUMMARY**

Tables 9, 10, and 11 summarize the number of BMPs, Structures and Conveyances contained in the DeIDOT NPDES Database.

**TABLE 9  
STATEWIDE STRUCTURES (NO.)**

Category	New Castle	Kent	Sussex
Inlet	43,685	19,494	6,349
Outfall	8,277	11,464	4,918
Manhole	5,183	786	64
Swale End	4,516	2,754	605
<b>TOTAL</b>	<b>61,661</b>	<b>34,498</b>	<b>11,936</b>

**TABLE 10  
STATEWIDE CONVEYANCES (LF.)**

Type	New Castle	Kent	Sussex
Open	2,319,352	8,355,455	3,859,253
Closed	4,705,120	1,550,160	383,730
<b>TOTAL</b>	<b>7,024,472</b>	<b>9,905,615</b>	<b>4,242,983</b>

**TABLE 11  
STATEWIDE BMP (NO.)**

Type	New Castle	Kent	Sussex
BaySaver	1	0	0
Check Dam	6	0	0
Bioswale	54	23	57
Bioretention	23	4	2
Dry Pond	47	6	2
Filter Strip	1	2	15
Infiltration Basin / Trench	0	0	0
Sand Filter	66	1	1
Sediment Forebay	4	0	3
Wet Pond	88	23	8
Wet Pond / Wetland	2	0	0
Infiltration Trench	9	0	0
Infiltration Basin	0	1	0
Underground Storage/Infiltration	5	0	0
Shallow Marsh	2	0	0
<b>TOTAL</b>	<b>308</b>	<b>60</b>	<b>88</b>

**Appendix D.** 2012 Outfall Screening Report from KCI Technologies, Inc.



**DELDOT AGREEMENT 1613  
ENVIRONMENTAL AND WATER QUALITY MONITORING  
OUTFALL SCREENING  
2012 ANNUAL REPORT**



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**APPENDIX A - Potential Illicit Discharge Investigations:**

Correspondence, Field Information and Documentation - Tab Dividers 1-4

(See **Table 1** for PID Corresponding Tab Divider No.)



**DELDOT AGREEMENT 1613  
ENVIRONMENTAL AND WATER QUALITY MONITORING**



**OUTFALL SCREENING  
2012 ANNUAL REPORT**

As part of the Delaware Department of Transportation’s National Pollutant Discharge Elimination System (NPDES) General Permit Program Regulations Governing Stormwater Discharge, KCI Technologies, Inc. was contracted to conduct dry weather outfall inspection and monitoring of DelDOT-owned storm drain outfalls. Other activities conducted under this task include investigation of Potential Illicit Discharges (PIDs) and NPDES Flyer Awareness Distribution.

**A. OUTFALL SCREENING & POTENTIAL ILLICIT DISCHARGES**

In 2012, 1,854 outfalls (442 in New Castle County; 1,412 in Sussex County) were screened as part of the inventory, inspection and re-inspection tasks under Agreement 1591.

A total of 71 outfalls were found to have dry weather flow. To-date, none of these have been determined to be illicit discharges, and all are assumed to be groundwater.

In 2012, three PIDs were investigated under Agreement 1613. Two of the PIDs were a continuation of previous PID coordination from the year prior.



*Outfall Screening*

**Table 1** lists the three PIDs and investigation results. Detailed correspondence, field investigation information and documentation regarding PIDs are provided in **Appendix A**. **Table 1** indicates the corresponding **Appendix A** tab divider number (1-3) for each PID listed.



*PID Appleby Road  
02/02/12*



*PID Bi-State Boulevard  
12/04/12*

**TABLE 1  
DELAWARE DEPARTMENT OF TRANSPORTATION  
2012 POTENTIAL ILLICIT DISCHARGE INVESTIGATIONS  
Agreement Nos. 1495 / 1613**

Structure No.	Field Visit Date	Neighborhood	Address	Reported By	Issue Reported	Investigation Results	Determination	Action	2012 Annual Report Binder Tab #
<b>NEW CASTLE COUNTY</b>									
86938 & 372	01/16/09	N/A	255 & 229 Appleby Rd	New Castle County	Possible sanitary sewer connection into catch basin	Debris and ice incatch basin preventing inspection.	Unable to pinpoint source	Referred to DeIDOT; DeIDOT cleaned basin	1
	02/16/09			New Castle County		Flow observed with sewage odor; Discharge tested high for ammonia and detergents: 24-hour re-test: high ammonia and detergents.	Camera-on-stick utilized-No visible connections observed from residence. Small 8" terracotta pipe coming from property north of 255 Appleby Rd that outfalls to swale, which is part of catch basin conveyance. Source of terracotta pipe could not be determined.	Referred to DeIDOT	
	01/09/12			DeIDOT		Catch basin fully submerged; unable to inspect.	Unable to pinpoint source.	Referred to DeIDOT; Contractor specializing in sanitary sewers will flush pipe.	
	02/02/12			DeIDOT		DeIDOT notified KCI that catch basin cleaned out. Sample collected from downstream structure 372; tested high for phenols, detergents, ammonia and turbidity. 24-hour re-test: high detergents, ammonia and turbidity.	Field crew traced source of flow back to PVC pipe tied into side of conveyance 51706. PVC probably ties into sewer connection on left side 229 Appleby.	Referred to DeIDOT.	
	03/02/12			DeIDOT		DeIDOT contacted DNREC to provide PID information		DNREC to dye test.	
	03/02/12			DeIDOT		DNREC contacted to KCI to verify address		DNREC to dye test.	
	60570 & 60571			11/09/12		Sharpley	102 Whitby Road	DeIDOT	
11/13/12	Distributed 5 doorhangers.								

**TABLE 1  
DELAWARE DEPARTMENT OF TRANSPORTATION  
2012 POTENTIAL ILLICIT DISCHARGE INVESTIGATIONS  
Agreement Nos. 1495 / 1613**

Structure No.	Field Visit Date	Neighborhood	Address	Reported By	Issue Reported	Investigation Results	Determination	Action	2012 Annual Report Binder Tab #	
<b>KENT COUNTY</b>										
520110114081352	03/24/11	N/A	2777 Andrews ville Road Greenwood, DE	Agr 1354 Field Crew	Possible sewage connection into stormdrain system	Clumps toilet paper in bottom of catch basin with strong sewage odor. Sample tested high for ammonia, detergents and turbidity.	Possible septic tank overflow.	Forwarded to DeIDOT. DNREC investigated-recommend having pipe closed by DeIDOT. 05/20/11: Attempted to send DeIDOT Illicit Discharge notice by US Certified Mail-Returned by Post Office "No Mail Receptacle-Unable to Forward" 06/14/11: Sent regular US Mail.	2	
	04/07/11					Strong sewage odor. Sample tested high for ammonia, detergents, turbidity and phenols.				
	04/13/11					DNREC investigated/spoke w/resident; recommended to have pipe closed.	DNREC recommends pipe closure.			Schedule push camera inspection.
	06/29/11					Tri State Grouting push camera inspection.	Junction box discovered connecting to what appears to be an additional sewage pipe.			Will continue to try to notify homeowner of the requirement to correct within 30 days.
	11/22/11					DNREC contacted homeowner (Tim Carrington 302-382-9649) and recommended he call DeIDOT. DeIDOT confirmed with Mr. Carrington that DeIDOT intends to plug pipe; and any potential problems that may occur from back-ups would be homeowner's responsibility. Mr. Carrington acknowledged he understood this and is OK with DeIDOT plugging pipe.	DeIDOT to plug pipe.			
	10/22/12					DeIDOT contractor plugged pipes and placed aluminum plate in front of each pipe. In junction box, there was no active residue or waste; however odor was present; therefore other pipes plugged as well.	No Further Action.			
<b>SUSSEX COUNTY</b>										
420121101135958	12/04/12	N/A	32772 Bi-State Blvd.	CEI	Illegal connection to storm drain; stagnant water with sewage smell	No flow from 4" illegal connection; discharge ponded in bottom catch basin smelled like sewage, had disintegrated paper, and tested high for turbidity, detergents and ammonia; 4 hour re-test: high turbidity, ammonia and detergents.	Notified DeIDOT; requested KCI sent Illicit Discharge Notice	Mailed Illicit Discharge Notice via 2-day FedEx 12/12/12; will revisit site in 30 days	3	

## B. NPDES FLYER AWARENESS DISTRIBUTION

The purpose of the NPDES flyer awareness distribution (doorhangers) is to inform the public and increase awareness of illegal dumping of pollutants into the surrounding storm sewer systems.

Doorhangers were distributed to those areas where suspected illegal discharge/dumping had occurred, as observed by the general public and/or field crews performing storm drain inventories.

In 2012, 15 doorhangers were distributed in the Sharpley neighborhood in New Castle County due to a resident complaint about a neighbor dumping leaves in a catch basin.

**Table 1** lists the leaf dumping investigation results. Correspondence, field investigation information and documentation regarding the dumping is provided in **Appendix A**. **Table 1** indicates the corresponding **Appendix A** tab divider number (4) for the dumping listed.



**Stormwater Pollution Found in Your Area!**  
*This is not a citation.*

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: \_\_\_\_\_

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

Delaware Department of Transportation

## C. NEXT STEPS

KCI will continue to provide as-needed outfall screening activities in 2013. This includes investigating dry weather flow and potential illicit discharges at outfalls and storm drain structures discovered by KCI field crews, DelDOT maintenance staff or the public.

**OUTFALL SCREENING**

**2011 ANNUAL REPORT**

**APPENDIX A**

**POTENTIAL ILLICIT DISCHARGE INVESTIGATIONS**

**CORRESPONDENCE, FIELD INFORMATION AND DOCUMENTATION**

Structures 86938 & 372  
255 & 229 Appleby Road



**DELDOT AGR. 1613 / KCI 17121613A**  
**POTENTIAL ILLICIT DISCHARGE INVESTIGATION**  
**DOCUMENTATION CHECKLIST**

PID Structure No(s).      86938 & 372

Subdivision:              N/A

PID Address:              255 & 229 Appleby Road

City:                        Bear

Zip Code:                 19701

**PHOTOGRAPHS:**

- |                                     |           |          |
|-------------------------------------|-----------|----------|
| <input checked="" type="checkbox"/> | Landscape | Required |
| <input checked="" type="checkbox"/> | Structure | Required |

**DOCUMENTATION ATTACHED:**

- |                                     |   |                   |
|-------------------------------------|---|-------------------|
| <input checked="" type="checkbox"/> | IDDE Tracking Form  | Required          |
| <input checked="" type="checkbox"/> | Location Map from NPDES Map Viewer  | Required          |
| <input checked="" type="checkbox"/> | Dry Weather Flow Field Test Sheet   | Required for Flow |
| <input checked="" type="checkbox"/> | Summary Memorandum with Photographs   | Required          |
| <input type="checkbox"/>            | Door Hanger   | As Applicable     |
| <input type="checkbox"/>            | Certified Letter  | As Applicable     |
| <input checked="" type="checkbox"/> | OTHER: DeIDOT Appleby Road Plans, Property Tax Parcel Information, and Email Correspondence |                   |

## Illicit Discharge Incident Tracking Sheet

**Date:** 01/16/09, 02/16/09, 01/09/12, 02/02/12    **Logged by:** Matt Ortynsky 302-731-9176    **Incident ID:** 03/02/12

**Caller contact information:**

01/16/09 Referred by NCCo via Randy Cole  
 01/09/12 Referred by Richard Fain (DeIDOT Canal District)

Subdivision: N/A  
 County: New Castle County  
 ADC Map No./Grid: 12 D-13

**Incident Location**

**Primary Location Description**

- |   |                                     |                                      |
|---|-------------------------------------|--------------------------------------|
| <input checked="" type="checkbox"/> Storm drain | <input type="checkbox"/> Outfall    | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> In stream              | <input type="checkbox"/> Along bank |                                      |
| <input type="checkbox"/> Stormwater pond        | <input type="checkbox"/> Upland     |                                      |

Outfall / inlet ID# : Catch basins 86938 & 372

Closest street address: 255 & 229 Appleby R Bear, DE 19701

Watershed name: Army Creek                      Impacted Stream name: Army Creek

Nearby landmark: Route 40

**Narrative description of location**

Catch basin 86938 located directly in front yard of 255 Appleby Rd. Additional investigation traced flow source to catch basin 372 at 229/231 Appleby Rd.

**Description of problem**

**Visual**

- |  |   |
|--|---|
| <input type="checkbox"/> Oil / Oil sheen   | <input type="checkbox"/> Soap   |
| <input type="checkbox"/> Paint             | <input type="checkbox"/> Flotables (toilet paper, etc.)                               |
| <input type="checkbox"/> Algae             | <input type="checkbox"/> Dead fish  |
| <input checked="" type="checkbox"/> Cloudy | <input checked="" type="checkbox"/> Flow -----> Precipitation in last 48-hours?    No |
| <input type="checkbox"/> Anti-freeze       |   |
| <input type="checkbox"/> Yard waste        | <input type="checkbox"/> Other _____  |

**Odor**

- |  |   |                                  |
|--|---|----------------------------------|
| <input checked="" type="checkbox"/> Sewage | <input type="checkbox"/> Sulfide ("rotten egg") | <input type="checkbox"/> Gas/oil |
| <input type="checkbox"/> None              | <input type="checkbox"/> Other (describe) _____ |                                  |

**Narrative description/comments of problem**

**Jan 2009:** Address forwarded to KCI by Randy Cole (DeIDOT NPDES), who was contacted by NCCo. Debris/ice filled catch basin. KCI observed flow in the catchbasin; flow tested high for ammonia and detergents. KCI was unable to directly pinpoint the source. **Feb 2009:** Flow observed with sewage odor. sample collected from catch basin 86938 tested high from ammonia/detergents. 24-hr re-visit also tested high for ammonia/detergents. Camera-on-stick used to inspect-inconclusive. 8' terracotta pipe coming from another property north of 255 Appleby that outfalls to swale; source terra cotta could not be determined.

**Plan of Action (check all that apply)**

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Sample           | <input type="checkbox"/> Contact DNREC | <input checked="" type="checkbox"/> Contact NPDES Manager |
| <input type="checkbox"/> Photos           | <input type="checkbox"/> Door hangers  | <input type="checkbox"/> GPS Coordinates                  |
| <input type="checkbox"/> Other (describe) |  |   |

**Follow-up Action**

**01/02/12::** Richard Fain (Canal District) informed Randy Cole of possible sanitary sewer connection into catch basin 86938 at 255 Appleby Rd. Randy forwarded information to KCI for further investigation.

**01/09/12:** KCI crew visited 255 Appleby Road. Catch basin 86938 fully submerged; therefore source could not be determined. Randy Cole will have contractor flush pipe. KCI field personnel will re-visit after pipe cleaned out.

**02/02/12:** KCI crew traced flow source to PVC pipe tied into side of conveyance 51706. PVC pipe probably ties into sewer connection on left side of 229 Appleby Road (when facing house front). Sample collected from downstream structure 372 tested high for phenols, detergents, ammonia, and turbidity. The 24-hour re-visit tested high for detergents, ammonia, and turbidity. KCI notified Randy Cole on February 6, 2012.

**03/02/12:** Randy Cole contacted Casey Fountain, DNREC EPO, to provide PID information for potential dye testing by DNREC. KCI was contacted by DNREC regarding PID to verify address.



## MEMORANDUM

**TO:** Randy Cole, DelDOT

**FROM:** Matt Ortynsky, KCI

**DATE:** January 16, 2009  
February 16, 2009 Re-visit  
January 9, 2012 Re-visit  
February 2 Re-visit

**SUBJECT:** **Potential Illicit Discharge**  
**255 & 229 Appleby Rd.**  
**Structures 86938 & 372**  
Agreement 1495/KCI Project 0203019I

---

**The purpose of this Memo** is to summarize the field investigations regarding a Potential Illicit Discharge (PID) at 255 Appleby Road in New Castle County.

**January 15, 2009** Status Meeting: Randy Cole informed KCI of a PID at 255 Appleby Road. New Castle County alerted Randy that the residence at 255 Appleby Road had a connection from the house directly tied into the catch basin.

**January 16, 2009:** KCI crew visited catch basin 86938 at 255 Appleby Road. Debris and ice filled the catch basin, which could not be inspected. KCI contacted Randy Cole regarding the investigation results. DelDOT scheduled basin cleaning the following week.

**February 16, 2009:** KCI crew re-visited 255 Appleby Road. Flow was observed in the catch basin, along with a sewage odor. The sample collected from the catch basin flow tested high for ammonia and detergents. The 24 hour re-visit tested high for ammonia and detergents.

No visible connections were observed from the residence. KCI used the camera on a stick to inspect the upstream side of the conveyance leading into the catch basin. This did not result in any conclusive observations. There is a small 8" terracotta pipe coming from another property north of 255 Appleby Road that outfalls into a swale, which is part of the same conveyance system as the catch basin. The source of the terracotta pipe could not be determined.

**January 5, 2012:** Richard Fain, DelDOT Canal District, informed Randy Cole of a possible sanitary sewer connection into catch basin 86938 located at 255 Appleby Road. Randy forwarded this information to KCI for further investigation.

**January 9, 2012:** KCI crew visited 255 Appleby Road. The PID source was not determined because catch basin 86938 was fully submerged (**Photos 1 and 2**). The crew observed a patch of recently disturbed ground on the back left corner of 255 Appleby Road; it is uncertain if it is related to the PID source (**Photo 3**). KCI notified DelDOT about the clogged catch basin; a sanitary sewer contractor will flush the pipe.

**January 27, 2012:** Randy Cole notified KCI that catch basin 86938 was cleaned out.

**February 2, 2012:** KCI crew traced the source of flow to a PVC pipe tied into the side of conveyance 51706 (**Photo 4**). Upon further investigation, it was discovered that the PVC pipe probably ties into a sewer connection on the left side of 229 Appleby Road (when facing the house front) (**Photo 5**). The sample collected from the downstream structure 372 (**Photo 6**) tested high for phenols, detergents, ammonia, and turbidity. The 24-hour re-visit tested high for detergents, ammonia, and turbidity. KCI notified Randy Cole on February 6, 2012.



**Photo 1**



**Photo 2**



**Photo 3**



**Photo 4**



**Photo 5**



**Photo 6**

# Appleby Road PID



Legend			
	INLET		RISER
	MANHOLE		JUNCTION BOX
	OUTFALL		CULVERT
	SWALE END		DITCH
	SWALE VERTEX		PIPE
	DUMMY NODE		HYDRAULIC CONNECTION
	BMP		WORK ORDER

**NPDES  
Inventory Map**  
1 in. = 143 ft.



**DELDOT AGREEMENT 1495  
POTENTIAL ILLICIT DISCHARGE FIELD DATA SHEET**



Structure/Outfall ID Number: 372

Address/Location Description: 229 / 231 Appleby Rd

Outfall Data	
Digital picture? (Y/N):	Y
Camera Number:	
Picture Number:	
Personnel:	Gordon R. + Brie B.
Date (MM/DD/YY):	2/2/12
Time:	12:30pm
Date of Last Rain >0.10" (MM/DD/YY):	01/27/12
Follow Up Screen Date (MM/DD/YY):	2/3/12
Follow Up Field Screen Time:	8:30 AM
Follow Up Personnel:	Brad B. + Brie B.
Outfall Dimensions (in):	
Outfall Shape: Round (R), Oval (O), Box (B), V-Ditch (VD), Trap Ditch (TD), Other Ditch (OD)	R
Outfall Type (CMP, RCP, PVC, Other):	PVC
Flow Observed? (Y/N):	Y
Follow Up Flow Observed? (Y/N):	N
Flow Source	Possible Septic Overflow
Structural Condition: Normal (N), Concrete Spauling (SP), Peeling Paint (PP), Concrete Cracking (CC), Outfall Damaged (OD), Submerged (S), Metal Corrosion (MC), Other (O-explain)	N
Erosion (Outfall Area): None (N), Moderate (M), Severe (S)	N
Odor: None (N)=0, Rancid-Sour (RS)=4, Gas (G)=4, Sewage (S)=4, Oil (O)=4, Sulfur (S)=4, Other (Other-explain)	S = 4
Deposits / Stains: None (N)=0, Sediment (S)=2, Oil (OY)=3, Other (O-explain)	N = 0
Algae Growth? (Y/N):	N
Vegetative Condition (Outfall Area): Normal (N), Inhibited Growth (IG), Excessive Growth (EG), Other (O-explain)	N
Land Use: Industrial (I), Commercial (C), Residential (R), Other (O-explain)	R
Specific Land Use:	

		Result 1	Val.	Result 2	Val. 2
<b>Flow Rate (cfs):</b>	<0.022 cfs=0; ≥0.022 cfs=4	< 0.022	0	<0.022	0
<b>Water Temperature (Fahrenheit):</b>		55.7	-	44.2	-
<b>pH:</b>	<4.5=4; >8.5=4; change ≥ 2 units=1	6.98	-	7.01	0
<b>Phenol (mg/L):</b>	<0.3 mg/L=0; ≥0.3 mg/L=4	0.7	4	0	0
<b>Chlorine (mg/L):</b>	<0.3 mg/L=0; ≥0.3 mg/L=4	0	0	0	0
<b>Detergents (mg/L):</b>	<0.2=0; 0.2 - 0.4=1; ≥0.5 mg/L=4	0.55	4	0.55	4
<b>Copper (mg/L):</b>	<0.01 mg/L=0; ≥0.01 mg/L=4	0	0	0	0
<b>Ammonia (mg/L):</b>	<0.05-0.1 mg/L=0; 0.1-1.0 mg/L=1; 1.0-2.99 mg/L=2; ≥3.0 mg/L=4	>3.0	4	73.0	4
<b>Turbidity:</b>	0-10 ntu=0; 11-40=1; 41-150=3; >150=4	156.2	4	349.3	4
<b>Color:</b>	Clear (C)=0, Gray (G)=1, Red (R)=1, Yellow (Y)=1, Brown (B)=1, Green (GR)=1, Other (O-explain)	Y	1	G	1
<b>Floatables:</b>	None (N)=0, Oil Sheen (OS)=4, Sewage (S)=4, Trash (T)=2, Other (O-explain)	S	4	S	4

## FIELD SKETCH



DELDOT NPDES FY 07 AGREEMENT 1351 – TASK 08  
RE-VISIT DUFFIELD OUTFALLS FIELD DATA SHEET

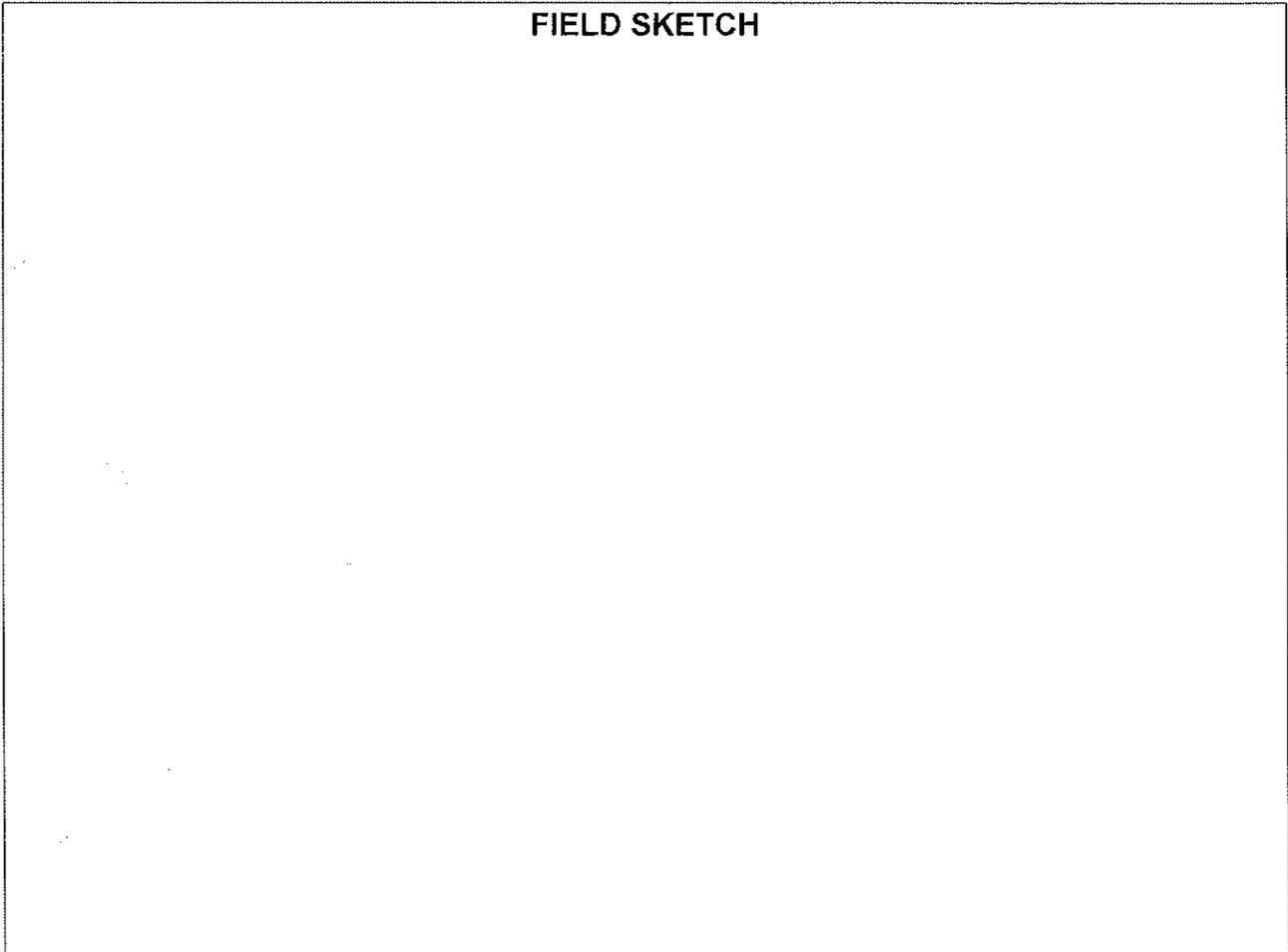


Duffield Outfall ID Number: 255 Appleton Rd.  
Structure # 86938

Outfall Data	
Digital picture? (Y/N):	Y
Camera Number:	ES-1
Picture Number:	
Personnel:	RC, CB
Date (MM/DD/YY):	2-16-01
Time:	
Date of Last Rain >0.10" (MM/DD/YY):	
Follow Up Screen Date (MM/DD/YY):	
Follow Up Field Screen Time:	
Outfall Dimensions (in):	Catchbasin - 86938
Outfall Shape: Round (R), Oval (O), Box (B), V-Ditch (VD), Trap Ditch (TD), Other Ditch (OD)	
Outfall Type (CMP, RCP, PVC, Other):	
Flow Observed? (Y/N):	N
Follow Up Flow Observed? (Y/N):	N
Flow Source	Could not locate
Structural Condition: Normal (N), Concrete Spauling (SP), Peeling Paint (PP), Concrete Cracking (CC), Outfall Damaged (OD), Submerged (S), Metal Corrosion (MC), Other (O-explain)	N
Erosion (Outfall Area): None (N), Moderate (M), Severe (S)	N
Odor: None (N)=0, Rancid-Sour (RS)=4, Gas (G)=4, Sewage (S)=4, Oil (O)=4, Sulfur (S)=4, Other (Other-explain)	S
Deposits / Stains: None (N)=0, Sediment (S)=2, Oil (OY)=3, Other (O-explain)	N
Algae Growth? (Y/N):	N
Vegetative Condition (Outfall Area): Normal (N), Inhibited Growth (IG), Excessive Growth (EG), Other (O-explain)	N
Land Use: Industrial (I), Commercial (C), Residential (R), Other (O-explain)	R
Specific Land Use:	

	Result 1	255-1 Val.	255-2 Result 2	241 Val. 2
<b>Flow Rate (cfs):</b> <0.022 cfs=0; ≥0.022 cfs=4				
<b>Water Temperature (Fahrenheit):</b>		42.5	45.4	46.2
<b>pH:</b> <4.5=4; >8.5=4; change ≥ 2 units=1		7.71	7.65	7.75
<b>Phenol (mg/L):</b> <0.3 mg/L=0; ≥0.3 mg/L=4		0	0	0
<b>Chlorine (mg/L):</b> <0.3 mg/L=0; ≥0.3 mg/L=4		0	0	0
<b>Detergents (mg/L):</b> <0.2=0; 0.2 - 0.4=1; ≥0.5 mg/L=4		71.3	71.3	1.3
<b>Copper (mg/L):</b> <0.01 mg/L=0; ≥0.01 mg/L=4		0	0	0
<b>Ammonia (mg/L):</b> <0.05-0.1 mg/L=0; 0.1-1.0 mg/L=1; 1.0-2.99 mg/L=2; ≥3.0 mg/L=4		73.0	73.0	73.0
<b>Turbidity:</b> 0-10 ntu=0; 11-40=1; 41-150=3; >150=4		158.4	139.8	131.1
<b>Color:</b> Clear (C)=0, Gray (G)=1, Red (R)=1, Yellow (Y)=1, Brown (B)=1, Green (GR)=1, Other (O-explain)	g	1	6	1 9
<b>Floatables:</b> None (N)=0, Oil Sheen (OS)=4, Sewage (S)=4, Trash (T)=2, Other (O-explain)	Other (debris)	1	other (debris)	other (debris)

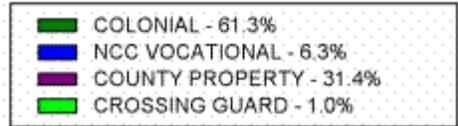
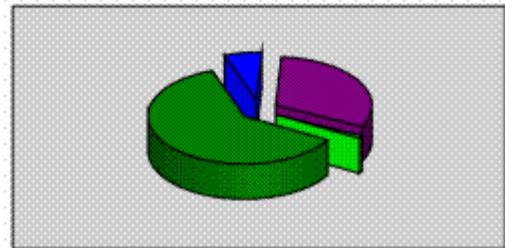
**FIELD SKETCH**



## Parcel # 1003400107

**Property Address:** 229 A APPLEBY RD  
NEW CASTLE, DE 19720-  
**Subdivision:** MELANCON SUBD  
**Owner:** TE ANH  
70 WORTHINGTON PARK RD  
**Owner Address:**  
NEWARK, DE 19711  
**Municipal Info:** Unincorporated

### 2011 - 2012 Tax Summary



**Lot #:** 2  
**Location:**  
**Map Grid:** 09003380  
**Block:**  
**Census Tract:** 149.08  
**Street Type:**  
**Water:**  
**Microfilm #:** 012162

**Property Class:** RESIDENTIAL  
**Lot Size:** 1.84  
**Lot Depth:** 993.20  
**Lot Frontage:** 25  
**Street Finish:**

### District & Zoning Info

#### Districts

- **COLONIAL SCHOOL DIST-TRES**
- **COUNCIL 7 - GEORGE SMILEY**
- **FIRE/RESCUE - CHRISTIANA**
- NORTH OF C&D CANAL
- SEWER DISTRICT NORTHERN-ASMT
- BLUELINE STREAM 100FT BUFFER
- DE SEN 13-DAVID B MCBRIDE
- DE REP 05-MELANIE L GEORGE
- PLANNING 2 - NEW CASTLE
- TRAFFIC ZONE T163 (YR2000)

#### Zoning

- NC21 - UDC - SINGLE FAMILY - 1/2 ACRE

### Sales History

Owner	Deed	Current Owner?	Multi?	Sale Date	Sale Amount
MELANCON MICHAEL J & BARBARA	585 26	N	Y	8/1/1987	\$10.00
WILLIAMS MARTIN S & GEORGIA L	20041020 0114304	N	N	10/1/2004	\$45,000.00
TE ANITA	20060614 0056954	N	N	5/9/2006	\$47,500.00

TE ANH	20070111 0003237	Y	N	1/9/2007	\$10.00
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**Tax/Assessment Info**

**Assessment**

**Land:** 9600  
**Structure:** 0  
**Homesite:** 0  
**Total:** 9600  
**County Taxable:** 9600  
**School Taxable:** 9600

**Tax History as of 2/9/2012 6:21:02 AM**

Tax Year	County				School			
	Principal Due	Penalty Due	Date Paid	Amt Paid	Principal Due	Penalty Due	Date Paid	Amt Paid
2007A	\$0.00	\$0.00	9/26/2007	\$56.28	\$0.00	\$0.00	9/26/2007	\$146.88
2008A	\$0.00	\$0.00	9/23/2008	\$55.85	\$0.00	\$0.00	9/23/2008	\$150.24
2009A	\$0.00	\$0.00	9/30/2009	\$68.32	\$0.00	\$0.00	9/30/2009	\$148.70
2010A	\$0.00	\$0.00	8/19/2010	\$68.77	\$0.00	\$0.00	8/19/2010	\$147.17
2011A	\$0.00	\$0.00	9/27/2011	\$69.35	\$0.00	\$0.00	9/27/2011	\$144.68

**County Balance Due:** \$0.00

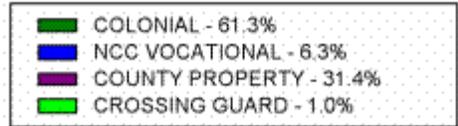
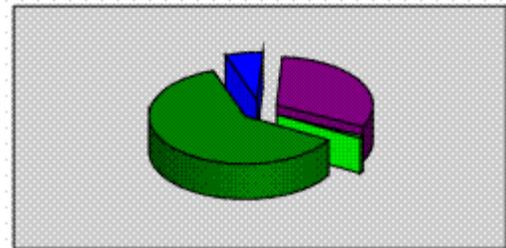
**School Balance Due:** \$0.00

Accounts with delinquent balances do not reflect the most recent statutory penalty, which was imposed on the first of the month. To obtain the exact amount necessary to pay the account in full, please call New Castle County's Treasury Division at (302) 323-2600.

## Parcel # 1003400038

**Property Address:** 229 APPLEBY RD  
NEW CASTLE, DE 19720-  
**Subdivision:** MELANCON SUBD  
**Owner:** JOHNSON BRENDA L  
229 APPLEBY RD  
**Owner Address:**  
NEW CASTLE, DE 19720  
**Municipal Info:** Unincorporated

### 2011 - 2012 Tax Summary



**Lot #:** 1  
**Location:**  
**Map Grid:** 09003380  
**Block:**  
**Census Tract:** 149.08  
**Street Type:** ARTERIAL  
**Water:** PUBLIC  
**Microfilm #:** 012162

**Property Class:** RESIDENTIAL  
**Lot Size:** 1.11  
**Lot Depth:** 471.80  
**Lot Frontage:** 102.80  
**Street Finish:**

### District & Zoning Info

#### Districts

- **COLONIAL SCHOOL DIST-TRES**
- **COUNCIL 7 - GEORGE SMILEY**
- **FIRE/RESCUE - CHRISTIANA**
- NORTH OF C&D CANAL
- SEWER DISTRICT NORTHERN-ASMT
- DE SEN 13-DAVID B MCBRIDE
- DE REP 05-MELANIE L GEORGE
- PLANNING 2 - NEW CASTLE
- TRAFFIC ZONE T163 (YR2000)

#### Zoning

- NC21 - UDC - SINGLE FAMILY - 1/2 ACRE

### Sales History

Owner	Deed	Current Owner?	Multi?	Sale Date	Sale Amount
MELANCON MICHAEL J & BARBARA	585 26	N	N	3/1/1987	\$60,000.00
JOHNSON BRENDA L	2089 320	N	N	8/1/1987	\$10.00
		Y	N	4/24/1996	\$90,000.00

### Tax/Assessment Info

## Assessment

**Land:** 5800  
**Structure:** 28200  
**Homesite:**     0  
**Total:** 34000  
**County Taxable:** 34000  
**School Taxable:** 34000

## Tax History as of 2/9/2012 6:21:02 AM

Tax Year	County				School			
	Principal Due	Penalty Due	Date Paid	Amt Paid	Principal Due	Penalty Due	Date Paid	Amt Paid
2007A	\$0.00	\$0.00	9/26/2007	\$199.35	\$0.00	\$0.00	9/26/2007	\$520.20
2008A	\$0.00	\$0.00	9/29/2008	\$197.81	\$0.00	\$0.00	9/29/2008	\$532.10
2009A	\$0.00	\$0.00	9/25/2009	\$241.96	\$0.00	\$0.00	9/25/2009	\$526.66
2010A	\$0.00	\$0.00	9/24/2010	\$243.56	\$0.00	\$0.00	9/24/2010	\$521.22
2011A	\$0.00	\$0.00	9/26/2011	\$245.62	\$0.00	\$0.00	9/26/2011	\$512.38

**County Balance Due:** \$0.00

**School Balance Due:** \$0.00

Accounts with delinquent balances do not reflect the most recent statutory penalty, which was imposed on the first of the month. To obtain the exact amount necessary to pay the account in full, please call New Castle County's Treasury Division at (302) 323-2600.

## Residence Characteristics

## Residence 1

<b>Building Design:</b> BUNGALOW	<b>Residence Class:</b> SFD ON 1.01-5.00 AC.
<b>Grade:</b> FAIR	<b>Condition:</b> AVERAGE
<b>Year Built:</b> 1943	<b># Stories:</b> 1
<b>Total Area (sq. ft.):</b> 1075	<b>Main Floor Area:</b> 804
<b># Rooms:</b> 6	<b># Bedrooms:</b> 3
<b># 1/2 Baths:</b> 0	<b># Full Baths:</b> 2
<b># Fam. Rooms:</b> 0	<b># Fixtures:</b> 8
<b>Roof Type:</b> GABLE	<b>Roof Material:</b> ASPHALT
<b>Exterior Wall:</b> ASBESTOS	<b>Interior Wall Finish:</b> PLASTER
<b>Floor Finish:</b> WOOD	<b>Foundation:</b> SLAB
<b>Garage Capacity:</b> 0	<b>Basement %:</b>
<b>Basement % Finished:</b>	<b>Basement Finish Type:</b> NO BASEMENT FINISH
<b>Attic % Finished:</b> 100%	
<b>Unfinished %:</b>	<b>Unfinished Area:</b> 0
<b>Heat Type:</b> HOTWATER	<b>Air Conditioning:</b>
<b>Remodel Year:</b> 0	

**From:** Cole Randy (DeIDOT) [mailto:Randy.Cole@state.de.us]  
**Sent:** Tuesday, January 10, 2012 8:53 AM  
**To:** Matthew Ortynsky  
**Cc:** Bruce R. Thompson  
**Subject:** FW: Appleby Rd (N343)

Matt – Here are the plan sheets for Appleby Road we discussed and Rich Fain’s email to me.

---

**From:** Gilliam LaTonya (DeIDOT)  
**Sent:** Friday, January 06, 2012 8:49 AM  
**To:** Cole Randy (DeIDOT)  
**Subject:** RE: Appleby Rd (N343)

Randy,

I am attaching 3 plan sheets.

The first is the plan sheet from Contract # 1074 – where it shows the existing septic pipes out letting to the drainage ditch.

The second plan sheet is from Contract 8800101 where you can see a sanitary sewer line, but no septic connections. The only pay items on this contract for anything other than the new storm sewer were for 20 roof drains that were installed along Appleby Road.

The third plan sheet is the most recent Appleby Rd construction project Contract # 22-119-05. This was one of Brian Urbanek’s Contracts. There is a note on the plan sheet about connecting the existing 6” terracotta pipe to the drainage inlet, however I don’t know if that is a sewer pipe or a roof drain pipe. House 255 Appleby Road is Parcel 10-029.110-027 owned by George M. and Janice P. Dick. You could have Real Estate pull up the ROW agreement, but it doesn’t look like there was a ROW take for this property so there may not be one. There is a sewer & Drainage Easement along the east side of their property shown so they must be tied into the sewer system.

LaTonya

---

**From:** Cole Randy (DeIDOT)  
**Sent:** Friday, January 06, 2012 8:02 AM  
**To:** Gilliam LaTonya (DeIDOT)  
**Subject:** FW: Appleby Rd (N343)

Are you able to open these attachments?

**From:** Fain Richard (DeIDOT)  
**Sent:** Thursday, January 05, 2012 4:32 PM  
**To:** Cole Randy (DeIDOT)  
**Cc:** Anthony Wayne (DeIDOT)  
**Subject:** Appleby Rd (N343)

Randy –

Wayne Anthony, Area 10 supervisor, recently brought me a problem I think you can help with, or at least I should bring to your attention.

We received a call about a clogged pipe along the east side of Appleby Rd just north of US 40. Upon investigation, the flusher crew found what appeared to be grease in the pipe. They spoke to the resident at #255 who claimed that this is caused by the homes whose septic system overflows are tied into the storm sewer. She stated that DNREC is aware of it. Though she herself is not tied into the storm sewer, several of her neighbors appear to be.

Since I have never heard of this, I attempted to find some plans to verify if this was true or not, and thinking that if we did the work, it would indicate that we allowed the connection. I've attached what I found. One sheet is from Contract #1074 in 1950. It looks like it was open drainage at the time, but you can see the septic system overflows outletting into the ditch. The second is from Contract #88-001-01. You'll notice the installation of a cleanout and 6" PVC pipe into CB 1. I'm thinking this is a septic system. Also, in looking at structure #86934 on the NPDES inventory, you can see a PVC pipe tied into the basin.

This raises a few questions:

- 1) Are you aware of this situation and is it allowed? If it's not allowed, I'm not sure what we would do about it.
- 2) Should DeIDOT be maintaining this given what may be in the pipe, or is this something DNREC should be involved in?
- 3) If it is ours, do we need to take special precautions when flushing the pipe? We're thinking that we should use a contractor that specializes in sanitary sewer to flush the pipe.

Your thoughts on this matter are appreciated. If you have any questions, let me know.

Rich

Structure 520110114081352

2777 Andrewsville Road

**Structure 520110114081352**



**DELDOT AGR. 1495 / KCI 0203019H-I**  
**POTENTIAL ILLICIT DISCHARGE INVESTIGATION**  
**DOCUMENTATION CHECKLIST**

PID Structure No(s).      520110114081352

Subdivision:              N/A

PID Address:              2777 Andrewsville Drive

City:                        Greenwood

Zip Code:                 19950

**PHOTOGRAPHS:**

- |                                     |           |          |
|-------------------------------------|-----------|----------|
| <input checked="" type="checkbox"/> | Landscape | Required |
| <input checked="" type="checkbox"/> | Structure | Required |

**DOCUMENTATION ATTACHED:**

- |                                     |                                     |                   |
|-------------------------------------|-------------------------------------|-------------------|
| <input checked="" type="checkbox"/> | IDDE Tracking Form                  | Required          |
| <input checked="" type="checkbox"/> | Summary Memorandum with Photographs | Required          |
| <input checked="" type="checkbox"/> | Location Map from NPDES Map Viewer  | Required          |
| <input checked="" type="checkbox"/> | Dry Weather Flow Test Field Sheet   | Required for Flow |
| <input type="checkbox"/>            | Door Hanger                         | As Applicable     |
| <input checked="" type="checkbox"/> | Certified Letter                    | As Applicable     |
| <input checked="" type="checkbox"/> | OTHER:                              |                   |
|                                     | o 10-22-12 Pipe Plug Email          |                   |
|                                     | o 10-22-12 Pipe Plug Photos         |                   |

## Lydia Hill

---

**From:** Bruce R. Thompson  
**Sent:** Monday, October 22, 2012 1:14 PM  
**To:** Matthew Ortynsky; Lydia Hill  
**Subject:** FW: Potential Illicit Discharge - Suspected Sewage - 2777 Andrewsville Rd, Harrington DE  
**Attachments:** downsized951022120916.jpg; 1022120917.jpg; 1022120917a.jpg

Case Closed

---

**From:** Cole Randy (DeIDOT) [mailto:Randy.Cole@state.de.us]  
**Sent:** Monday, October 22, 2012 12:46 PM  
**To:** Bruce R. Thompson  
**Subject:** FW: Potential Illicit Discharge - Suspected Sewage - 2777 Andrewsville Rd, Harrington DE

Bruce – FYI.

---

**From:** Cohee Carolyn (DeIDOT)  
**Sent:** Monday, October 22, 2012 12:04 PM  
**To:** Gilliam LaTonya (DeIDOT)  
**Cc:** Stynchula Timothy (DeIDOT); Cole Randy (DeIDOT); Taavoni Shahin (DeIDOT)  
**Subject:** RE: Potential Illicit Discharge - Suspected Sewage - 2777 Andrewsville Rd, Harrington DE

LaTonya, this location's fix is complete. Today, the contractor filled the pipes with a mixture of hydraulic cement and Screte and, then, placed an aluminum plate with masonry screws in front of each pipe. In the junction box, there is no active residue or waste; however, the odor was present, which is why the other pipes were done, as well. Mr. Carrington is appreciative of the fix. Attached is a couple photos from today's work.

Feel free to pass along to DNREC or whomever.

Thanks.

Carolyn

---

**From:** Gilliam LaTonya (DeIDOT)  
**Sent:** Thursday, September 06, 2012 11:32 AM  
**To:** Taavoni Shahin (DeIDOT)  
**Cc:** Cohee Carolyn (DeIDOT); Stynchula Timothy (DeIDOT); Cole Randy (DeIDOT)  
**Subject:** RE: Potential Illicit Discharge - Suspected Sewage - 2777 Andrewsville Rd, Harrington DE

Good Morning Shahin,

Thank you again for taking care of this drainage issue under your contracts for us. I have attached a letter that I plan to send to the homeowner today. If the homeowner is agreeable to signing the temporary trespass agreement letter (H-22 form attached), plugging the pipe at the junction box will yield better results.

Timothy Carrington's phone number is 302-398-6120 if you need to contact him in advance of heading out to the site.

Please feel free to contact me if you need more information.

LaTonya

---

**From:** Taavoni Shahin (DeIDOT)  
**Sent:** Thursday, September 06, 2012 8:54 AM  
**To:** Stynchula Timothy (DeIDOT)  
**Cc:** Cohee Carolyn (DeIDOT); Gilliam LaTonya (DeIDOT)  
**Subject:** FW: Potential Illicit Discharge - Suspected Sewage - 2777 Andrewsville Rd, Harrington DE

Tim,

We need to take care of this issue either with CTF or our Drainage Contract.

Thanks

Shahin

---

**From:** Gilliam LaTonya (DeIDOT)  
**Sent:** Wednesday, September 05, 2012 2:18 PM  
**To:** Taavoni Shahin (DeIDOT)  
**Cc:** Cole Randy (DeIDOT)  
**Subject:** FW: Potential Illicit Discharge - Suspected Sewage - 2777 Andrewsville Rd, Harrington DE

Good Afternoon Shahin,

Attached to this e-mail is the illicit discharge memo that gives the location information and photographs for the catch basin that has the illegal septic tap in. David Moyer, DNREC enforcement office, has contacted the homeowner, Tim Carrington, and informed him that DeIDOT would be plugging the pipe. The homeowner does not have a problem with us doing this, since he was unaware that the pipe existed. (He bought the property 6 years ago.

The work would be limited to having the contractor plug the 4" clay pipe and then the Contractor or District can remove the sewage and debris from the catch basin. Once completed, we would like a picture of the drainage inlet after the pipe has been plugged and the basin cleaned.

If you need any additional information please feel free to call or send me an e-mail. Thank you in advance for your assistance with this.

LaTonya

**LaTonya Gilliam, P.E.**  
NPDES Engineer  
Phone: 302.760.2191



2777 ADREWSVILLE ROAD

OCTOBER 2012

DELDOT PLUG PIPE AND INSTALL STEEL PLATE



**2777 ADREWSVILLE ROAD**

**OCTOBER 2012**

**DELDOT PLUG PIPE AND INSTALL STEEL PLATE**



## Illicit Discharge Incident Tracking Sheet

**Date:** 04/08/11 & 03/24/2011    **Logged by:** Matt Ortynsky    **Contact #:** 302-731-9176    **Incident ID:**

**Caller contact information:**

Subdivision: N/A  
 County: Kent  
 ADC Map No./Grid: 41-K7

**Incident Location**

Primary Location Description

- |   |                                     |                                      |
|---|-------------------------------------|--------------------------------------|
| <input checked="" type="checkbox"/> Storm drain | <input type="checkbox"/> Outfall    | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> In stream              | <input type="checkbox"/> Along bank |                                      |
| <input type="checkbox"/> Stormwater pond        | <input type="checkbox"/> Upland     |                                      |

Outfall / inlet ID# : 520110114081352

Closest street address: 2777 Andrewsville Road

City: Greenwood, DE 19950

Watershed name: Marshyhope Creek      Impacted Stream name: Tomahawk Branch

Nearby landmark: In front of residence (2777 Andrewsville Road)

**Narrative description of location**

In catch basin in front yard of residence at 2777 Andrewsville Road

**Description of problem**

**Visual**

- |  |   |
|--|---|
| <input type="checkbox"/> Oil / Oil sheen   | <input type="checkbox"/> Soap   |
| <input type="checkbox"/> Paint             | <input checked="" type="checkbox"/> Floatables (toilet paper, etc.)                         |
| <input type="checkbox"/> Algae             | <input type="checkbox"/> Dead fish  |
| <input checked="" type="checkbox"/> Cloudy | <input checked="" type="checkbox"/> Flow -----> Precipitation in last 48-hours?    Yes / No |
| <input type="checkbox"/> Anti-freeze       |   |
| <input type="checkbox"/> Yard waste        | <input type="checkbox"/> Other _____  |

**Odor**

- |  |   |                                  |
|--|---|----------------------------------|
| <input checked="" type="checkbox"/> Sewage | <input type="checkbox"/> Sulfide ("rotten egg") | <input type="checkbox"/> Gas/oil |
| <input type="checkbox"/> None              | <input type="checkbox"/> Other (describe) _____ |                                  |

**Narrative description/comments of problem**

**02/11/11:** CEI observed 4" clay pipe coming from residence at 2777 Andrewsville Rd tying into catch basin 520110114081352. Strong sewage smell observed along with cloudy water/toilet paper in bottom of basin.  
**03/24/11:** KCI visited location and confirmed apparent sewage discharge into catch basin 520110114081352. Discharge tested high for ammonia, detergents, and turbidity.  
**04/07/11:** KCI observed strong sewage odor/toilet paper. Discharge tested high for ammonia, detergents, turbidity, and phenols.

**Plan of Action (check all that apply)**

- |  |  |   |
|--|--|---|
| <input checked="" type="checkbox"/> Sample | <input type="checkbox"/> Contact DNREC | <input checked="" type="checkbox"/> Contact NPDES Manager |
| <input checked="" type="checkbox"/> Photos | <input type="checkbox"/> Door hangers  | <input type="checkbox"/> GPS Coordinates                  |
| <input type="checkbox"/> Other (describe)  |  |   |

**Follow-up Action**

**04/08/11:** KCI contacted DeIDOT via telephone to relay field investigation results. Submitted information to DeIDOT in 04/08/11 email. DeIDOT will evaluate issue and determine future action.  
**04/13/11:** DNREC investigated area and spoke with owner of 2777 Andrewsville Rd, who did not know about pipe in catch basin. DNREC informed resident of their recommendation to have pipe closed by DeIDOT. If resident has problems with septic-will confirm origination from his system. If anyone else contacts either DNREC or DeIDOT once it's closed off, then DNREC will consider enforcement action at that time, because this would show someone knew pipe was there.  
**05/20/11:** KCI attempted to send DeIDOT Illicit Discharge notice by Certified Mail. Letter returned by Post Office "No Mail Receptacle-Unable to Forward".    **06/14/11:** Sent regular mail.  
**11/22/11:** DNREC contacted homeowner (Tim Carrington 302-382-9649) and recommended he call DeIDOT. DeIDOT confirmed with Mr. Carrington that DeIDOT intends to plug the pipe and any potential problems that may occur from back-ups would be homeowner's responsibility. Mr. Carrington acknowledged that he understood this and is OK with DeIDOT plugging pipe. DeIDOT to plug pipe.



DELDOT AGREEMENT 1495  
 POTENTIAL ILLICIT DISCHARGE FIELD DATA SHEET

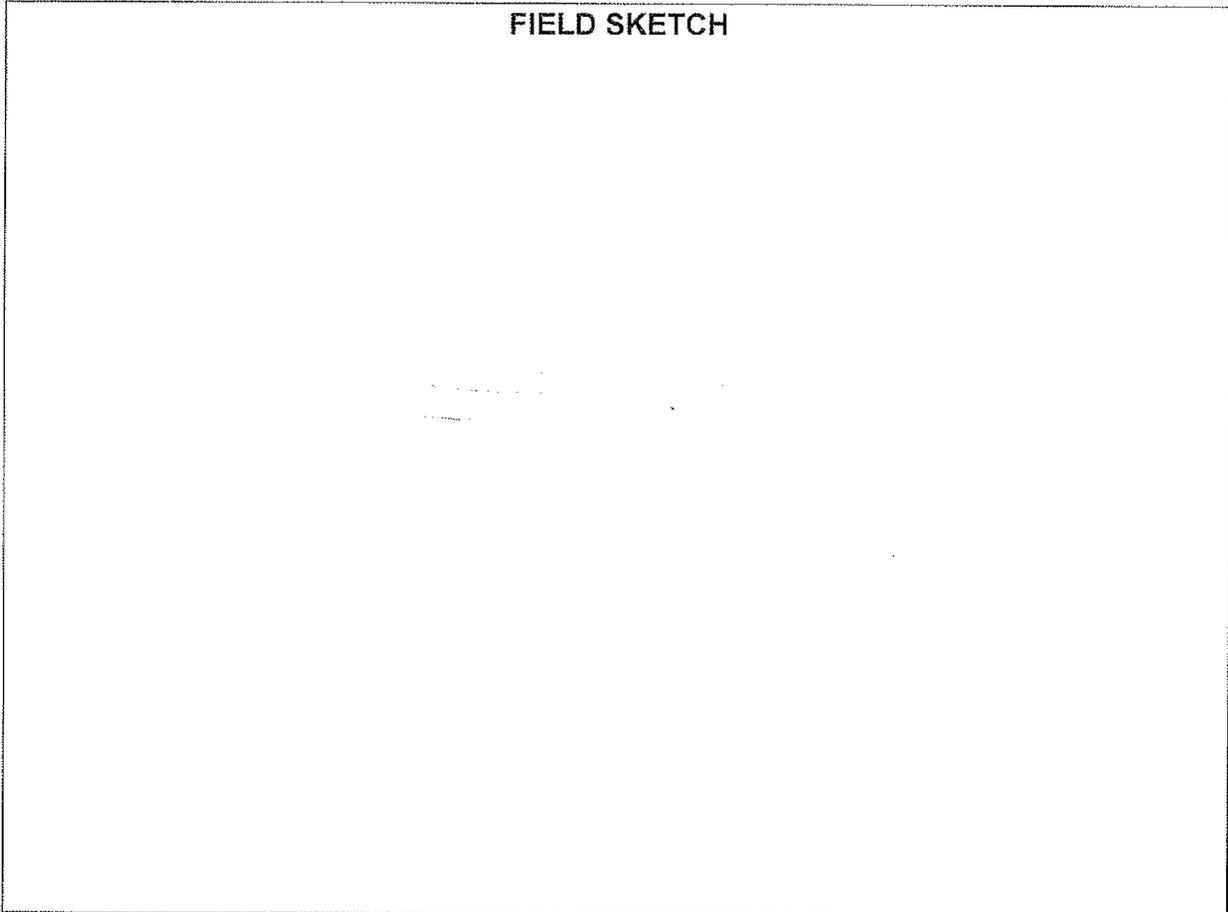
Structure/Outfall ID Number: 520110114081352

Address/Location Description: 2777 Andrewsville Rd.

Outfall Data	
Digital picture? (Y/N):	Y
Camera Number:	
Picture Number:	
Personnel:	CB/mo
Date (MM/DD/YY):	3/24/11
Time:	10:35am
Date of Last Rain >0.10" (MM/DD/YY):	
Follow Up Screen Date (MM/DD/YY):	4/7/11
Follow Up Field Screen Time:	11:00am
Outfall Dimensions (in):	4"
Outfall Shape: Round (R), Oval (O), Box (B), V-Ditch (VD), Trap Ditch (TD), Other Ditch (OD)	Round
Outfall Type (CMP, RCP, PVC, Other):	Clay
Flow Observed? (Y/N):	Y
Follow Up Flow Observed? (Y/N):	Y
Flow Source	Possible septic system
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)	N
Odor: None (N)=0, Rancid-Sour (RS)=4, Gas (G)=4, Sewage (S)=4, Oil (O)=4, Sulfur (S)=4, Other (Other-explain)	Sewage
Deposits / Stains: None (N)=0, Sediment (S)=2, Oil (OY)=3, Other (O-explain)	White Cloudy discharge/Staining in pipe
Algae Growth? (Y/N):	N
Vegetative Condition (Outfall Area): Normal (N), Inhibited Growth (IG), Excessive Growth (EG), Other (O-explain)	N
Land Use: Industrial (I), Commercial (C), Residential (R), Other (O-explain)	Res.
Specific Land Use:	Along roadside from residential area

		Result 1	Val.	Result 2	Val. 2
<b>Flow Rate (cfs):</b>	<0.022 cfs=0; ≥0.022 cfs=4	<.000	0	<.000	0
<b>Water Temperature (Fahrenheit):</b>		44.5°	-	69°	-
<b>pH:</b>	<4.5=4; >8.5=4; change ≥ 2 units=1	7.40	0	7.50	0
<b>Phenol (mg/L):</b>	<0.3 mg/L=0; ≥0.3 mg/L=4	0	0	.5 mg/L	4
<b>Chlorine (mg/L):</b>	<0.3 mg/L=0; ≥0.3 mg/L=4	0	0	0	0
<b>Detergents (mg/L):</b>	<0.2=0; 0.2 - 0.4=1; ≥0.5 mg/L=4	>1.3	4	>1.3	4
<b>Copper (mg/L):</b>	<0.01 mg/L=0; ≥0.01 mg/L=4	0	0	0	0
<b>Ammonia (mg/L):</b>	<0.05-0.1 mg/L=0; 0.1-1.0 mg/L=1; 1.0-2.99 mg/L=2; ≥3.0 mg/L=4	>3.0	4	>3.0	4
<b>Turbidity:</b>	0-10 ntu=0; 11-40=1; 41-150=3; >150=4	89.10	3	141.3	3
<b>Color:</b>	Clear (C)=0, Gray (G)=1, Red (R)=1, Yellow (Y)=1, Brown (B)=1, Green (GR)=1, Other (O-explain)	G/white G/cloudy	1	G/white G/cloudy	1
<b>Floatables:</b>	None (N)=0, Oil Sheen (OS)=4, Sewage (S)=4, Trash (T)=2, Other (O-explain)	N	0	N	0

**FIELD SKETCH**





## MEMORANDUM

**TO:** Randy Cole  
Marianne Walch  
DelDOT Stormwater Quality Program

**FROM:** Matthew Ortynsky  
Environmental Scientist

**DATE:** June 29, 2011 through November 22, 2011

**SUBJECT:** **2777 Andrewsville Road PID Summary**  
**Structure No. 520110114081352**  
Agreement 1495 / KCI Project 0203019H/0203019I

---

**The purpose of this Memo** is to summarize the investigation of a Potential Illicit Discharge (PID) at 2777 Andrewsville Road (Figures 1-2).

**March 15, 2011:** CEI identified a PID at 2777 Andrewsville Road. Field crew observed what appeared to be clumps of toilet paper and cloudy water in the bottom of Structure No. 520110114081352. A strong sewage odor was detected.

**March 24, 2011:** KCI inspected the catch basin and noticed a 4" clay pipe with a small amount of cloudy discharge (Figure 3). There appeared to be clumps of toilet paper in the bottom of the catch basin and a strong sewage odor was detected. The sample collected tested high for levels of ammonia, detergents, and turbidity. The source of the discharge could not be determined, but was suspected to be from septic tank overflow.

**April 7, 2011:** KCI detected a strong sewage odor. The sample collected tested high for levels of ammonia, detergents, turbidity and phenol (the latter of which was undetected 03/24/11 but high on 04/07/11).

**April 8, 2011:** KCI contacted DelDOT to relay the field investigation observations.

**April 13, 2011:** DNREC investigated area and spoke with owner of 2777 Andrewsville Rd, who did not know about pipe in catch basin. DNREC informed resident of their recommendation to have pipe closed by DelDOT. If resident has problems with septic-will confirm origination from his system. If anyone else contacts either DNREC or DelDOT once it's closed off, then DNREC will consider enforcement action at that time, because this would show someone knew pipe was there.

**May 20, 2011:** KCI attempted to send via certified mail a DeIDOT Illicit Discharge Notice, which was returned to sender with message “No mail receptacle-unable to forward”.

**June 14, 2011:** KCI attempted to send via regular mail a DeIDOT Illicit Discharge Notice.

**June 29, 2011:** KCI and Tri State Grouting conducted a push camera inspection. At approximately 83’ 6” a junction box was discovered that connects to what appears to be an additional sewage pipe (Figure 4). Upon further investigation, a metal cover was found at the area where the junction box should be located. There is a septic tank at the rear of the house (Figure 5).

**November 22, 2011:** DNREC contacted homeowner (Tim Carrington 302-382-9649) and recommended he call DeIDOT. DeIDOT confirmed with Mr. Carrington that DeIDOT intends to plug the pipe and any potential problems that may occur from back-ups would be the homeowner's responsibility. Mr. Carrington acknowledged that he understood this and is OK with DeIDOT plugging pipe.



**Figure 1. Aerial View**



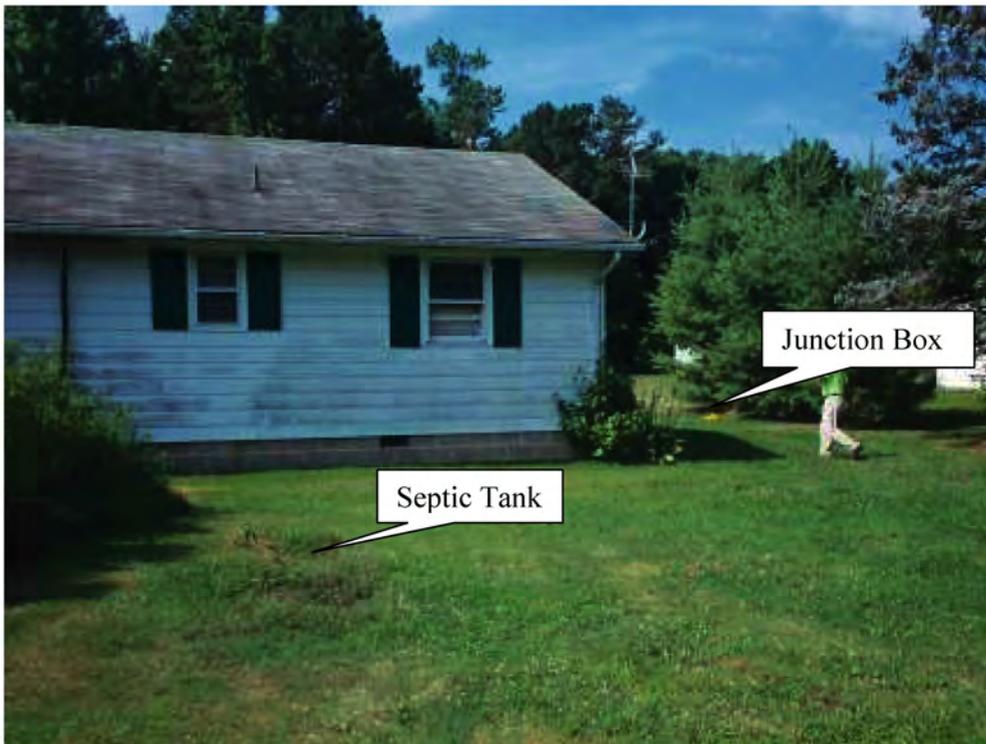
**Figure 2. Landscape**



**Figure 3. Structure View**



**Figure 4. Junction Box**



**Figure 5. Septic Tank / Junction Box**

# 2777 Andrewsville Road PID



● INLET	■ CULVERT	◆ SWALE VERTEX	■ Bay Saver	■ Filter Strip
● MANHOLE	◆ SWALE END	— Ditch	■ Biofiltration	■ Infiltration Basin / Trench
● OUTFALL	■ JUNCTION BOX	— Pipe	■ Biofiltration & Bioretention	■ Sand Filter
■ RISER	× DUMMY NODE	— Hydraulic Connection	■ Bioretention	■ Sediment Forebay
			■ Dry Pond	■ Storm Filter
				■ Wet Pond
				■ Wet Pond / Wetland



**NPDES  
Inventory Map**  
1 in. = 104 ft.





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

CAROLANN WICKS, P.E.  
SECRETARY

June 14, 2011

## NOTICE OF POTENTIAL ILLEGAL DISCHARGE

**Timothy O. & Angela F. Carrington**  
2777 Andrewsville Road  
Harrington, Delaware 19952

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. Upon inspection, KCI Technologies, Inc. found a 4 inch pipe with what appears to have a sewage discharge and odor. KCI Technologies, Inc. along with Tri State Utilities will be conducting an inspection with a camera to determine the origin of this 4 inch pipe leading into a catch basin in front of 2777 Andrewsville Road. If you have any questions regarding this matter please contact:

Bruce Thompson  
KCI Technologies, Inc.  
1352 Marrows Road, Suite 100  
Newark, DE 19711  
(302) 731-9176 (voice); (302) 731-7807 (fax)  
bruce.thompson@kci.com

Thank you for helping us preserve Delaware's environment.





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.

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Bruce Thompson  
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1352 Marrows Road, Suite 100  
Newark, DE 19711  
(302) 731-9176 (voice); (302) 731-7807 (fax)  
[bruce.thompson@kci.com](mailto:bruce.thompson@kci.com)

Thank you for helping us preserve Delaware's environment.





## MEMORANDUM

**TO:** Randy Cole  
Environmental Program Manager  
DelDOT Stormwater Quality Program

**FROM:** Matthew Ortynsky  
Environmental Scientist

**DATE:** April 8, 2011

**SUBJECT:** 2777 Andrews ville Road PID  
Structure No. 520110114081352  
Agreement 1495 / KCI Project 0203019H

---

**The purpose of this Memo** is to summarize the investigation of a potential illicit discharge at 2777 Andrews ville Road.

While performing Agreement 1354 Re-inspections, a Century field crew identified a potential illicit discharge (PID) located at 2777 Andrews ville Road. Century field crews observed what appeared to be clumps of toilet paper and cloudy water in the bottom of Structure ID No. 520110114081352. A strong sewage odor was also observed. Alex Schmidt from Century notified Bruce Thompson of KCI on Tuesday March 15, 2011 of this PID.

On Thursday March 24, 2011, KCI field crews inspected the catch basin and noticed a 4" clay pipe with a small amount of cloudy discharge. There appeared to be clumps of toilet paper in the bottom of the catch basin and a strong sewage odor was observed. KCI collected a sample to be tested. The sample tested high for levels of ammonia, detergents, and turbidity. KCI was unable to pin point the source of the discharge, but it is suspected that the discharge is coming from a septic tank overflow. KCI will retest the discharge in the future.

On Thursday April 7, 2011, KCI field crews conducted a follow up visit on the catch basin. KCI observed a strong sewage odor and collected another sample to be tested. The sample tested high for levels of ammonia, detergents, turbidity and phenols. Phenols were undetected on Thursday March 24, 2011, but tested high during the follow up visit.

KCI contacted Randy Cole on April 8, 2011 to relay the field investigation observations. Randy stated that DelDOT will evaluate this issue and determine the appropriate action.



**Figure 1. Landscape**



**Figure 2. Structure View**

Structure 420121101135958

32772 Bi-State Boulevard

Laurel, DE 19956



**DELDOT AGR. 1613 / KCI 17121613A**  
**POTENTIAL ILLICIT DISCHARGE INVESTIGATION**  
**DOCUMENTATION CHECKLIST**

PID Structure No(s).      420121101135958

Subdivision:              N/A

PID Address:              32772 Bi-state Boulevard

City:                        Laurel

Zip Code:                 19956

**PHOTOGRAPHS:**

- |                                     |           |          |
|-------------------------------------|-----------|----------|
| <input checked="" type="checkbox"/> | Landscape | Required |
| <input checked="" type="checkbox"/> | Structure | Required |

**DOCUMENTATION ATTACHED:**

- |                                     |  |                   |
|-------------------------------------|--|-------------------|
| <input checked="" type="checkbox"/> | IDDE Tracking Form                           | Required          |
| <input checked="" type="checkbox"/> | Location Map from NPDES Map Viewer           | Required          |
| <input checked="" type="checkbox"/> | Dry Weather Flow Field Test Sheet            | Required for Flow |
| <input checked="" type="checkbox"/> | Summary Memorandum with Photographs          | Required          |
| <input type="checkbox"/>            | Door Hanger                                  | As Applicable     |
| <input checked="" type="checkbox"/> | Notice of Potential Illegal Discharge Letter | As Applicable     |
| <input checked="" type="checkbox"/> | OTHER:                                       |                   |
|                                     | ○ Property Tax Parcel Information            |                   |
|                                     | ○ 01-08-13 Telephone Memorandum              |                   |



## TELEPHONE MEMORANDUM

**TO:** The Files

**FROM:** Bruce Thompson

**DATE:** January 8, 2013

**TIME:** 11:50 AM

**SUBJECT:** **Potential Illicit Discharge – Sussex County**  
**32772 Bi-State Boulevard, Laurel DE 19956**  
**Structure 420121101135958**  
Agreement 1613 / KCI Project 17121613A

---

**The purpose of this Telephone Memo** is to summarize the conversation between Bruce Thompson and Mr. Massey, homeowner at 32772 Bi-State Boulevard in Sussex County.

The following items were discussed:

- Mr. Massey received the IDDE Notice delivered via FedEx.
- Mr. Massey was not aware of the pipe in the catch basin in front of his house.
- Mr. Massey stated the pipe in the catch basin was connected to the washer and the sink in the house by the previous homeowner.
- Mr. Massey will fix the situation and notify Bruce Thompson when it is repaired. He anticipates this repair to be completed by the end of February 2013.
- Bruce Thompson stated that KCI field staff will come out to inspect the catch basin upon notification by Mr. Massey of repair.
- Bruce Thompson stated that DelDOT would eventually plug the pipe in the catch basin.



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

SHAILEN P. BHATT  
SECRETARY

December 12, 2012

### 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: 12/04/12      Outfall No: 420121101135958      Address: 32772 Bi-state Boulevard  
Laurel, DE 19956

Indicators or Source: 4" connection; discharge has strong sewage smell; gray disintegrated paper; tested high for turbidity, detergents and ammonia.

- 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 (voice); (302) 731-7807 (fax)  
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](mailto:randy.cole@state.de.us).

Thank you for helping us preserve Delaware's environment.



## Lydia Hill

---

**From:** trackingupdates@fedex.com  
**Sent:** Friday, December 14, 2012 4:10 PM  
**To:** Lydia Hill  
**Subject:** FedEx Shipment 794280103707 Delivered

---

This tracking update has been requested by:

Company Name: KCI Technologies, Inc.  
Name: Bruce R. Thompson  
E-mail: [bruce.thompson@kci.com](mailto:bruce.thompson@kci.com)

---

Our records indicate that the following shipment has been delivered:

Reference: 99909-00 P916  
Ship (P/U) date: Dec 12, 2012  
Delivery date: Dec 14, 2012 4:05 PM  
Sign for by: Signature not required  
Delivery location: LAUREL, DE  
Delivered to: Residence  
Service type: FedEx 2Day  
Packaging type: FedEx Envelope  
Number of pieces: 1  
Weight: 0.50 lb.  
Special handling/Services: Deliver Weekday  
Residential Delivery  
Tracking number: [794280103707](https://www.fedex.com/track/794280103707)

Shipper Information  
Bruce R. Thompson  
KCI Technologies, Inc.  
1352 Marrows Road  
Suite 100  
Newark  
DE  
US  
19711

Recipient Information  
Harley Pete and Norma Jean Massey  
32772 Bi State Boulevard  
LAUREL  
DE  
US  
19956

Please do not respond to this message. This email was sent from an unattended mailbox. This report was generated at approximately 3:09 PM CST on 12/14/2012.

To learn more about FedEx Express, please visit our website at [fedex.com](http://fedex.com).

All weights are estimated.

To track the latest status of your shipment, click on the tracking number above, or visit us at [fedex.com](https://www.fedex.com).

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Thank you for your business.





## MEMORANDUM

**TO:** Randy Cole, DelDOT

**FROM:** Matt Ortynsky, KCI

**DATE:** December 5, 2012

**SUBJECT:** **Potential Illicit Discharge – Sussex County**  
**32772 Bi-State Boulevard, Laurel DE 19956**  
**Structure 420121101135958**  
Agreement 1613 / KCI Project 17121613A

---

**The purpose of this Memo** is to summarize the field investigations regarding a Potential Illicit Discharge (PID) at 32772 Bi-State Boulevard in Sussex County. The following documentation is attached:

- Location Map from Map Viewer
- 11-28-12 CEI IDDE Tracking Form and Camera on a Stick Photograph
- 12-04-12 KCI IDDE Field Data Sheet
- General Information from <http://www.sussexcountyde.gov/e-service/propertytaxes/taxsearch/index.cfm?CFID=8299225&CFTOKEN=97100465>

**November 28, 2012 - CEI Agr. 1591 Routine Drainage Inventory:** CEI field staff observed a catch basin in front of the above address (see attached Map) with a 4” pipe that appeared to be connected from the residence to the storm drain. Cloudy water with a sewage smell was observed in the bottom of the basin (see attached 11-28-12 IDDE Tracking Form).

**December 4, 2012 – KCI Agr 1613 PID Investigation:** KCI field staff visited the above catch basin and recorded the following observations:

- There is a 4” pipe in concrete wall that appears to originate from the residence.
- No flow was observed from the 4” pipe.
- At the bottom of the catch basin was stagnant gray, cloudy water, combined with wads of disintegrated paper, and a strong sewage smell.
- The sample collected from the stagnant water at the bottom of the catch basin tested high for turbidity, detergents and ammonia. The total rating was 16 (see attached field sheet).
- The second sample collected for the re-visit (between 4-24 hours) also tested high for turbidity, detergents and ammonia. The total rating was 16 (see attached field sheet).

**32772 Bi-State Boulevard - Structure 420121101135958 in Foreground**



**Structure 420121101135958 with 4" Tie-In**



**4" Tie-In with Gray Disintegrated Paper**



**Gray Disintegrated Paper with Strong Sewage Smell in Upstream end of Conveyance**



**Possible Septic Tank in Back Yard along Gravel Driveway approximately 100 feet  
from Structure 420121101135958**



**Looking from Possible Septic Tank to Structure 420121101135958**

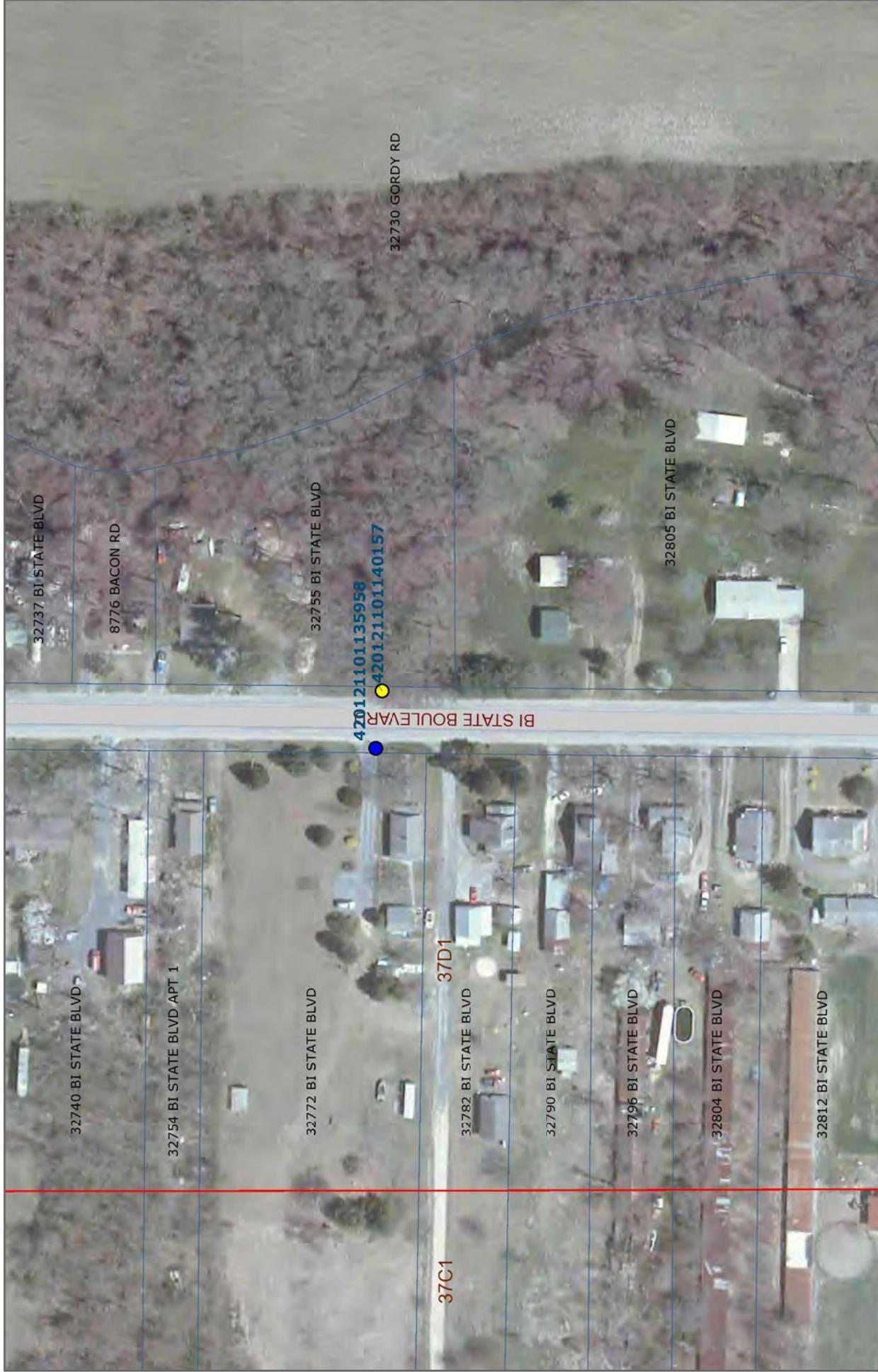


**Pipe coming into Structure 420121101135958  
probably from Residence at 32772 Bi-State Boulevard, Laurel DE 19956**



# Structure

420121101135958



**Legend**

	INLET		RISER		SWALE END		DITCH
	MANHOLE		JUNCTION BOX		SWALE VERTEX		PIPE
	OUTFALL		CULVERT		DUMMY NODE		HYDRAULIC CONNECTION
	BMP		WORK ORDER				

**NPDES Inventory Map**

3 Dec, 2012

0 60 120 240 Feet

**DeIDOT**

## Illicit Discharge Incident Tracking Sheet

**Date:** 11/28/2012 **Logged by:** J. Widerman **Contact #:** 302-734-9188 **Incident ID:**

<b>Caller contact information:</b> Logged during routine drainage inventory	Subdivision: N/A County: Sussex ADC Map No./Grid: 37 D1
--	---

**Incident Location**

Primary Location Description

<input checked="" type="checkbox"/> Storm drain	<input type="checkbox"/> Outfall	<input type="checkbox"/> Other _____
<input type="checkbox"/> In stream	<input type="checkbox"/> Along bank	
<input type="checkbox"/> Stormwater pond	<input type="checkbox"/> Upland	

---

Outfall / inlet ID# : 420121101135958

Closest street address: 32772 Bi-state Boulevard  
Laurel, DE

Watershed name: Broad Creek                      Impacted Stream name: Rossakatum Branch

Nearby landmark: In front of residence (32772 Bi-State Boulevard)

**Narrative description of location**

In catchbasin in front yard of residence at 32772 Bi-State Boulevard.

**Description of problem**

**Visual**

- |  |   |
|--|---|
| <input type="checkbox"/> Oil / Oil sheen   | <input type="checkbox"/> Soap   |
| <input type="checkbox"/> Paint             | <input type="checkbox"/> Flotables (toilet paper, etc.)                       |
| <input type="checkbox"/> Algae             | <input type="checkbox"/> Dead fish  |
| <input checked="" type="checkbox"/> Cloudy | <input type="checkbox"/> Flow -----> Precipitation in last 48-hours? Yes / No |
| <input type="checkbox"/> Anti-freeze       |   |
| <input type="checkbox"/> Yard waste        | <input checked="" type="checkbox"/> Other <u>Black scum</u>                   |

**Odor**

- |  |   |                                  |
|--|---|----------------------------------|
| <input checked="" type="checkbox"/> Sewage | <input type="checkbox"/> Sulfide ("rotten egg") | <input type="checkbox"/> Gas/oil |
| <input type="checkbox"/> None              | <input type="checkbox"/> Other (describe) _____ |                                  |

**Narrative description/comments of problem**

4" diameter pipe appears to leave residence and connects to storm drain. Cloudy water has collected in bottom of basin. Strong stagnant water smell. Appears to be a washing machine connection or basement sump connection.

**Plan of Action (check all that apply)**

- |  |  |   |
|--|--|---|
| <input checked="" type="checkbox"/> Sample | <input type="checkbox"/> Contact DNREC | <input checked="" type="checkbox"/> Contact NPDES Manager |
| <input checked="" type="checkbox"/> Photos | <input type="checkbox"/> Door hangers  | <input checked="" type="checkbox"/> GPS Coordinates       |
| <input type="checkbox"/> Other (describe)  |  |   |

**Follow-up Action**

Photos and GPS coordinates taken. Suggest notification of NPDES manager and sampling to determine nature of effluent.



Pipe coming into the basin from the residence on Bi-State Boulevard



**DELDOT AGREEMENT 1613  
DRY WEATHER SCREENING / PID FIELD SHEET**



Structure Number: 420121101135958  
 County: SUSSEX  
 Subdivision: N/A  
 Address/Location: 32772 Bi-state Blvd.

Personnel	MD/LH			
Date	9:30 AM			
Time	12-04-12			
Digital picture	Yes(Y), No(N)		YES	
Air Temperature	(F)		63°	
Date Last Rain >0.10"	11-27-12			
Outfall Dimensions	(inches)		4"	
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/Sample 1	SAMPLED STAGNANT POOL Yes(Y), No(N)		N	
Flow Source	APPEARS TO BE FROM RESIDENCE			
Sample 2 Date/Time	(if Sample 1 = Total Rating ≥4; collect w/in 4-24 hrs)		12-04-12 1:30 PM	
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)			
<b>WATER QUALITY PARAMETERS</b>	<b>Sample 1</b>	<b>Rating</b>	<b>Sample 2</b>	<b>Rating</b>
Water Temperature (F)	55.3	—	56.4	—
Flow Rate (cfs)	<0.022 cfs=0; ≥0.022 cfs=4	<0.022 0	<0.022 0	0
pH (units)	4.5-8.5=0; change ≥ 2=1, <4.5=4; >8.5=4	6.85 0	6.88 0	0
Phenol (mg/L)	<0.3=0; ≥0.3=4	0 0	0 0	0
Chlorine (mg/L)	<0.5=0; ≥0.5=4	0 0	0 0	0
Detergent (mg/L)	<0.2=0; 0.2-0.4=1; ≥0.5=4	>1.3 4	>1.3 4	4
Copper (mg/L)	<0.01=0; ≥0.01=4	0 0	0 0	0
Ammonia (mg/L)	<0.05-0.1=0; ≥0.1-1.0=1 >1.0-2.99=2; ≥3.0=4	2.6 2	2.8 2	2
Turbidity (ntu)	0-10=0; 11-40=1; 41-150=3; >150=4	28.88 1	31.24 1	1
Odor	None(N)=0, Rancid-Sour(RS)=4, Gas(G)=4 Sewage(S)=4, Oil(O)=4, Sulfur(S)=4, Other(O-explain)	S 4	S 4	4
Deposits/Stains	None(N)=0, Sediment(S)=2 Oil(OY)=3, Other(O-explain)	0 0	0 0	0
Color	Clear(C)=0, Gray(G)=1, Red(R)=1, Yellow(Y)=1 Brown(B)=1, Green(GR)=1, Other(O-explain)	G 1	G 1	1
Floatables	None(N)=0, Trash(T)=2 Oil Sheen(OS)=4, Sewage(S)=4, , Other(O-explain)	S 4	S 4	4
<b>TOTAL RATING =</b>	16		16	

STRONG SEWAGE SMELL - GRAY DISINTEGRATED PAPER



- Government
- Residents
- Visitors
- Business
- Online Services
- About

Home > Online Services > Property Tax Information > Tax Search > General Information

Font size: [A](#) [A](#) [A](#)

## General Information

### PROPERTY DETAILS

- [General Information](#)
- [Payment Status](#)
- [Appraisal & Assessment Info](#)
- [Sales Info](#)
- [Property Description](#)
- [Council District](#)
- [Tax Summary](#)
- [County Taxes](#)
- [School Taxes](#)
- [Change Billing Address](#)
- [Map of Property](#)

<b>District-Map-Parcel:</b>	3-32 3.00 13.00
<b>Owner(s) Names</b>	MASSEY , HARLEY PETE JR & NORMA JEAN
<b>Property Address</b>	OSCAR EVANS PLOT, LOTS 1-4,W/RT. 13A,
<b>Billing Address</b>	32772 BI STATE BLVD LAUREL , DE 19956
<b>Land Use</b>	Residential, Single dwelling & lot
<b>Zoning</b>	Agricultural/Residential
<b>Town/Municipality</b>	-No Town or Municipality Specified-
<b>Fire District(s)</b>	Laurel Fire District
<b>Tax Ditch(es)</b>	-No Ditch Records-
<b>Sewer/Water District</b>	-No Sewer Records-

SEARCH

Quick Links

# Illicit Discharge Incident Tracking Sheet

**Date:** \_\_\_\_\_ **Logged by:** \_\_\_\_\_ **Contact #:** \_\_\_\_\_ **Incident ID:** \_\_\_\_\_

**Caller contact information:**  
DeIDOT NPDES Program Manager Randy Cole  
Subdivision: Sharpley  
County: New Castle County  
ADC Map No./Grid: 3F12

**Incident Location**

Primary Location Description  
 Storm drain                       Outfall                       Other \_\_\_\_\_  
 In stream                               Along bank  
 Stormwater pond                       Upland

Outfall / inlet ID# :                      60570

Closest street address: 102 Whitby Drive

City:                      Wilmington

Watershed name: Brandywine-Christina                      Impacted Stream name: Brandywine Creek

Nearby landmark:

**Narrative description of location**

**Description of problem**

**Visual**  
 Oil / Oil sheen                       Soap  
 Paint                                       Floatables (toilet paper, etc.)  
 Algae                                       Dead fish  
 Cloudy                                       Flow  
 Anti-freeze                               Precip w/in 72 hrs  
 Yard waste                               Other \_\_\_\_\_

**Odor**  
 Sewage                                       Sulfide ("rotten egg")                       Gas/oil  
 None                                       Other (describe) \_\_\_\_\_

**Narrative description/comments of problem**

Leaves were reported to have been dumped in a catch basin.

**Plan of Action (check all that apply)**

Sample                       Contact DNREC                       Contact NPDES Manager  
 Photos                       Door hangers                       GPS Coordinates  
 Other (describe)

**Follow-up Action**

No Further Action Required.

**DELDOT AGR. 1613/KCI 17121613A**  
**DRY WEATHER SCREENING/POTENTIAL ILLICIT DISCHARGE**

Date: Nov 9, 2012 and Nov 13, 2013

Structure No(s): 60570

County: New Castle

Subdivision: Sharpley

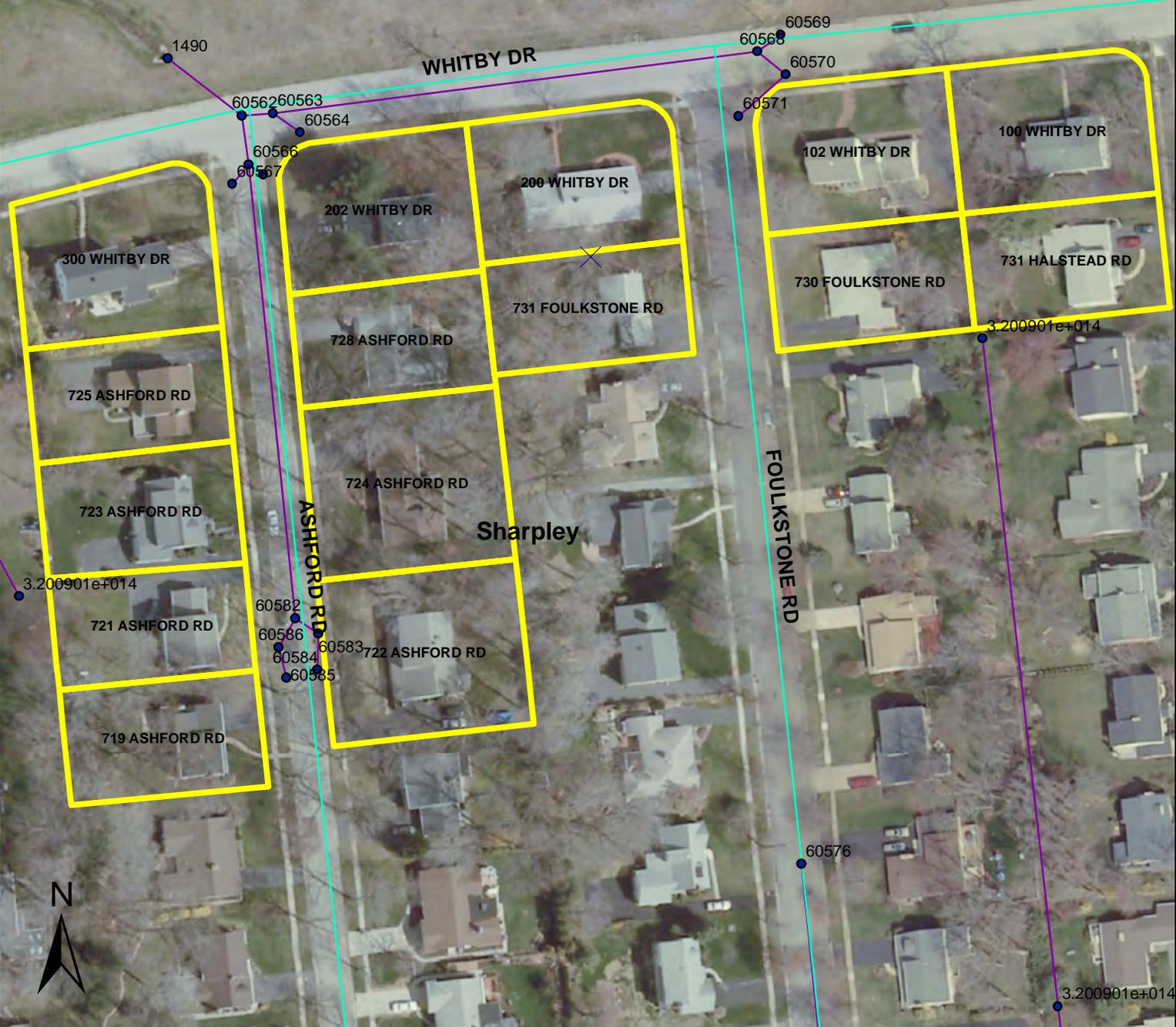
Address: 102 Whitby Drive

Determination: Leaves were found in the catch basin at 102 Whitby Drive. Door hangers were left at 15 houses in the surrounding area.



# Sharpley NPDES Doorhanger Distribution - 11/13/12

New Castle County



**Appendix E.** Guardrail Vegetation Management Article



By Susan Barton  
Contributing Author

# Guards lose cover

Study finds most effective way to treat guardrails

**F**or the past 50 years or more, mowing and herbicides have been the predominant methods used to manage nationwide roadside vegetation.

New environmental laws, reduced budgets and increased public interests necessitate finding more environmentally sensitive methods, incorporating new technologies, incurring lower maintenance costs and finding cost-effective alternatives to today's methods of management of roadside vegetation. The Delaware Department of Transportation (DelDOT) is committed to reducing pesticide use in their transportation rights-of-way and therefore funded a study to look at various options for controlling vegetation under guardrails while maintaining functionality.

## A variety of ways

The area adjacent to the guardrail must be kept clear of vegetation to allow clear visibility of the barrier. Robert Moosmann of Maine DOT explained that control of vegetation under and behind guardrails would restrict the buildup of debris, which includes sand and sediment that prevent proper sheet flow of water off the road surface. With unmanaged vegetation, rills develop behind the guardrail as water channels to points of least resistance and results in erosion. But low-growing grasses planted under guardrails can increase biofiltration of storm-water runoff.

Some states use mowing and hand trimming (mechanical control) as their primary management tool. Mowing, while evaluated as the most cost efficient currently available option in a California study, is often not



**Left to right:** U-Teck WeedEnder standard cut, U-Teck WeedEnder custom cut, Universal Weed Cover, Traffix. All are guardrail treatments studied in Delaware.

feasible because of mower size and the inability to maneuver the mowing head around and under the guardrails. Hand trimming is time consuming and labor intensive as well as dangerous because of operator exposure working between traffic and the barriers.

With cultural control, a plant species is established that will compete with and suppress growth of the unwanted brush. A dense stand of low-growing plants is referred to as living mulch. White clover was tested as living mulch but did not establish successfully enough to compete with weeds. Where maintenance with residual herbicides has been practiced over a number of years, the lingering presence of residual herbicides may limit desirable plant growth, favoring the most aggressive and often undesirable species. Creating and encouraging stable, low-maintenance vegetation is a more permanent vegetation-management strategy and should be the goal for all rights-of-way. Weed-control mats (fiber and rubber)

have been tested in some states, and concerns about joint sealing and molding around guardrail posts providing an opportunity for weed growth have been identified. Washington state tested several weed barriers and found a need for annual cleaning to remove accumulation of organic and inorganic debris. Without this debris removal, the organic buildup starts to grow grass and weeds. Although prohibitively expensive for normal guardrail locations, on sites where herbicide use is restricted, weed barriers may provide a viable option.

Herbicides are considered to be the cheapest and most efficient method of vegetation control. Two applications of herbicide are often sufficient to effectively treat weeds for a season. There also are many environmental, health and logistical problems with herbicide use. Herbicide spray trucks hamper traffic flow, often requiring a lane closure and causing traffic delays. Herbicide application is sensitive to weather conditions—herbicides cannot be applied on rainy or windy days. Human health risk is a concern, and protective equipment must be used



**In Delaware, zoysiagrass** appears to be competitive enough to prevent weed incursion, at least in the first year of establishment.

**Table 1. DeIDOT Treatments Under Guardrails**

<b>Three herbicide formulations</b>
<i>Formulation 1</i> - standard DeIDOT New Castle County formulation comprised of DuPont Karmex DF Herbicide (diuron), BASF Plateau (imazapic ammonium salt), Dow AgroSciences Accord XRT (glyphosate), BASF Pendulum (pendimethalin)
<i>Formulation 2</i> - sensitive areas formulation comprised of BASF Plateau (imazapic ammonium salt), Dow AgroSciences Accord XRT (glyphosate), BASF Pendulum (pendimethalin)
<i>Formulation 3</i> - Dow AgroSciences Accord XRT (glyphosate)
<b>Four weed-control barriers</b>
<i>U-Teck WeedEnder standard installation</i> (a permeable recycled fiber material)
<i>U-Teck WeedEnder custom installation</i> (a product designed to reach the road edge and accommodate variances in post width)
<i>Universal Weed Cover</i> (a semi-rigid panel made of 100% recycled plastic)
<i>TraFFix</i> (a rubber mat with three punched guardrail cutouts for flexible installation)
<b>Competitive vegetation</b>
Low fescue
Zoysia seed
Zoysia sod
<b>Hand trimming</b>
<b>Pavement under guardrail</b>



Irregular edge between herbicide-treated guardrail zone and median vegetation.

**Table 2. DeIDOT Suitability Rating and Weeds Rating Summarized by Treatments for 2011**

Treatment	DeIDOT suitability	Weeds
U-Teck WeedEnder standard cut	3.38	2.75
U-Teck WeedEnder custom cut	4.87	4.58
TraFFix	4.20	3.93
Low fescue	4.20	3.45
Zoysiagrass sod	4.93	4.47
Zoysiagrass seed	4.00	2.27
Hand trim	3.73	2.78

by applicators. Dead vegetation after the use of herbicides can be unsightly. Bare-ground herbicides can increase the risk of erosion and usually results in an uneven line between bare ground and living vegetation, which is unsightly. Herbicides are a tool in integrated vegetation management, but high ecological costs, high sociological costs and short-term, temporary benefits are prompting vegetation managers to look for alternatives.

### Plotting for improvement

Most states use a mixture of vegetation-control methodologies. Site-specific procedures are selected rather than policy that applies to the entire state. The department of transportation can then utilize a geographic information system (GIS) to map populations and preserve desirable roadsides while managing undesirable vegetation. The first step is to decide if vegetation control is required based on surface-drainage issues; subsurface drainage issues; storm-water management; pavement breakup; visibility for safety; worker safety; fire starts; landscape design; wildlife road kill; and structural deterioration of guardrails. If control is required, feasibility of alternatives (mechanical, cultural, biological and chemical) is considered. Finally, criteria can be developed to identify highly sensitive areas that warrant finding workable alternatives to conventional maintenance even if costs increase.

In April 2008, 24 guardrail plots were selected on Delaware roadsides based on the presence of guardrail with low-growing existing vegetation, as well as accessibility for treatment and data collection. Treatments included three formulations of herbicide, four weed barriers, hand trimming, pavement, low fescue turf, zoysiagrass and a control (Table 1). There were three replications of each treatment located at different sections of guardrail and split between the two sites.

Low fescue plots were established using a low fescue blend (Silverlawn Creeping Red Fescue [34.46%]), Discovery Hard Fescue (27.34%), Rescue 911 Hard Fescue (27.32%) and Annual Ryegrass (9.98%), and were

hand trimmed as needed to meet DeDOT's safety requirements. Low fescue plots were spot-treated with herbicides as needed in order to reduce competition during the establishment period. Zoysiagrass plots were seeded with Compadre zoysiagrass. Zoysiagrass sod plots were prepped by raking out debris and digging out the soil so the sod could be installed level with the road surface and surrounding median turf. Hand-trimmed plots were trimmed as needed to maintain vegetation below the top of the guardrail. Hand trimming varied from year to year based primarily on rainfall. There was no vegetation-management strategy employed on the control treatment.

Plots were observed monthly during the growing season, and were assessed for compliance with DeDOT guardrail standards and the weed level present. A DeDOT acceptability rating was taken as an assessment of how well the plot conformed to DeDOT's requirement of a clear guardrail on a scale of 1-5 (1 = guardrail completely obscured; 2 = vegetation covering most of guardrail; 3 = vegetation taller than guardrail in spots; 4 = vegetation starting to grow taller than guardrail in spots; 5 = no



When you consider amortization over a 10-year lifespan, weed-control barriers are still the most expensive vegetation-control option under guardrail.

vegetation near guardrail). A weeds rating was assigned on a scale of 1-5 (1 = completely overgrown with weeds; 2 = a high level of weeds present; 3 = moderate weeds present; 4 = a few weeds present; 5 = no weeds present).

### Optimal options

Vegetation management of some kind is necessary to keep guardrails from being obstructed. Guardrails were still visible for the first year with no treatment, but early in the growing season of the second year they were obstructed.

Herbicides have been the traditional method of vegetation control in Delaware. The standard DeDOT guardrail formulation (DuPont Karmex DF Herbicide [diuron]), BASF Plateau (imazapic ammonium salt), Dow AgroSciences Accord XRT (glyphosate) and BASF Pendulum (pendimethalin) is used in most places, and an alternative formulation of BASF Plateau

(imazapic ammonium salt), Dow AgroSciences Accord XRT (glyphosate) and BASF Pendulum (pendimethalin) is used in sensitive areas. Both provided adequate vegetation control when applied once a year. A third formulation (Dow AgroSciences Accord XRT [glyphosate]) did not adequately control vegetation. Herbicide treatments result in bare ground for most of the year. Erosion can be a problem when bare ground is maintained. After treatment, a brown zone of vegetation exists below the guardrail and can be unsightly, especially when spray drift or misapplication results in an uneven treatment edge.

We know that herbicides will prevent roadside vegetation from interfering with the guardrail and provide an inexpensive control option (Table 3). The goal of this project was to find a more environmentally satisfactory alternative to herbicide

**Table 3. Cost Comparison of Guardrail Treatments in Delaware (per 100 linear ft of guardrail)**

Treatment	Installation cost	Yearly maintenance cost	Installation cost (amortized over 10 years)	Total yearly cost (incl. amortized installation cost)
Standard herbicide formulation (1)	0	\$44.92	0	\$44.92
Sensitive site herbicide formulation (2)	0	\$44.20	0	\$44.20
Accord (glyphosate)-only formulation (3)	0	\$38.58	0	\$38.58
U-Teck WeedEnder standard cut	\$1789.52	\$24.00 <sup>1</sup>	\$178.95	\$202.95
U-Teck WeedEnder custom cut	\$2197.54	\$8.00 <sup>2</sup>	\$219.75	\$227.75
Universal Weed Cover	\$2607.00	0	\$260.70	\$260.70
TrafFix	\$2537.17	\$24.00 <sup>1</sup>	\$253.72	\$277.72
Low fescue	\$444.33	\$47.02 <sup>3</sup>	\$44.43	\$75.34
Hand trimming	0	\$24.00 <sup>1</sup>	0	\$24.00
Zoysia sod	\$1,582.28	0	\$158.23	\$158.23
Zoysia seed	\$345.28	\$16.00 <sup>4</sup>	\$34.53	\$50.53
FlightTurf	\$541.93	TBD	\$54.19	\$54.19
Control	0	0	0	0

<sup>1</sup> Includes 1.5 hand trims/100 linear ft, no herbicide treatment.

<sup>2</sup> Includes .5 hand trims/100 linear ft, no herbicide treatment.

<sup>3</sup> Includes 1.5 hand trims/100 linear ft, and 1.25 herbicide treatments/100 linear ft. (The herbicide treatment for low fescue is assumed to be required for three years until the low fescue stand becomes thick enough to outcompete other vegetation.)

<sup>4</sup> Includes 1 hand trim/100 linear ft. (This is based on only one year of data and assumed to be at least 1.5x in future years.)



Strip between weed barrier and pavement allowing weed growth.

use, so alternative control measures must compare favorably with herbicide use in terms of effectiveness, cost, environmental impact and aesthetics.

Weed-control barriers are difficult to retrofit in existing sites where the weed barrier cannot be laid true to the side of the road and on a perfectly flat surface. They are more appropriate in new road situations where grading and consistent distance between guardrail and road surface can be controlled. Vegetation growing over the surface of the barrier is not a problem, since the plants that grow over the surface are

low. Deposition of organic material on the barrier surface that supports weed growth may result in taller weed growth and is more likely to happen the longer the barrier stays in place on the road-side. Caulk is the weakest portion of the barrier and may degrade faster than the barrier fabric, resulting in breakthrough vegetation. Installation error also is a cause of barrier breakthrough. Expertise (possibly by vendors themselves) is required for installation.

Vegetation grows in open soil between the road surface and barrier when the barrier cannot abut the road

surface. The U-Teck WeedEnder custom cut product was designed to address this issue. In some guardrail situations this product can abut or overlap the road surface, but in some cases the guardrail is located too far away from the road surface to make this feasible.

Low fescue turf is used under guardrail to provide a solid low-growing ground cover that competes with other weedy plants that will grow taller and disturb the integrity of the guardrail. In 2009 and 2011, selective herbicides were used to reduce the broadleaved weed and annual grass competition. Low fescue did not establish a dense enough cover to outcompete weeds during the course of this study. Plots required hand trimming, but the low fescue plots were superior in appearance to the hand-trimmed plots, because they contained a larger percentage of desirable turf.

Zoysiagrass did not establish from seed in 2012, but zoysiagrass sod established within one month and provided a competitive cover under the guardrail. Zoysiagrass sod was competitive enough to prevent significant weed incursion during the first year after planting. It did not require mowing during the first year. Since zoysiagrass is a warm-season grass, it went dormant and turned brown in Delaware after the first frost.

Hand-trimmed plots required trimming twice a year for the first two years



The picture above shows Bermuda grass growing around guardrail beam where caulk malfunctioned.



The study revealed that zoysiagrass sod provided a competitive, low maintenance vegetative cover under guardrail.

of the study, when they were trimmed in May and September. By waiting until mid-June for the first trimming, most plots were maintained at an appropriate height for guardrail function with one hand trimming per year. On average over the four years of data collection these plots were trimmed 1.5 times a year. Hand trimming results in relatively solid vegetation under the guardrail, which reduces erosion potential and is more attractive than bare-ground treatment.

When you consider amortization over a 10-year life span, weed-control barriers are still the most expensive vegetation-control option under guardrail. They may be warranted in highly sensitive areas where herbicide use is unacceptable or other conditions warrant the complete lack of vegetation under guardrail.

Low fescue, if it is established within three years, provided a competitive enough mat of vegetation such that selective herbicides were no longer needed and competes favorably in cost per 100 linear ft with herbicide treatments. Herbicide use has not been eliminated for the first three years, but the herbicide use is selective rather than a nonselective burn-back of all existing vegetation. So, erosion is not a problem and the guardrail treatment is more aesthetically pleasing than bare ground, especially compared with an uneven treatment edge that often exists between the guardrail zone and the median vegetation with bare-ground herbicide treatment.

Hand trimming is the least expensive control method employed in this study (other than the control). This was true when DelDOT crews performed the hand trimming. If outside contractors were hired to hand trim, the cost per year would be approximately double the herbicide and low fescue treatments.

Since zoysiagrass did not establish from seed during the first year, this does not appear to be a viable establishment protocol on the roadside. Zoysiagrass sod appears to be an effective vegetative cover. North Carolina has reported that centipedegrass and zoysiagrass can

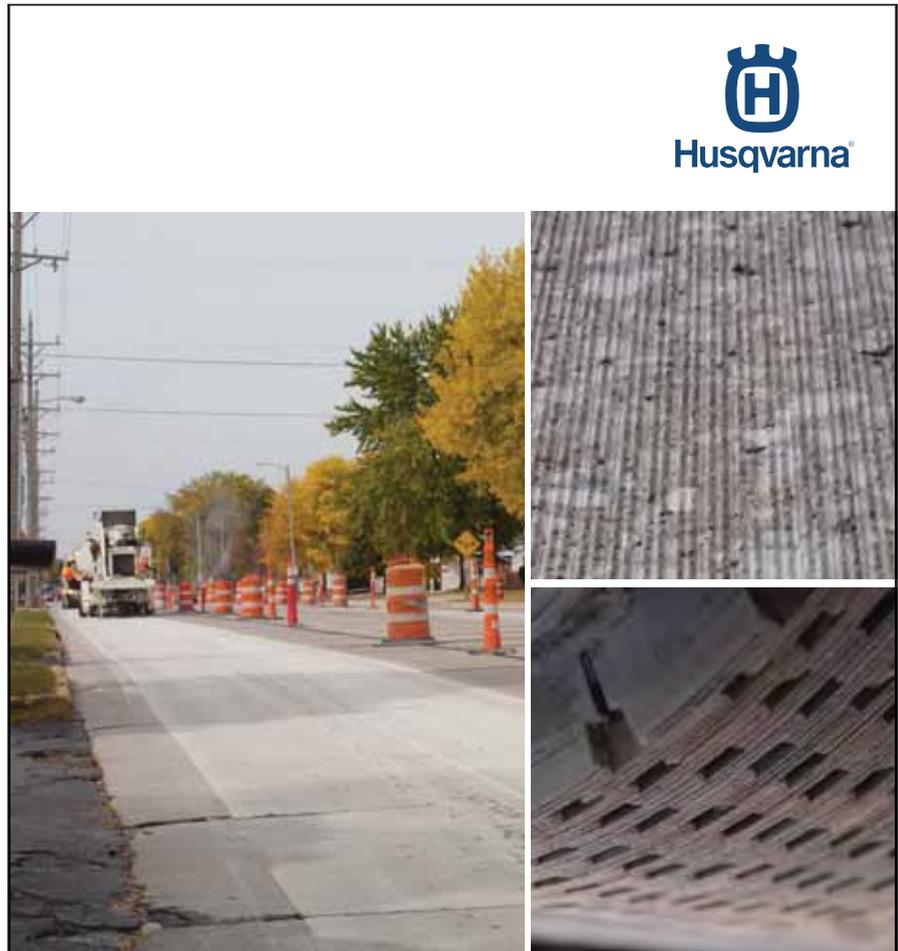
provide a stable competitive vegetation under guardrail.

In Delaware, zoysiagrass appears to be competitive enough to prevent weed incursion, at least in the first year after establishment. It will be interesting to continue observation of zoysiagrass sod plots to see how frequently hand trimming is required and if it remains competitive under the guardrail. Based

on the performance of zoysiagrass in lawns in Delaware, it is expected to start to grow into the adjacent median. **R&B**

Barton is an associate professor and extension specialist at the University of Delaware.

**For more information about this topic, check out the Maintenance Channel at [www.roadbridges.com](http://www.roadbridges.com).**



## Smooth ride.

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