

Annual Stormwater Report
Term III, Year 3: September 1, 2012 – August 31, 2013

for the
North Carolina Department of Transportation
Highway Stormwater Program

For submittal to
NC Department of Environment and Natural Resources
Division of Energy, Mineral, and Land Resources

NC Department of Transportation
NPDES Permit No. NCS000250

November 2013



Annual Stormwater Report

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Certification














"I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, 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."

Nick Tennyson
Interim Chief Operating Officer

Date



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Acronyms and Abbreviations

| | | | |
|--------|--|--------|---|
| AAH | Adopt-A-Highway | NCD&CS | North Carolina Department of Agriculture and Consumer Services |
| ACEC | America Council of Engineering Companies | NCDENR | North Carolina Department of Environment and Natural Resources |
| ARRA | American Recovery and Reinvestment Act | NCDOT | North Carolina Department of Transportation |
| BFC | Biofiltration Conveyance | NCSU | North Carolina State University |
| BMP | Best Management Practice | NCVMA | North Carolina Vegetation Management Association |
| BUA | Built-Up Area | NPDES | National Pollutant Discharge Elimination System |
| CFR | Code of Federal Regulations | NSAB | Nutrient Scientific Advisory Board |
| CPESC | Certified Professional in Erosion and Sediment Control | OGFC | Open-Grated Friction Course |
| CRA | Carolina Recycling Association | ORW | Outstanding Resource Waters |
| DCIA | Directly Connected Impervious Area | PAM | Polyacrylamide |
| DLR | Division of Land Resources | PCSP | Post-Construction Stormwater Program |
| DREE | Division Roadside Environmental Engineer | PFC | Porous Friction Course |
| DWR | Division of Water Resources | POTW | Publicly Owned Treatment Works |
| EMC | Environmental Management Commission | PSD | Particle Size Distribution |
| ESC | Erosion and Sediment Control | QAPP | Quality Assurance Program Plan |
| ESM | Environmental Sensitivity Map | REU | Roadside Environmental Unit |
| FIP | Field Inventory Program | ROW | Right-of-Way |
| FHWA | Federal Highway Administration | RUSLE2 | Revised Universal Soil Loss Equation, Version 2 |
| GI | Green Infrastructure | SCM | Stormwater Control Measure |
| GIS | Geographic Information System | SCMS | Stormwater Control Management System |
| GPS | Global Positioning System | SMP | Stormwater Management Plan |
| GREEN | Guided Reduction of Excess Environmental Nutrients | SPCC | Spill Prevention Control and Countermeasure |
| H&H | Hydrology and Hydraulics | SPPP | Stormwater Pollution Prevention Plan |
| HSB | Hazardous Spill Basin | SSIPP | Stormwater System Inventory and Prioritization Program |
| HSP | Highway Stormwater Program | TMDL | Total Maximum Daily Load |
| HQW | High Quality Waters | TS4 | Transportation Separate Stormwater Sewer System |
| I&M | Inspection and Maintenance | TSS | Total Suspended Solids |
| IDDEP | Illicit Discharge Detection and Elimination Program | UNCC | University of North Carolina Charlotte |
| IRMA | Industrial and Roadway Maintenance Activities | U.S. | United States |
| JLSLAT | Jordan/Falls Lake Stormwater Nutrient Load Accounting Tool | VCER-1 | Verification of Compliance with Environmental Regulations Checklist |
| LID | Low Impact Development | | |
| NCAC | North Carolina Administrative Code | | |





**Tanker rollover caused fuel spill
reported by WSOCTV Channel 9**



Tractor Trailer Accidents are Common Causes of Spills Along NCDOT Roadways

North Carolina Department of Transportation (NCDOT) continues to maintain its Illicit Discharge Detection and Elimination Program (IDDEP) to detect and eliminate illegal dumping, illegal drainage connections, and the illegal placement of hazardous waste materials along the state's roadway system. NCDOT employees participate in training to help enable them to identify potential illegal discharges when performing other work on the NCDOT system and report them to the Highway Stormwater Program (HSP) IDDEP Manager, who acts as the standard point of contact for the program. The continued success of this program depends on NCDOT employees detecting and reporting this type of illegal activity. From September 1, 2012, to August 31, 2013, NCDOT identified 21 new illegal discharges across the state. Of those discharges reported over the past permit year, eighty-one percent were tractor trailer fuel spills or discharges of gray water from residential dwellings. Nine occurred within the Catawba River Basin with five each occurring in the Tar-Pamlico and Neuse River Basins. These newly discovered discharges, along with past illegal discharge sites, are tracked in NCDOT's internal database and are reported as appropriate to NC Department of Natural Resources (NCDENR) Regional Offices within 30 days of each incident report date.

An example of a recent spill occurred on March 9, 2013, when an 18-wheeler overturned on the Brookshire Freeway near Charlotte, NC. It was hauling approximately 8,500 gallons of fuel and approximately 450 gallons of fuel was spilled. Hazardous materials cleanup crews worked to contain the spill, which included using inflatable pools to catch leaking fuel and absorbent materials to mop up what spilled on the ground. Workers also drilled holes into the side of the

Program Objectives

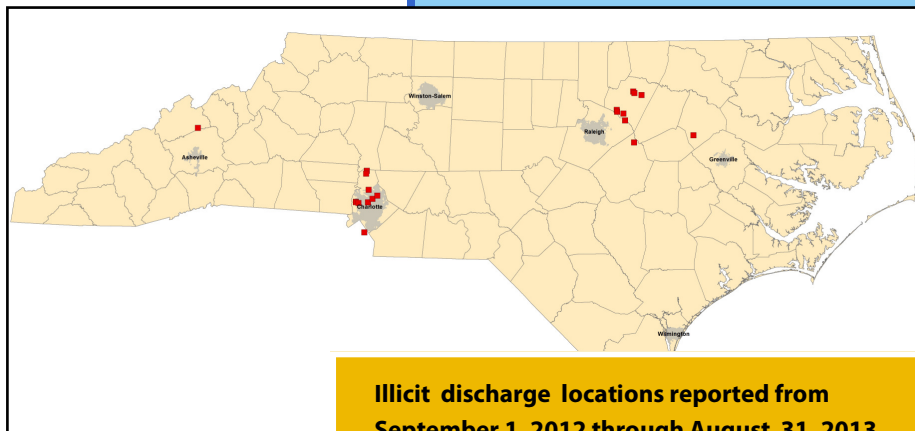
NPDES Permit Part II.A

Objectives

- i. Implement an Illicit Discharge Detection and Elimination Program to assure that the illicit discharges, spills, and illegal dumping into the NCDOT transportation separate storm sewer system (TS4) are detected and eliminated.
- ii. NCDOT shall implement appropriate procedures and actions to report illicit spills, discharges and illegal dumping for appropriate enforcement or other action by NCDENR.

Management Measures

- a. Provide illicit discharge identification training.
- b. Perform illicit discharge inspections.
- c. Maintain a standard point of contact.
- d. Report illicit discharges.
- e. Maintain a tracking database.



**Illicit discharge locations reported from
September 1, 2012 through August 31, 2013**

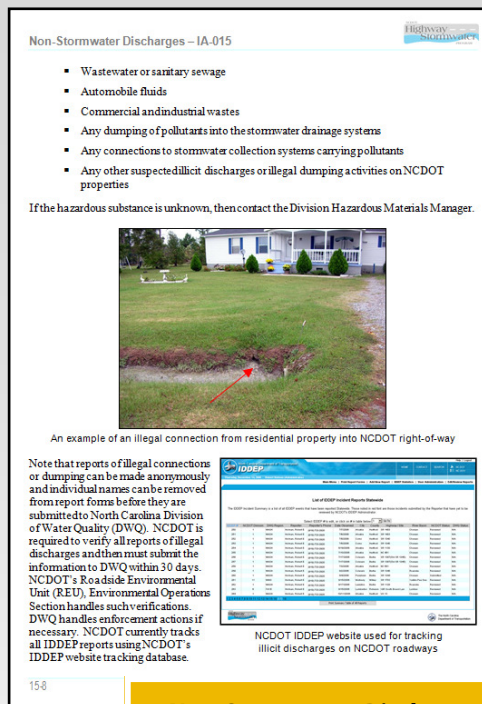


tanker to transfer fuel into a different truck. A private contractor cleaned up the fuel-soaked soil around the crash site. NCDOT was notified and the Division Hazardous Materials Manager recorded the spill following IDDEP procedures and subsequently notified NCDENR. The IDDEP manager visited the site after the clean up to be sure the materials were removed properly and vegetative cover at the site was stable.

Throughout the course of the program, NCDOT has reported more than 419 cases of illegal dumping to NCDENR. Of those 419 cases more than sixty percent were from residential sources.

Ongoing IDDEP Training

As required by Management Measures a and b from the Internal Education Program and Management Measure a from the IDDEP Program, NCDOT employees regularly receive training on how to recognize and report illicit discharges and illegal dumping activities. Training is incorporated into numerous training events, including annual Stormwater Pollution Prevention Plan (SWPPP) Implementation training and other regularly scheduled Unit and Division meetings. This training enables NCDOT employees to continue identifying, inspecting, and reporting illicit connections and illegal dumping activities across the state. During the annual SWPPP Implementation Training Workshops, NCDOT HSP instructors provided Division staff with Industrial Roadway Maintenance Activities (IRMA) Best Management Practice Guidance Manual training materials which included specific guidance on Non-Stormwater Discharges and IDDEP reporting. In addition, NCDOT continues to post Illegal Dumping educational posters at NCDOT maintenance facilities to help encourage NCDOT staff to report illicit discharges and illegal dumping activities as they perform their routine work along NCDOT roadways. Hardcopies of NCDOT's IDDEP Field Report (a form used to document observed discharges or dumps) and the "Illegal Discharge: Know What to Do" brochure are handed out during annual SWPPP Implementation training workshops to NCDOT employees and at other appropriate meetings.



Non-Stormwater Discharge Chapter of IRMA Best Management Practices (BMP) Guidance Manual, page 15-8

Tracking and Reporting Illicit Discharges

NCDOT continues to maintain a web-based tracking system and database for identified illicit connections and illegal dump sites found along NCDOT rights-of-way (ROW). When an illicit discharge is identified along NCDOT ROW, an IDDEP Field Report form is used to capture applicable information. The Division that identifies the illicit discharge typically performs a preliminary investigation to verify the identified illicit discharge. The Division notifies the IDDEP manager who verifies the location and status of the spill site with the person reporting it. He then reports the illicit discharge as appropriate to the proper NCDENR Regional Office within 30 days of the illicit discharge identification date. NCDOT has been migrating to a Microsoft SharePoint platform and the IDDEP web-based tracking system was migrated to the new platform in April 2013.

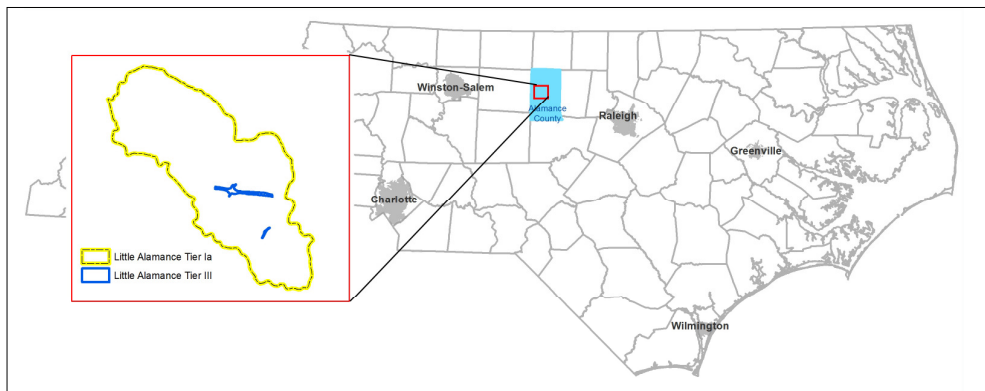


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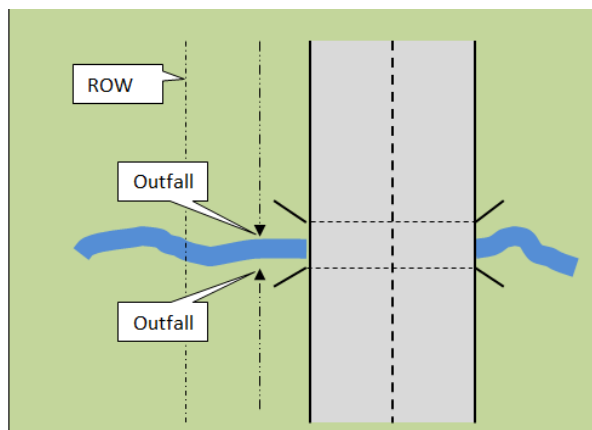


Little Alamance Creek Watershed Stormwater Outfall and Conveyance System Collection

The North Carolina Department of Transportation Highway Stormwater Program (NCDOT HSP) performed a Field Inventory Protocol (FIP) in the Little Alamance Creek Watershed to support an ongoing Category 4b Demonstration Project in collaboration with the cities of Graham and Burlington. The field effort for the task started in February 2013 and completed in May 2013; the GIS data review and FIP process document updates started months before and are still in progress.

Initially, a Tier Ia data collection was performed to identify stormwater outfalls within the Right-of-Way (ROW). This inventory includes collection of basic details of the geographic feature (e.g. size, location, comments, and owner), mapping grade global positioning system (GPS), and photographs as appropriate.

A subsequent complete conveyance system inventory was conducted for selected areas. This inventory includes detailed attribution (e.g. pipe size, pipe material, depth, lining, and widths) of the system, mapping grade GPS, and photographs as appropriate to define the connectivity of the drainage system within the study area.



Tier Ia Outfall Identification Guidance

Numerous detailed procedures, including a "Procedures Manual" and "Outfall Identification Protocol", were developed for the FIP. These procedures assisted the Little Alamance field teams and NCDOT staff to identify features in the field, manage and post process GPS data, and efficiently use field equipment and software. After field testing, some of these procedures and documents were updated to incorporate lessons learned from the field data collection.

Program Objectives and Management Measures

NPDES Permit Part II.B.1

Objectives

- Maintain the statewide NCDOT stormwater system inventory for the purpose of supporting other permit programs.
- Maintain a stormwater system Geographic Information System (GIS) to map and prioritize sensitive water crossings.
- Maintain a field inventory procedure to be used for NCDOT/DWQ-identified priority areas.

Management Measures

- Maintain a stormwater system inventory of existing stormwater outfalls to sensitive waters.
- Include in the inventory outfalls from new construction projects to all surface waters and wetlands.
- Include outfalls for NCDOT industrial facilities in the inventory.
- Develop a field outfall inventory procedure for priority areas.



Example of equipment used during the Tier III Little Alamance data gathering



Little Alamance outfall identified during the Tier Ia data gathering



Resulting data collection showing drainage system connectivity

NCDOT Maintains Outfall Inventory

NCDOT continues to maintain and update its GIS-based stormwater outfall inventory as required by the Department's NPDES permit. In Year 3, approximately twenty percent of the expected state-wide implicit outfalls from primary and secondary roadways which cross or run parallel to sensitive streams have been generated and added to DOT's Environmental Sensitivity Map (ESM). ESM is a GIS- and web-based repository of geographical information used for permitting and design planning. The ESM was also updated with the most recent roadways layer to locate outfalls from new construction. Outfalls from industrial activities were inspected and assessed as part of NCDOT's Stormwater Pollution Prevention Plan (SPPP) requirements. Newly identified outfalls were also added to the ESM.

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A thick stand of grass is established after compost seeding is applied

Compost Seeding of Critically Eroding Slopes

North Carolina Department of Transportation (NCDOT) used American Recovery and Reinvestment Act (ARRA) funds to address water quality impairments through retrofits.

A portion of these funds were made available to NCDOT Divisions for stormwater retrofits of critically eroding slopes. The retrofits consisted of repairing critically eroding slopes through vegetative practices, resulting in water quality benefits as well as transportation facility improvements. The Critically Eroding Slopes Retrofits Project involved 11 NCDOT Divisions, from the mountains to the coast.

Compost seeding, consisting of grass seed mixed with compost materials, and applied by pneumatic blower truck onto scarified bare soils, is an effective technique on eroding slopes. The compost provides the seed a soil structure where it can germinate and grow, whereas in-situ soils may be too compacted or nutrient deprived, which can restrict vegetative growth. The participating Divisions used a mixture of organic compost and various seed blends, including native and conventional grasses (annual and perennial) and some wildflowers. No additional fertilizer was applied after seeding, as the compost mixture provided sufficient nutrients and chemical composition to support seed germination and plant growth. Both the seed and compost mixtures were held to quality specifications set by the Department. More than 120 acres across the participating Divisions were compost seeded. Comparing existing conditions with proposed vegetative cover, a potential reduction in sediment loss of 29-39 tons/ac/yr was estimated. This estimate is based on sediment loss rates using soil type, slope, length of flow path, and type and density of cover using the Revised Universal Soil Loss Equation, Version 2 (RUSLE2) Program. NCDOT received a total of eight (8) non-structural retrofit credits for this project.

Program Objectives and Management Measures

NPDES Permit Part II.B.2

Objectives

- Develop, implement, and support the NCDOT program to be consistent with National Pollutant Discharge Elimination System (NPDES) post-construction control measures.
- Use retrofits to address pollutant loading from existing NCDOT activities.
- Retrofits should not be associated with meeting the requirements of any other DWQ program, unless otherwise allowed.

Management Measures

- Identify appropriate retrofit sites.
- Implement/Install BMP retrofits.



Prior to compost seeding, vegetative coverage was not well established on this slope in NCDOT's Division 2



Alamance Biofiltration Conveyance Retrofit installed in the Jordan Lake Watershed

NCDOT constructed a biofiltration conveyance (BFC) at the rest area off I-85/I-40 in Alamance County (Division 7). Biofiltration conveyances are well-suited to treating stormwater in linear environments or areas with limited space or right-of-way. BFCs are open channel seepage filtering systems that utilize a series of shallow aquatic pools, riffle weir grade controls, native vegetation, and underlying sand channels to treat, safely attenuate, and convey stormwater flows. BFCs offer benefits beyond those of conventional Stormwater Control Measures (SCMs) in terms of stormwater management, including reasonable cost, safety due to easy recovery of vehicles that accidentally go off the roadway, and aesthetics. The Alamance BFC was constructed over an existing riprap channel that receives flow from an existing 24" pipe. The BFC discharges to an unnamed tributary of Little Alamance Creek. The site is located in the Jordan Lake watershed, which is subject to the Jordan Lake Rules, a nutrient management strategy designed to restore water quality in the lake by reducing the amount of pollution entering upstream. The BFC treats runoff from impervious surfaces such as rooftops, parking areas, access drives, and sidewalks at the Alamance Rest Area. NCDOT is currently funding research on BFCs to gauge their efficacy in reducing mass and volume loading of pollutants to receiving streams. Refer to the Research Program section of this report for more information on this research project.



The Alamance Creek BFC under construction (See the Research section for another photo of this BMP)



NCDOT is required to implement management measures to meet the objectives of the BMP Retrofit Program including (1) identifying a minimum of 14 sites per year that are appropriate for retrofit installation and (2) implementing a minimum of five retrofits per year, with a total of 70 retrofits implemented over the 5-year period of the permit. A total of 10 BMP retrofits were completed in year 3 of this permit term.



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Paw Creek County Maintenance Yard Infiltration Basin Retrofit Upgrades Drainage System

One of the measurable goals of the best management practices (BMP) Retrofit Program is to identify sites with the potential to contribute significant pollutant loading to a receiving stream and that possesses suitable characteristics for installation or implementation of an appropriate retrofit. The NCDOT Maintenance Yard at Paw Creek, in Charlotte, is an example of a site that meets the description of this measurable goal. The existing site was an old sediment basin that captured runoff from the maintenance yard. The sediment basin's original corrugated metal riser structure had become rusted and deteriorated, thus it had the potential to contribute pollutants to the Catawba River which is located downstream of the site. Since the basin only needed to be modified to provide water quality benefit, it was well suited for implementation of a retrofit project. The original intent was to convert the sediment basin to a wet detention basin, however, soil infiltration tests revealed conditions suitable for infiltration. After a water budget was performed which further supported the use of infiltration, it was decided to transform the sediment basin into an infiltration basin. Infiltration basins are often preferable from a water quality perspective because they are effective at reducing a wide range of pollutants and at reducing runoff volume. The Paw Creek project exemplifies effective identification and implementation of a retrofit project.



Erosion and scouring seen in the drainage system at Paw Creek prior to the BMP upgrade (left)



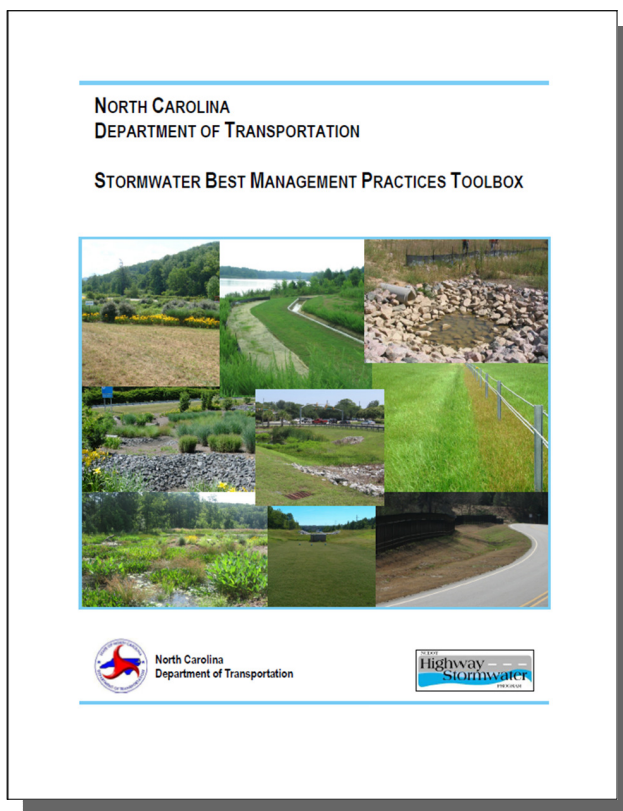
Stormwater collects in the infiltration basin during rain events but will infiltrate, reducing runoff volume (right)





Four New Chapters for the NCDOT BMP Toolbox Prepared; Discussion of Pollutant Removal Mechanisms Provided

North Carolina Department of Transportation (NCDOT) continues to maintain its *Best Management Practices Toolbox*. This toolbox is a guidance document for use by NCDOT staff and contractors which describes the critical design components and techniques for structural best management practice (BMPs) used in the linear highway system. The BMP Toolbox was first developed and approved by North Carolina Department of Environment and Natural Resources (NCDENR) in 2008. Recently, NCDOT has developed four new chapters which will be submitted to NCDENR for review in the Fall of 2013: Media Filters, Wet Detention Basins, Stormwater Wetlands, and Filter Strips.



One important component of the BMP Toolbox is the discussion of pollutant removal mechanisms each BMP uses to affect reductions in pollutant concentrations from stormwater runoff. To improve BMP design and support innovative applications, the designer should understand pollutant removal mechanisms and how they impact the design components. Some of the more common pollutant removal mechanisms are discussed briefly in Chapter 2 of the Toolbox. The table on the next page summarizes the pollutant removal mechanisms for the new structural BMPs added recently. All of these BMPs use microbially mediated transformation.

Microbial activity in stormwater control systems is a critical mechanism for removing soluble pollutants. Microbial activity can promote or catalyze reduction-oxidation (redox) reactions to decompose organic and transform inorganic constituents. Many BMPs inherently have the key elements to support a diverse microbial population, including a substrate for colonization, carbon sources and other nutrients, and moisture. For this reason, the use of microbes to treat the soluble fraction of pollutants in stormwater can be more feasible and economical than other chemical treatments.

Program Objectives and Management Measures

NPDES Permit Part II.B.3

Objectives

- Maintain and update (as necessary) a BMP Toolbox to aid in the siting, design, and construction of stormwater quality BMPs with guidance on the suitability of each for NCDOT applications.
- Evaluate BMPs for applicability to a linear highway system.
- Implement new and innovative technology on an experimental basis in keeping with the current DWQ policy on new stormwater treatment technologies.

Management Measures

- Maintain a BMP Toolbox.
- Evaluate design-related BMPs.
- Submit proposed BMP Toolbox revisions to DWQ for approval.

One of the important transformation processes facilitated by microbes in stormwater treatment is the conversion of nitrogen species as part of the nitrogen cycle. Ammonification, nitrification, denitrification, and fixation are all microbially mediated processes that are more significant to nitrogen removal than physical treatment (i.e., filtration, sedimentation).

| Name | Description | Pollutant Removal Mechanism |
|--|---|--|
| Filtration Basin (A type of Media Filter) | A type of media filter with a shallow basin, engineered media, and an underdrain system. | Filtration, sorption, microbially mediated transformation, biological uptake |
| Bioretention Basin (A type of Media Filter) | A type of media filter with a shallow basin, engineered media, an underdrain system, and landscaped vegetation. | Microbially mediated transformation, biological uptake, sorption, filtration |
| Filter Strip | A linear section of land, either grassed or forested, that physically filters and infiltrates stormwater. | Filtration, infiltration, sorption, microbially mediated transformation, |
| Wet Detention Basin | A shallow basin that maintains a permanent pool of water by using an elevated outlet control structure. | Detention, sedimentation, biological uptake, microbially mediated transformation |
| Stormwater Wetland | An engineered marsh or swamp with dense wetland vegetation. | Microbially mediated transformation, biological uptake, detention, sedimentation, sorption |

Low Impact Development and Green Infrastructure Techniques Emphasized

Whenever feasible, NCDOT prefers the use of stormwater management controls that are easy to design and maintain, provide safe transition along the right of way in case vehicles accidentally go off the roadway, and also facilitate water quality benefits. Therefore, in the recent BMP Toolbox update, NCDOT included new text that explains the use of low impact development (LID) concepts and green infrastructure (GI). The LID/GI discussion focuses on three concepts:

1. Restoring the natural hydrologic and hydraulic function of the site,
2. Using site design and small-scale source control techniques, and
3. Reducing runoff by encouraging infiltration and evapotranspiration

The recommended practices for achieving these concepts include:

- Maximize vegetative conveyance of stormwater
- Grade to encourage diffuse flow and lengthen flow paths
- Minimize directly connected impervious area (DCIA)
- Minimize diversion of stormwater
- Preserve naturally vegetated areas and soil types that slow runoff, filter pollutants, and facilitate infiltration
- Provide small scale BMPs and devices that meet regulatory and resource objectives that promote infiltration, evapotranspiration, and water harvest or reuse
- Treat pollutants where they are generated or prevent their generation

The BMP Toolbox includes several structural controls which incorporate LID principles, including Dry Detention Basins, Swales, Infiltration Basins, Media Filters, Wet Detention Basins, and Stormwater Wetlands. See the Internal Education section for more details on the new Media Filter chapter.



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Stormwater wetlands remove a variety of pollutants by temporarily storing stormwater runoff in shallow pools



Typical swale along a roadway





Before repairs - significant sediment build-up occurring in the HSB



Before repairs - significant scouring around the outlet structure

Re-design of Clayton Bypass Hazardous Spill Basins

During routine inspections of two new Hazardous Spill Basins (HSBs) on the US 70 Clayton Bypass in Johnston County, the Division Roadside Environmental Engineer (DREE) noted signs of failure. The rate of failure was unexpected, especially for newly constructed controls. The DREE contacted Environmental Operations within the Roadside Environmental Unit and the Hydraulics Unit to re-design the failing components of the HSBs. NCDOT implemented the following modifications to the HSB:

- Sealed outlet pipe
- Removed earthen berm and replace with a clay core berm
- Constructed access path for future maintenance
- Removed excessive sediment
- Enlarged forebay to capture excessive sediment received from offsite drainage

The photos show before and after repairs of the HSB.

The redesign of this stormwater Best Management Practices (BMP) is a good example of the checks and balances built into the NCDOT's inspection and maintenance program. Discovering a failing control, working with the design engineers to determine the cause of failure, executing a better design, and reconstructing the BMP represent steps of an effective inspection and maintenance program. The details of "lessons learned" from this redesign will be shared with other engineers through various meetings, conferences, and other training opportunities.



After repairs - the outlet structure was stabilized

Program Objectives and Management Measures

NPDES Permit Part II.B.4

Objectives

- Maintain a BMP Inspection and Maintenance Program to aid in the inspection, operation, and maintenance of BMPs.
- Maintain and update as necessary the BMP Inspection and Maintenance Manual.

Management Measures

- Evaluate new BMP inspection and maintenance needs.
- Evaluate BMP Inspection and Maintenance Manual.
- Implement a BMP Inspection and Maintenance Program.
- BMP Inspection and Maintenance information.



Infiltration Chamber Maintenance

In 2005, NCDOT installed 38 Infiltration Chambers in two coastal counties to address problems with localized flooding. The chambers allow the infiltration into the soil below surface, reducing flow volume as well as pollutant concentrations in stormwater runoff. Originally, the local municipalities were tasked with maintaining the chambers, which is critical in the sandy beach area as they can easily plug. NCDOT continued to perform regular inspections on the chambers. Once it was identified that adequate maintenance was not being performed, the District 1 Engineer working with the DREE for Division 3 resumed the responsibility of maintaining these stormwater control assets to protect NCDOT's investment. NCDOT's Division 3 uses a vacuum truck to clean out the chambers so that they do not become plugged, which would result in localized flooding.



An infiltration chamber used in coastal counties

Green Infrastructure Controls Included in Inventory



Permeable Pavement sidewalk at an NCDOT Rest Area facility in Division 13

NCDOT's inventory of stormwater controls, or best management practices (BMPs), has continued to expand with the current total of controls numbering over 1,500 in the Department's Stormwater Control Management System (SCMS).

There were two new BMP types added to the inventory during this calendar year: Permeable Pavement and Rain Gardens. These low impact development (LID) or green infrastructure (GI) BMP types

are starting to be installed at NCDOT rest areas. A Permeable Pavement chapter is currently being evaluated for inclusion in NCDOT's Stormwater Control Inspection and Maintenance Manual. Since permeable pavements are typically installed in non-linear environments, this control type does not have a dedicated chapter in NCDOT's BMP Toolbox.

NCDOT continues to implement its BMP I&M Program making programmatic changes where necessary to promote a sustainable program.

NCDOT

Highway — — —
Stormwater
PROGRAM

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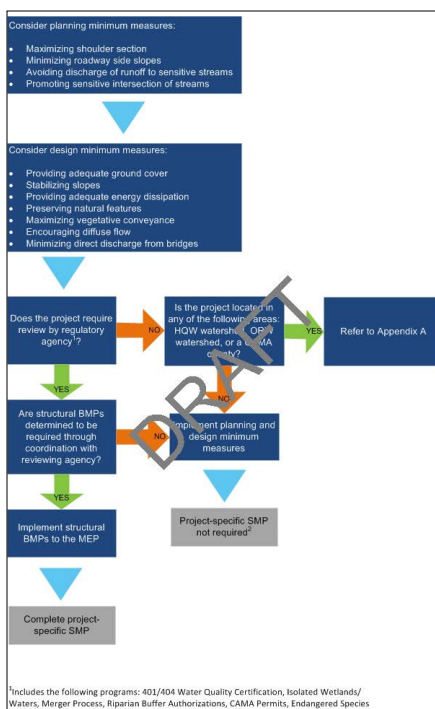
PCSP Updates

Incorporates New Workflows

In the previous year, a working group was formed to update North Carolina Department of Transportation (NCDOT's) Post-Construction Stormwater Program (PCSP) guidance document. One change was to incorporate nutrient load reduction requirements from the Falls and Jordan Lake nutrient management rules, which allow integration of full requirements with existing programs, such as NCDOT's Highway Stormwater Program (HSP). Another update was to refine the documentation methods for demonstrating compliance with existing Management Measures under NCDOT's National Pollutant Discharge Elimination System (NPDES) permit. The PCSP now provides guidance on when to use the site specific stormwater management plans (SMP) or other documentation.

Additionally, the update incorporates recent changes in the state stormwater permitting requirements established by North Carolina Department of Environmental and Natural Resources (NCDENR). Effective August 1, 2013, the NCDOT is no longer required to submit state stormwater permit applications for projects discharging stormwater runoff in High Quality Waters (HQW) and Outstanding Resource Waters (ORW) watersheds. In addition, projects located within the 20 coastal counties are no longer required to submit state stormwater permit applications or submittal of requests for NCDENR to provide confirmation that the proposed project is excluded from state stormwater permitting requirements. These policy changes altered existing PCSP compliance processes and necessitated an adjustment to existing workflows. New workflows for roadway and non-roadway projects are being developed for inclusion in the PCSP update. To address these changes immediately, NCDOT has developed an Interim Guidance which will be provided for reference until the updated PCSP is approved by NCDENR. NCDOT met with NCDENR to review the proposed workflows, receive input, and collaborate on appropriate solutions.

Finally, the holistic approach NCDOT takes to protect surface waters is highlighted in the updated PCSP in part by describing other NPDES programs that inherently benefit water quality through a wide range of practices. These programs integrate with each other through all project phases to provide guidance to NCDOT staff and contractors to help sustain the outcome of the PCSP. For example, the Internal Education Program provides training to NCDOT staff and contractors to promote compliance with BMP Toolbox implementation. Significant progress has been made in updating the PCSP through this permit year, and is anticipated to be submitted to NCDENR for approval by the end of the calendar year.



The workflow for implementing design and planning minimum measures and documentation from the draft PCSP guidance document

Program Objectives and Management Measures

NPDES Permit Part II.B.5

Objective

- In cooperation with NCDENR, implement a PCSP to regulate stormwater from new NCDOT development and redevelopment for new built-upon area (BUA) by requiring structural and non-structural best management practices to protect water quality, reduce pollutant loading, and minimize post-construction impacts to water quality.

Management Measures

- Implement post-construction stormwater control measures for discharges in accordance with the PCSP.
- Implement a PCSP.
- Submit revisions to the PCSP to DWQ for approval.

PCSP Defines Minimum Design and Planning Measures for Roadway and Non-Roadway Projects

In addition to incorporating new workflows as described above, the update to the PCSP also outlines minimum stormwater control measures (minimum measures) that are implemented on all projects where appropriate. Minimum measures are applied during both planning and design phases, that protect water quality, minimize pollutant loading, and minimize post-construction impacts to water quality. Many of the minimum measures embody the low impact development (LID) and green infrastructure (GI) concepts of conservation and use of on-site natural features to retain or treat runoff close to the source.

Examples of minimum measures considered for roadway projects during the planning phase (such as during the Merger Process) include:

- Maximizing shoulder section
- Minimizing roadway side slopes
- Minimizing the impacts of runoff to environmentally-sensitive areas
- Promoting sensitive intersection of streams

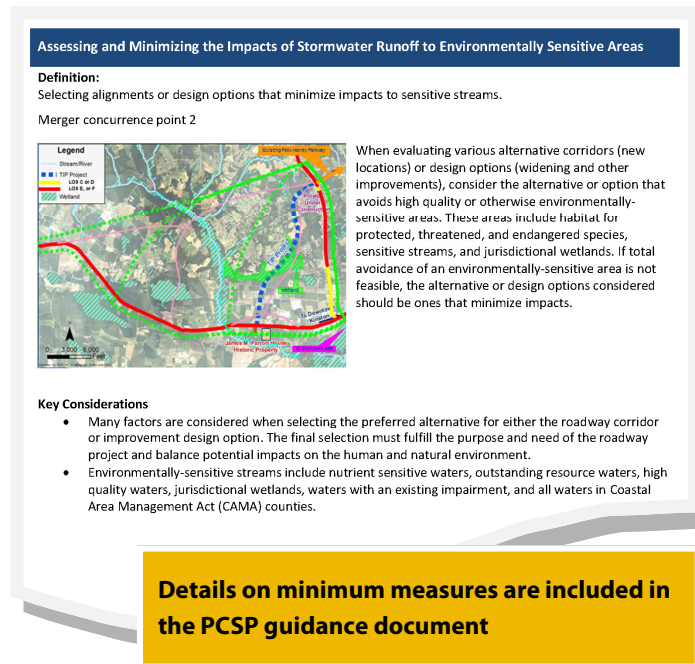
During the design phase (such as while the project drawings are being prepared) for roadway projects, the following minimum measures are considered:

- Providing adequate ground cover
- Stabilizing slopes
- Providing adequate energy dissipation
- Utilizing natural features and drainage pathways
- Maximizing vegetative conveyance
- Encouraging diffuse flow
- Minimizing direct discharge from bridges

For non-roadway projects, which follow a different workflow than roadway projects, the following minimum measures are considered:

- Maximizing vegetative and natural conveyance
- Minimize impervious surfaces (also known as built-upon area or BUA)
- Minimize land disturbance and soil compaction
- Disconnection practices

These measures are an important part of program compliance and highlight the wide-ranging practices NCDOT employs to protect surface waters.



Improved Documentation for Non-Roadway Projects

As part of the effort to improve and refine documentation for demonstrating compliance with NCDOT's National Pollutant Discharge Elimination System (NPDES) permit, the stormwater management plan (SMP) tool was updated. The update includes additional input areas designed to capture non-roadway specific data, such as location markers for BMPs (based on latitude/longitude instead of by station). Having a standardized SMP tool for non-roadway projects will improve documentation of stormwater management decisions and compliance with the PCSP.

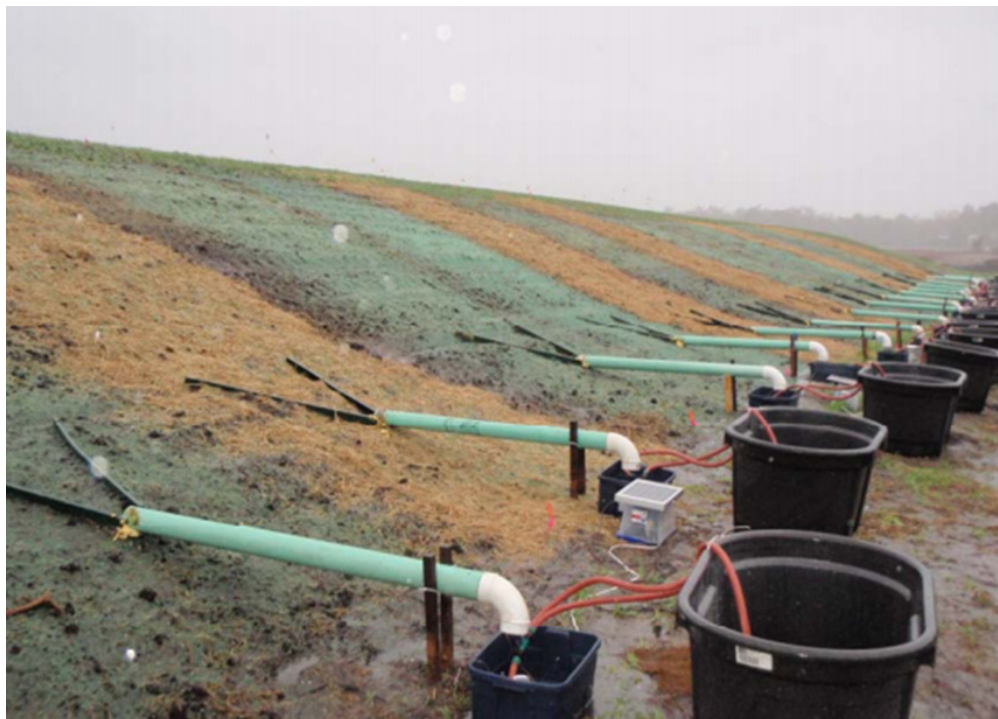


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Runoff from recently constructed highway fill slopes is collected for analysis to compare hydromulch types and application rates

NCDOT Sponsored Study on Hydromulches

At highway construction sites where the soil surface is frequently disturbed, there is always a potential increase in erosion, runoff rates, and sediment transport to surface waters. In an effort to reduce erosion and its adverse effect on surface water quality, the North Carolina Department of Transportation (NCDOT) sponsored a study conducted by North Carolina State University (NCSU) entitled *Field Evaluation of Hydromulches for Water Quality and Vegetation Establishment*.

The study compared runoff quantity and quality as well as grass establishment using five different types of hydromulch and straw mulch (with and without polyacrylamide, also known as PAM). Polyacrylamide is a water-soluble, synthetic polymer that acts as a binding agent with soil particles and is used to remove sediment from suspension in runoff from construction activities.

Runoff volumes, turbidity levels, eroded sediment, grass growth and cover, and nutrient concentration data were collected after natural rain events at five locations established in Raleigh and surrounding areas. An additional location just north of Boone was also included. Study findings were published March 8, 2013 and showed that hydromulches did not have a strong advantage over standard straw mulch for erosion control and vegetation management. The only exception was in cases where tackifier was applied too thick over the straw mulch which reduces seed generation.

Program Objectives and Management Measures

NPDES Permit Part II.B.6

Objectives

- i. Manage application of pesticides, fertilizers, and other vegetation management materials to minimize pollutant potential of stormwater runoff.
- ii. Use only approved vegetation management materials.

Management Measures

- a. Implement appropriate pest control practices.
- b. Use appropriate vegetation management materials.
- c. Provide training on vegetation management.



NCDOT will continue to investigate materials and methods to minimize erosion and sedimentation by providing temporary or permanent vegetative groundcovers on exposed soil surfaces.

Economic Assessment of Roadside Turf Alternatives

NCDOT is funding work with NCSU's Dr. Travis Gannon to develop research-based, comprehensive guidelines for vegetative practices, as well as perform an economic assessment comparing existing roadside turf vegetation management procedures to alternative roadside turf vegetation management procedures for use along North Carolina roadsides.



Specifically, the objectives of this research include:

- An agronomic evaluation and economic assessment of turf management using routine mowing compared to integrated turf vegetation management plans which incorporate plant growth regulators and other vegetation management aids
- An evaluation of recently registered turf vegetation management products compared to existing management practices and products, including an assessment of new herbicides, plant growth regulators and practices
- An evaluation of zoysiagrass sod for use along roadsides compared to current desirable species, comparing multiple cultivars of zoysiagrass sod throughout various geographic regions of NC to evaluate turfgrass performance under contrasting climatic conditions
- An evaluation of seeded zoysiagrass and bermudagrass varieties for use along roadsides compared to the seed mix that is currently utilized. New varieties are available and will be evaluated alongside current seed mixes and sod to determine application and feasibility. Weed control during turf establishment from seed is critical and herbicide programs will be devised to promote zoysiagrass and bermudagrass establishment, taking into consideration the turf's tolerance to herbicides and the effectiveness of the weed control

NCVMA 17th Annual Symposium

As a part of its annual training, NCDOT staff participated in the North Carolina Vegetation Management Association (NCVMA) symposium held in Raleigh on December 12th and 13th, 2012. This avenue affords NCDOT exposure to contractors and staff, as well as private vegetation management businesses that may not work directly with NCDOT. Stormwater related topics discussed at the symposium included brush control, National Pollutants Discharge Elimination System (NPDES) update on the pesticide application rules, and management of forest roads. Additionally, NCDOT's State Roadside Erosion Control and Vegetation Management Engineer presented on the importance of stormwater management and effective BMPs associated with vegetation management. The talk discussed the affects that stormwater management may have on downstream water quality and water uses. The uses of non-structural BMPs, such as properly calibrating application equipment, targeted application of herbicides and fertilizers, spill clean-up, preventative maintenance, and proper equipment fueling, washing and rinsing were recommended to control pollutant sources. Furthermore, the presentation encouraged the participants to become leaders to promote stormwater management among their peers.



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NCDOT Continues Encroachment Program Permit Certification

Independent entities regularly connect to the North Carolina Department of Transportation (NCDOT's) roadway and drainage systems and/or disturb NCDOT's right-of-way during construction activities, including installation of water lines, power lines, driveways, and other infrastructure improvements. These activities have the potential to discharge pollutants to NCDOT's stormwater conveyance system. As a requirement of the National Pollutant Discharge Elimination System (NPDES) permit, NCDOT requires that these entities submit a certification of appropriate NPDES and State Stormwater Program coverage and are compliant at the time of the request.

NCDOT currently uses two forms, NPDES-1 and Verification of Compliance with Environmental Regulations Checklist Form (VCER-1), to accomplish this task. The NPDES-1 form is used by all encroachers to certify that the project does or does not require an NPDES permit and, if one is required, that a Stormwater Pollution Prevention Plan (SPPP) and required best management practices (BMPs) are in place. Non-utility encroachers (including construction of curb and gutter, pavement widening, storm drainage, grading or alteration of drainage, and subdivision roads constructed by non-NCDOT entities) use the VCER-1 form to affirm that the facility is in compliance with required permits issued by North Carolina Department of Environmental and Natural Resources (NCDENR) and the U.S. Army Corp of Engineers, including NPDES and applicable sedimentation and erosion control laws.

From July 1, 2012 thru June 30, 2013, the NPDES Stormwater Permit Compliance Certification was included in 41 encroachment agreement applications; 6 of these applications did require an NPDES permit, and the remaining 35 applications certified that the permit was not required.

To further facilitate proper NPDES or stormwater permit coverage for these projects, the NCDOT State Encroachment Engineer may identify projects during review of encroachment applications where an NPDES certification should have been provided, but was not; for these cases, the encroaching party and/or the appropriate District Engineer is notified that the review cannot proceed until the proper certification is received. Additionally, in order to further streamline and improve overall efficiency of the program, NCDOT initiated an internal effort in the past year to evaluate the current certification forms, NPDES-1 and VCER-1, and assess whether updates would be beneficial.



Program Objectives and Management Measures

NPDES Permit Part II.C

Objectives

- i. Assist NCDENR to ensure all discharges to NCDOT's roadway drainage are properly permitted under applicable laws and rules.

Management Measures

- a. Require certification of stormwater program coverage and compliance.



Encroachment Program Contacts

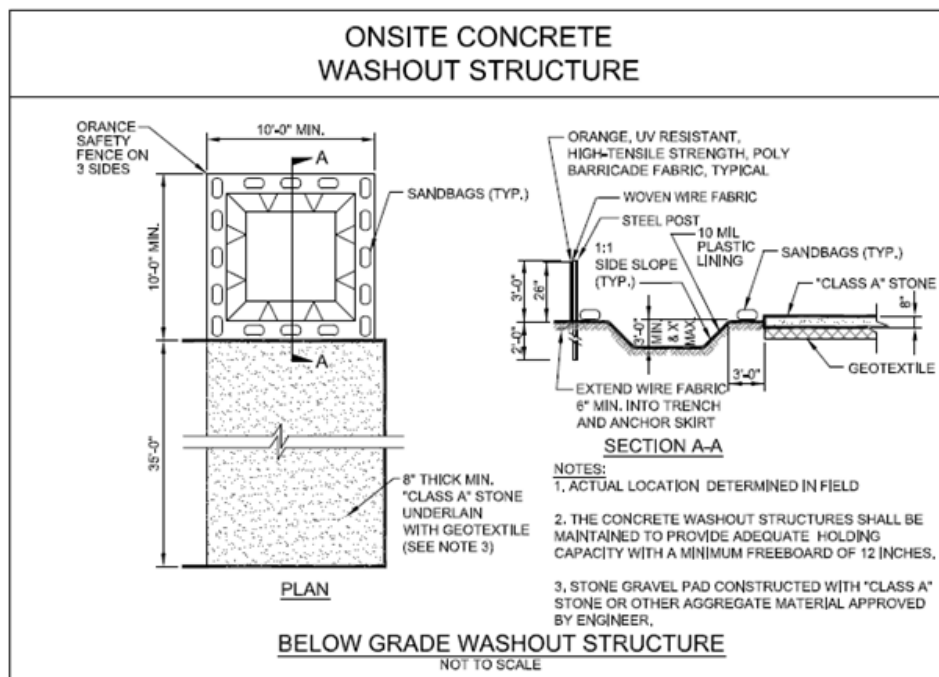
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Structural and Non-Structural BMPs Standardized for Concrete Waste Management

Fluids associated with concrete wastes can be alkaline, causing elevated pH levels that can affect aquatic life when it comes in contact with stormwater, and the solids can clog storm drainage systems. Therefore, North Carolina Department of Transportation (NCDOT) Roadside Environmental Unit (REU) standardized structural and non-structural BMPs to address compliance with the NCG01 Construction General Permit conditions for managing concrete waste on construction sites. As part of this effort, existing manuals and typical on-site practices for construction waste management were reviewed. The information was used to develop BMPs which minimize the discharge of concrete waste materials to stormwater conveyance systems, surface waters, wetlands, and/or associated buffers.

One such best management practices (BMP) establishes specifications and requirements that construction site operators must use to mitigate construction waste through the proper use of a Concrete Washout Structure. When cleaning concrete mixers and trucks, operators direct the water and solids to a plastic-lined sump, allowing the water to evaporate and the solids to be collected for proper disposal. Additionally, the equipment is parked on a gravel pad during the washout activities to further reduce the runoff of water. The BMP also specifies maintenance and inspection of the structure so that the intent of the BMP is reinforced.

Program Objectives and Management Measures

NPDES Permit Part II.D.1

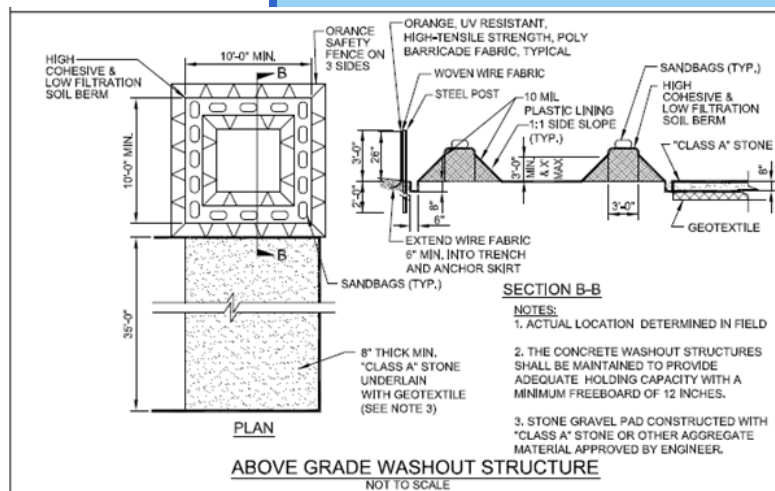
Sediment and Erosion Control Program

Objectives

- Continue to control development activities disturbing one or more acres of land surface.
- Require construction site operators to implement appropriate erosion and sediment control practices.
- Require site inspection and enforcement of control measures.
- Establish requirements for construction site operators to control waste that may cause adverse impacts to water quality.

Management Measures

- Implementation of the NCDENR DLR Erosion and Sediment Control Program delegated to NCDOT.
- Incorporation of requirements of NCG010000 associated with construction activities into the Erosion and Sediment Control Program.



NCDOT Hosts CPESC Training and Certification Course



As in previous years, NCDOT has continued to require contractors and NCDOT staff supervising and designing erosion and sediment control (ESC) practices to be certified through the Department's three tiered NCDOT Erosion and Sediment Control/Stormwater Certification. In an effort to increase ESC knowledge and further reduce the potential for construction activities to impact stormwater runoff, NCDOT hosted a Certified Professional in Erosion and Sediment Control (CPESC) training course on December 11, 2012. In order to receive the nationally-recognized certification, professionals

are tested on their competence of design principles and their applications through a 4 hour exam. Approximately 20 professionals participated, including NCDOT staff, contractors, and government agencies.

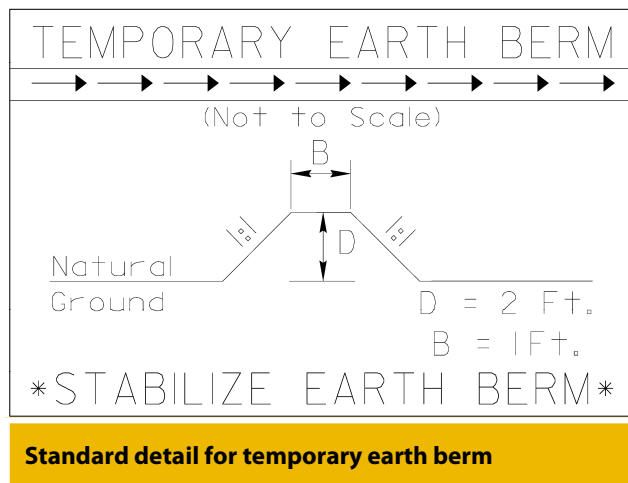
The training and certification is intended to further educate erosion and sediment control professionals on proper control measures and water quality methods to meet current National Pollutant Discharge Elimination System (NPDES) requirements. Certification holders must also complete 60 hours of professional development units over a period of three years in order to maintain their certification.

NCDOT Updates Contractors on ESC Plan Requirements

NCDOT frequently updates and improves its requirements for the content of ESC plans, as well as the techniques for constructing BMPs. NCDOT staff relayed recent developments NCDOT staff and contractors during the America Council of Engineering Companies (ACEC) Erosion Control Plans Workshop, held March 14, 2013. The training discussed the critical attributes of several ESC BMPs, including temporary silt fencing, special sediment control fence, wattle barrier, and temporary silt ditch.

New this year, the earthen berm was approved for use in ESC plans. This BMP can be used during clearing and grubbing phases as well as final grade phases of a project. It is typically placed at the toe of fill slopes and provides sediment storage for large fills slopes (greater than 20 feet in height and covering 2 acres or more in area) where sediment basins are not feasible. NCDOT recommends that stone drainage breaks, using temporary rock slit check dams and sediment dams, be used to break up the drainage area into sub areas less than one acre each. Earth berms can also be used to divert offsite runoff to minimize the runoff flowing to erosion control devices, to direct onsite runoff to the control devices, and to reduce the size of the drainage area.

Updates on nomenclature for basin skimmer devices, as well as a reminder that the minimum dewatering time has changed from 24 hours to 48 hours was also presented at the conference.



Program Objectives & Management Measures

NPDES Permit Part II.D.2

Borrow Pit/Waste Pile Activities

Objectives

- Continue to implement sediment and erosion control measures and reclamation plans on all borrow pit and waste pile projects.

Management Measures

- Implement erosion and sediment control measures on all noncommercial borrow pits/waste piles.
- Implement approved reclamation plans on all borrow pits/waste piles.
- Implement Borrow Pit Discharge Management Program.



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NCDOT Maintains SPPP Implementation

North Carolina Department of Transportation (NCDOT) continues to maintain and implement site-specific Stormwater Pollution Prevention Plans (SPPPs) at its industrial facilities. During the permit year SPPP updates were performed for many NCDOT industrial facilities. There were no new industrial facilities this year. NCDOT SPPPs describe potential pollution sources at each facility and provide best management practices (BMPs) to minimize potential impacts on stormwater from on-site industrial activities. NCDOT continues to incorporate the Spill Prevention Control and Countermeasure (SPCC) Plans requirements from 40 Code of Federal Regulations (CFR) 112 into the appropriate facility SPPPs as part of NCDOT's Industrial Activities program. NCDOT SPCC components emphasize spill prevention practices, inspections of regulated oil containers, and spill response procedures.

NCDOT continues to utilize its SPPP website to help manage and track SPPP/SPCC implementation at each industrial facility. The SPPP website allows Highway Stormwater Program (HSP) staff and Division-level engineers to track the overall program implementation and facility personnel to document tasks, including qualitative monitoring of stormwater discharges [see below], inspections, training, and BMP implementation.

NCDOT continues to maintain its SPPP/SPCC Implementation Training program, which includes training videos, annual workshops, posters, and regular training briefings by Division personnel throughout the year. See Internal Education for more information on annual workshops. During this year, NCDOT HSP staff also provided Division personnel with NCDOT's Industrial & Roadway Maintenance Activities (IRMA) BMP Guidance Manual for their use in conducting training briefings to Division employees. IRMA training materials include chapters applicable to most NCDOT industrial facilities, trainer instructions, chapter summaries, and quizzes. NCDOT HSP is continuing to develop additional unit-specific training chapters to insert into the SPPP Team Leader IRMA BMP Guidance Manuals in each subsequent permit term.

During the permit term NCDOT SPPP Team members continued to evaluate the effectiveness of their site-specific SPPPs by performing semi-annual qualitative monitoring of stormwater discharges at their industrial stormwater discharge outfalls. NCDOT Division personnel continue to utilize the SPPP website as a tool to aid in documenting the visual observations.



Program Objectives and Management Measures

NPDES Permit Part II.E.1

Stormwater Pollution Prevention Plans

Objectives

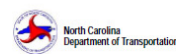
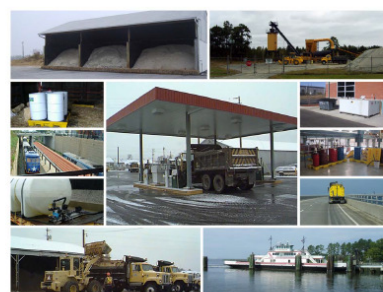
- i. Maintain and implement an SPPP for each facility with an industrial activity that is covered by the permit.
- ii. Develop and implement an SPPP prior to operation of any new industrial facilities.

Management Measures

- a. Maintain and implement an SPPP for each covered industrial activity and related facility.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

INDUSTRIAL AND ROADWAY MAINTENANCE ACTIVITIES BEST MANAGEMENT PRACTICE GUIDANCE MANUAL



NCDOT - HSP - JAN 2013

**IRMA BMP Guidance Manuals with
Industrial Activity Chapters provided to
SPPP Team Leaders and Division
Management**



Ongoing Internal Maintenance Yard Reviews

NCDOT HSP staff continue to conduct internal reviews of NCDOT maintenance yards, including over 10 internal reviews performed during this permit year. Each review includes an evaluation of the facility's SPPP/SPCC Plan, documentation of completed tasks, interviews with facility personnel, discussion of site-specific BMPs, and a site walk of the maintenance yard.

The primary goals of the internal reviews are to help Division staff identify potential stormwater pollution concerns, evaluate on-site SPPP/SPCC Plan implementation, and provide BMP recommendations if needed to help meet the NPDES permit requirements. The internal reviews aid Division management in prioritizing any major stormwater related expenditures. The reviews also help with updating SPPP/SPCC Plans. NCDOT HSP staff meet with Team Leaders to evaluate potential site improvements and to help determine appropriate BMPs that will address the particular needs of the yard. NCDOT anticipates continuing these internal reviews in the future.

Connecting Washing Operations to Sanitary Sewer Systems

In rural areas, NCDOT industrial facilities often do not have the opportunity to connect to publicly owned treatment works (POTWs) for the treatment and discharge of vehicle or equipment wash waters, or domestic wastewater. In such cases, NCDOT's permit requires that cleaning activities take place on vegetated or gravel area to prevent discharge of the wash water into the storm system. At these locations, domestic wastewater is typically treated and disposed of via on-site septic systems. NCDOT maintains a prioritized list of facilities not connected to POTWs and keeps abreast of opportunities to connect when POTW service is available.

By NCDOT HSP staff working closely with NCDOT Facilities Maintenance staff, NCDOT was able to fund approximately \$1.5 million toward sanitary sewer connections for eight high-priority maintenance yards this year. These upgrades reduce the potential for impacts on the storm system from washing and septic systems.

Structural BMPs Installed to Reduce Exposure

When performing SPPP/SPCC updates of NCDOT facilities, the sites are evaluated for potential structural BMPs, with funding provided to address high priority needs. Examples of structural BMPs include: covered secondary containment for salt brine operations, covers for material storage areas and scrap metal bins, vehicle wash pads, spill containment pallets, and spill response kits. NCDOT Division personnel constructed or installed many of these BMPs statewide during this year. For example, Division 9 constructed fuel truck storage buildings for all five maintenance yards this year.



New containment and covered shelter for salt brine operation



New cover protects scrap metal bin from precipitation

Program Objectives & Management Measures

NPDES Permit Part II.E.3

Qualitative Monitoring

Objectives

- Evaluate the effectiveness of the industrial SPPP for each industrial facility.
- Perform required qualitative monitoring at stormwater outfalls identified in the SPPPs and during supplemental inspections for new sources and discharges.

Management Measures

- Perform visual monitoring at each facility.



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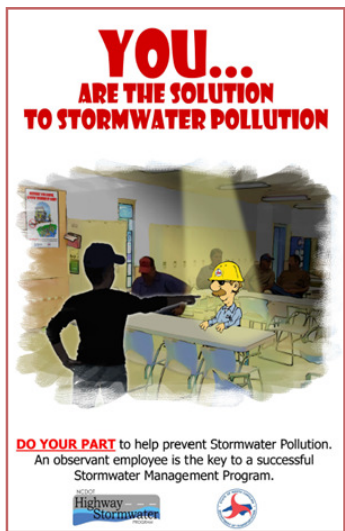


Ongoing SPPP Advanced Implementation Training

North Carolina Department of Transportation Highway Stormwater Program (NCDOT HSP) staff continued to provide annual Stormwater Pollution Prevention Plan (SPPP) and Spill Prevention Control and Countermeasure (SPCC) Plan Implementation Training for NCDOT's Highway, Ferry, and Rail Divisions, and Fleet and Material Management personnel. NCDOT HSP held 18 training workshops across the state for NCDOT division personnel in the spring of 2013. For the second straight year, the training workshops were broken down into Level I: Introductory and Review of SPPP/ SPCC Plans and Level II: Advanced SPPP/SPCC Update and Review. The Level I training focused on stormwater pollution prevention awareness, good housekeeping, and spill prevention practices, and was provided to over 154 individuals.

Level II Training was designed for SPPP Team Leaders (typically County Maintenance Engineers) at each NCDOT industrial facility and provided more specific guidance on SPPP/ SPCC Plan implementation issues such as managing changes at the yards. Level II training also included an update on NCDOT HSP internal facility compliance reviews, discussions about new creative BMPs to address various potential pollutant sources or industrial operations, and a review of NCDOT's Industrial and Roadway Maintenance Activities (IRMA) BMP Guidance Manual. Additionally, nutrient management education was incorporated into Level II training workshops for Division staff located in the Jordan Lake and Falls Lake watersheds. A total of 66 Division personnel were trained in nutrient management, including 46 staff from Divisions 5, 7, and 8. New posters, a part of the annual educational series for the Industrial Activities Program, were provided to SPPP Team Leaders as well. The Level II Training had over 225 individuals attending the sessions.

General updates for the SPPP/ Industrial Activity Program and Illicit Discharge Detection and Elimination Program were also provided to all 378 training workshop attendees. NCDOT plans to continue to provide the same formatted SPPP training sessions each spring with new topics added to the Level II agenda based on input from SPPP Team Leaders and HSP staff. The Level I and II training approach adopted by NCDOT HSP over the last two years has been extremely successful in terms of providing the Division staff with more targeted training to address where it is needed most.



New spring 2013 poster provided to SPPP Team Leaders to display at maintenance yard facilities

Program Objectives and Management Measures

NPDES Permit Part II.F.1

Objectives

- Implement a program to train NCDOT staff and contractors about the importance of stormwater quality.
- The training should include topics such as spill control, chemical application, illicit discharges, and illegal dumping, etc.

Management Measures

- Provide pollution prevention awareness training for construction workers.
- Provide pollution prevention awareness training for maintenance workers.
- Provide pollution prevention awareness training for NCDOT staff.
- Develop and submit an Internal Education and Involvement Plan.

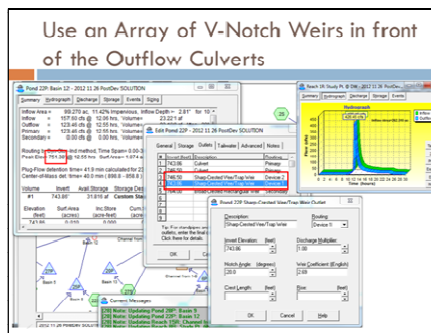


Example of Nutrient Management Training materials provided to NCDOT Division staff



HydroCAD® Stormwater Modeling Training

NCDOT engineers received training on HydroCAD® Stormwater Modeling computer program and associated applications. HydroCAD® is a computer aided design tool used by engineers for modeling hydrology and hydraulics (H&H) of stormwater runoff. The training provides NCDOT staff with a tool that offers a wide range of H&H techniques in a user friendly graphical form, managed by an on-screen routing diagram. The course enabled 24 NCDOT staff, including NCDOT HSP members, to receive two days of training in use of the software. Staff from NCDOT HSP have used HydroCAD® on several HSP projects this year, including stormwater retrofit designs. On NCDOT project K-5002, NCDOT HSP staff used HydroCAD® to model the pre- and post-stormwater discharges for the design of a new U.S. Highway 23-74 Southbound Rest Area to be located in Haywood County. HydroCAD® aided in the design of stormwater control measures, including a hazardous spill basin and a bioretention basin for the new rest area.



Example of HydroCAD® Stormwater Management Training materials provided to NCDOT staff

NCDOT HSP staff utilized HydroCAD® for the Southeast White Oak Total Maximum Daily Load (TMDL) analysis as part of the Assessment and Monitoring Plan implementation and Report of Findings. NCDOT HSP staff used HydroCAD® to evaluate the effectiveness of stormwater retrofits, which consisted of infiltration devices, to reduce pollutant loads in the Southeast White Oak River watershed. For additional details of this project see the TMDL section. The HydroCAD® training has enhanced NCDOT staff capabilities in performing the H&H-related designs and analyzing stormwater retrofit projects, which ultimately should have a positive impact toward improving water quality in the state.

Detailed Descriptions of BMP Function Facilitate Learning and Effective Implementation

NCDOT has incorporated detailed specifications of the best management practices (BMP) components and integrates scientifically-proven information on BMP function into its BMP Toolbox, as discussed in the BMP Toolbox section. One example of this knowledge transfer technique is the new chapter on Media Filters developed in 2013.

A media filter is a structural BMP that treats runoff by filtering it through a layer of natural, manufactured, or engineered media, which can include amended soil, sand, or other material. As runoff percolates through the media, solids are filtered out and pollutants are adsorbed to the media. After filtration, runoff is collected in an underdrain and conveyed off site. Media filters are typically planted with grass or with shrubs and other landscape vegetation. Two types of media filters were included in the BMP Toolbox: filtration basins (grassed media filters) and bioretention basins (landscaped media filters).

The media filter chapter includes discussion of recently completed, NC-based research on targeting pollutants for treatment by varying the depth of the media and the materials of which the media is made. For a bioretention basin, a media with 8% fines (silt and clay passing a No. 200 sieve) is preferred to obtain 2 in/hr hydraulic conductivity for phosphorus, metals, and other pollutant removal, while a media with 12% fines is necessary to obtain 1 in/hr hydraulic conductivity for increased nitrogen removal. This level of detail in the Toolbox facilitates the education of NCDOT's designers and contractors and results in the implementation of BMPs which are more effective to reduce pollutant loading.



NCDOT Continues Ongoing Training

NCDOT continues to implement the following ongoing NPDES internal training:

- Annual SPPP/SPCC Implementation group training
- Erosion and sediment control training, which includes training on the General Permit for Construction Activities NCG010000
- Vegetation Management training including chemical application and mowing techniques
- General stormwater pollution prevention and spill prevention and response training presented at internal meetings
- Winter weather (snow removal and deicing) training
- Illicit discharge detection and elimination training
- BMP inspection and maintenance training



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North Carolina Adopt-A-Highway Is In Its 25th Year!

2013 marks the 25th anniversary of the North Carolina Adopt-A-Highway (AAH) program. All the AAH volunteers have made a significant contribution to preserving the beauty and cleanliness of state's roadsides. North Carolina is proud to have so many of its citizens involved in making North Carolina a better place to live.

This year North Carolina is saluting AAH groups that began in the years 1988, 1993, 1998 and 2003, celebrating 10, 15, 20, or 25 years! During their continuous and consecutive years of service, they have kept their adopted roadway segments litter free. Currently, there are over 4,200 AAH groups. In addition to the 44 25-year groups, 237 volunteer groups are also being recognized for their consecutive years of service. There are 33 with 20 years; 88 with 15 years; and 116 with 10 years.

Each of these groups will receive their years of service stars for their signs; the 20-year groups also receive safety vests with the 20-year insignia, and the 10-year groups are awarded the ten year appreciation plaque. AAH groups attaining 25-year status will be presented with new safety vests that feature a 25-year star insignia and a special 25-year plaque in appreciation of their continuous and consecutive years of service and dedication to maintaining cleaner roadsides.

NCDOT Provides Anti-Litter Message Materials

North Carolina Department of Transportation (NCDOT) has developed a wide range of materials to spread the anti-litter message to citizens of all ages. Recently, NCDOT developed "I don't litter, I recycle" and "No Litter" bumper stickers. Additionally, car litter bags were distributed with a message from NCDOT's Highway Stormwater Program to "Do your



Program Objectives and Management Measures

NPDES Permit Part II.F.2

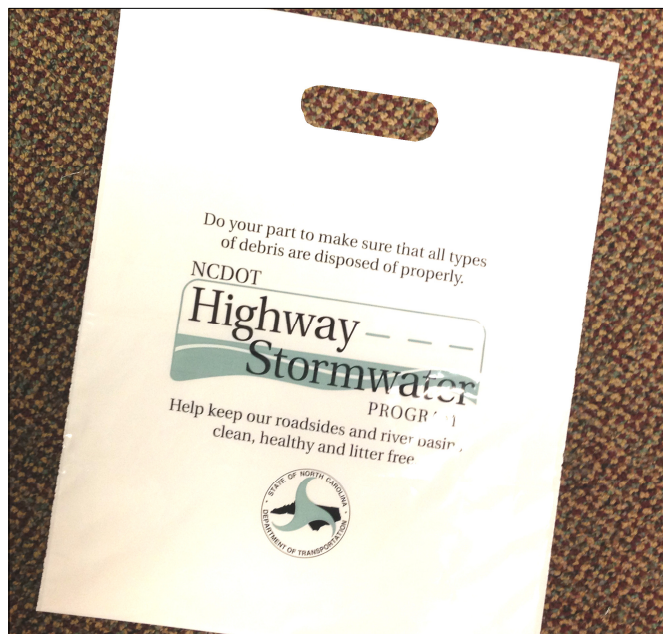
Objectives

- Implement a program to educate the public about the importance of stormwater quality, including chemical application, illicit discharges and illegal dumping, etc.
- Maintain diverse educational materials to engage and educate the public from different social, economic and age groups.
- Involve the public in NCDOT water quality programs.

Management Measures

- External Education and Involvement Plan.
- Provide pollution prevention awareness educational materials to general public.
- Maintain a public education website.
- Develop educational partnerships.
- Continue public involvement programs.





Car litter bags advertised the HSP and incorporated an anti-litter message

litter prevention items to assist within their classroom curriculum. Items such as litter prevention activity pages, stormwater activity pages, stormwater fact sheets, Swat-A-Litterbug cards, stickers, pencils, temporary tattoos, litter law fliers, car litter bags, and no litter bumper stickers were made available. In December, 2012, there were enough materials provided to supply more than 10,165 students in grades K-12. During the past nine years, 105,490 students have received these materials.

Other Litter Prevention Displays, Meetings, and Presentations

The Office of Beautification participated in various litter prevention events such as Earth Day at NC State University, Rotary, Turnpike Run, Carolina Recycling Association (CRA), Wellness Fair, and the NC State Fair. In addition to these, the Office of Beautification participated in board meetings of both Keep NC Beautiful and NC Big Sweep; also participated in the Solid Waste Enforcement Officers Association fall conference and provided information during media interviews regarding the Sponsor-A-Highway Program and Litter Sweep.



part... Stop the Littering" printed on one side, along with the message "STOP THE LITTERING... it could cost you up to a \$2000 fine, community service work, and a point on Driver's License".

These materials are distributed at NCDOT's visitor centers and welcome centers, at the NC State Fair, and Earth Day events across the state. Additionally, materials are provided directly to various groups who request them, such as Keep Gastonia Beautiful, Inc., the anti-litter program located in Gaston County.

The NCDOT REU's NC State Fair booth in 2012 continued to offer teacher materials; this was its ninth year that a teacher materials window was available for teachers to request



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Jordan Lake Cleanup Support

Since 2010, the NCDOT Highway Stormwater Program has supported the Clean Jordan Lake organization by donating garbage bags supplies to facilitate their cleanup activities. The Clean Jordan Lake organization works in partnership with the Haw River Assembly to expand volunteer programs to remove shoreline trash, to educate local and state government agencies about the trash problem at Jordan Lake, and to recommend trash prevention strategies that will keep the shoreline clean in the future. Additionally, HSP staff have personally participated in the clean up efforts.





Sediment Basin Design for Flocculated Sediment

Recent studies have shown that significant reductions in turbidity can be achieved through a variety of passive treatment approaches using the flocculant, polyacrylamide (PAM). North Carolina Department of Transportation (NCDOT) and North Carolina State University (NCSU) are collaborating on a project to understand various aspects of floc production and implications on basin design. The study includes determination of particle characteristics, (specifically size, density, and settling rate) of flocculated soils with different untreated solid particle size distribution characteristics and mineralogy; testing the relationships between flow, flocculant delivery method, and basin trapping efficiency; determining the influence of basin geometry and baffles on floc settling; characterization of particle sizes in untreated and treated runoff on construction sites; and validation of the performance of the flocculation system under field conditions. This will provide the information needed to adjust the basin design to account for changes in sediment characteristics when it is flocculated. This research is expected to yield a more efficient basin design that is smaller and wider than current design standards.

Quality Assurance Program Plan

NCDOT developed a Quality Assurance Program Plan (QAPP) to provide a standardized approach to quality principles in the planning, design, and execution of research projects under the HSP Research Program. The document serves as a minimum framework for quality, and also sets requirements to facilitate consistency among projects to allow comparison of results across studies. The document lists the management approach and data quality objectives, requires researchers to develop a project-specific QAPP, and specifies minimum standards for a variety of quality objectives. NCDOT believes this QAPP will serve as a template to improve the quality of the Research Program data and support greater use of research data in decision making. The QAPP will be implemented fully by 2014.

Program Objectives and Management Measures

NPDES Permit Part II.G

Objectives

- i. Conduct research with faculty and staff at state universities or other designated institutions that results in independent quantitative assessment of stormwater from NCDOT permitted activities and/or measures structural BMP effectiveness.
- ii. Conduct research to enhance or improve existing practices or develop new methods or processes to meet future permit requirements.

Management Measures

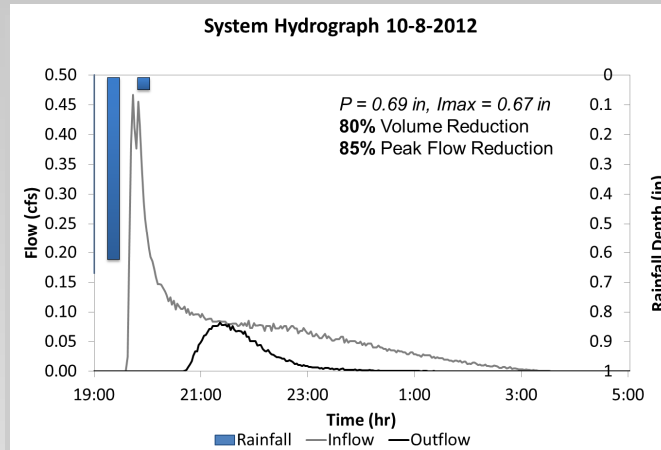
- a. Maintain a Research Plan in keeping with guidelines established by the Federal Highway Administration (FHWA).
- b. Submit the Research Plan to DWQ for approval.
- c. Implement the Research Plan.



Ongoing and Completed Monitoring

NCDOT continues to work with researchers from state universities. Updates on three ongoing research projects are provided below:

- NCDOT and University of North Carolina Charlotte (UNCC) continued monitoring at two porous friction course (PFC) sites and associated control sites to determine the effectiveness of these overlays in improving the quality of runoff from highways. The study found that the time of concentration (the time needed for water to flow from the most remote point in a watershed to the watershed outlet) was higher for both types of PFCs than conventional pavement, aiding in the settling of suspended solids and associated pollutants. Median effluent total suspended solids (TSS) levels from the Open-Grated Friction Course (OGFC) pavement was significantly lower than levels in the control site with traditional hot-mix asphalt pavement. Significant reduction of nutrient or dissolved metal levels was not observed.
- NCDOT and NCSU continued hydrological monitoring at the Brunswick County biofiltration conveyance (BFC), located on US-17. Only four out of 22 monitored storm events had any outflow, and effluent flow represented an eighty percent volume reduction and eighty-five percent peak flow reduction for these four events. This indicates that BFC is an effective LID practice, allowing substantial volume reductions within a small footprint when site conditions are favorable. Monitoring will continue at this site in the next year, along with monitoring at the Alamance site discussed in the Retrofits section.
- NCDOT and NCSU have finished field monitoring to evaluate particle size distributions (PSD) in runoff from highways at eight sites across the three ecoregions of the state. These particle size distributions should be useful in the future to select BMPs which are effective at solids removal based on particle size, such as optimizing the design of vegetative swales.



Hydrograph from BFC retrofit showing significant volume reduction



Monitoring of a BFC retrofit in Brunswick County



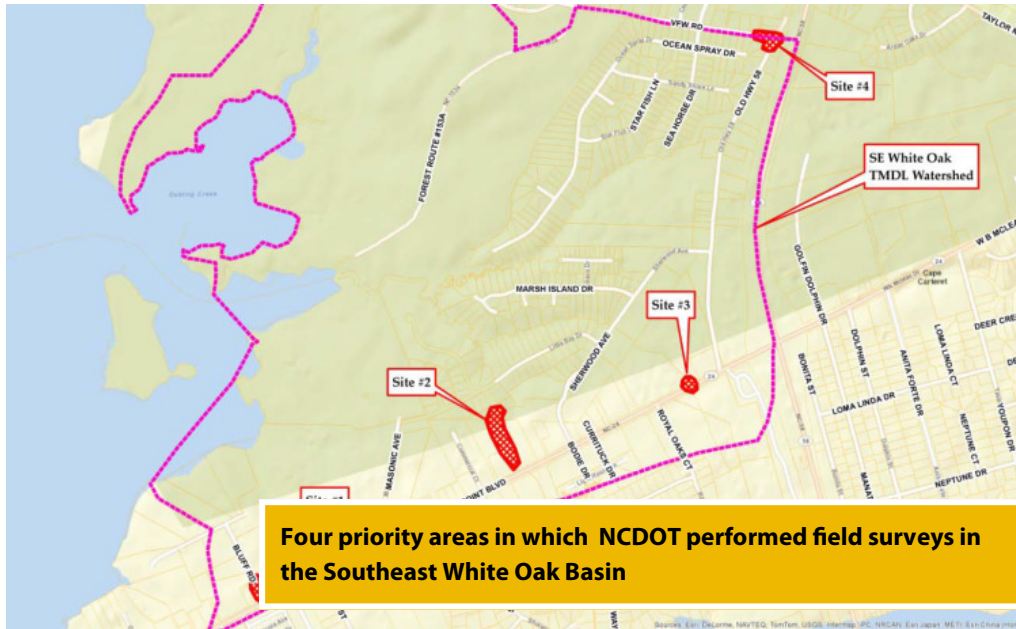
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Report of Findings Completed in the Southeast White Oak River Watershed

To address Total Maximum Daily Loads (TMDLs) for fecal coliform bacteria impairments within the White Oak River Basin, NCDOT performed detailed surveys at four locations within the Hills Bay and Boathouse Creek watersheds. The objective of these studies was to collect additional data, not available in the TMDL report, to support the assessment of potential load reduction measures at these locations. Efforts included locating and mapping stormwater drainage features, identifying potential conflicts with existing utilities, estimating space and property requirements, identifying human and natural environment concerns, preparing preliminary cost estimates, determining constructability, and estimating load reductions. The four sites are:

- Site 1 – NC-24 and Bluff Road
- Site 2 – NC-24 between Commercial Court and Lois Lane
- Site 3 – NC-24 west of Old NC-58
- Site 4 – Eastbound Shoulder of VFW Road

Results of the surveys revealed that Site 4 was not actually located within the watershed. The information collected during this process will also be used to perform a feasibility analysis to retrofit stormwater control measures (SCMs) on these sites.

Protocol for Determining NCDOT Significant Contributor Status for TMDL Development

NCDOT is required to develop and implement a program to address impaired waters identified in TMDLs in which NCDOT is named as a significant contributor of the pollutant addressed by the TMDL and that assigns NCDOT a wasteload allocation separate from other point sources. Over the past several years, NCDOT and Division of Water Resources (DWR)

Program Objectives and Management Measures

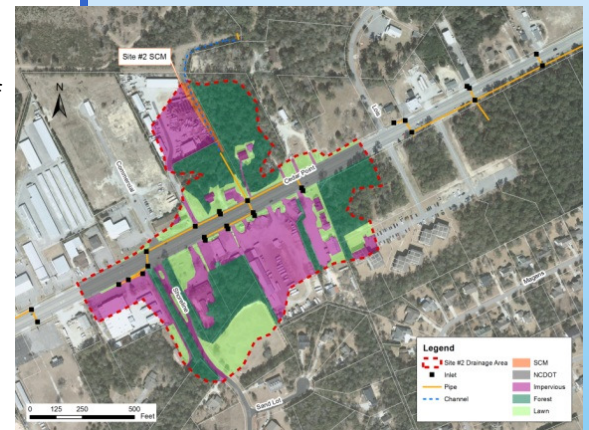
NPDES Permit Part III.C

Objectives

NCDOT will develop and implement a program to address impaired waters identified in Total Maximum Daily Loads (TMDLs) in which NCDOT is named as a significant contributor of the pollutant and an assigned Waste Load Allocation.

Management Measures

Management measures include: assessment & monitoring plans for each TMDL location, schedules for plan execution, and findings reports submitted to DWQ.



Site 2 drainage area, stormwater conveyance system, land use and land cover



have worked closely to support the development of TMDLs and the evaluation of NCDOT as part of those TMDLs; however, a procedure for determining when NCDOT is considered a significant contributor in a TMDL has not been formally documented. Under this project, NCDOT and DWR are developing a method for evaluating NCDOT's relative contribution in a TMDL watershed and defining how the determination of significant contributor status will be made. To date, a draft protocol has been prepared and coordination meetings held among the project team members. The draft protocol includes an evaluation of the TMDL parameter in the context of pollutants associated with transportation runoff and procedure for evaluating NCDOT's contribution, depending on the methods and models used to prepare the TMDL. The final product is anticipated to be relatively simple, scientifically-based, and transparent protocol for DWR and NCDOT to follow in preparing TMDLs.

Little Alamance Creek Category 4b Demonstration Project to Address Biological Impairment

Portions of Little Alamance Creek in the Cape Fear River Basin are impaired based on a benthic macroinvertebrate (aquatic life) impairment; however, no known pollutants have been identified. For waterbodies where a pollutant has not been identified, a TMDL is not appropriate since existing and allowable pollutant loads cannot be calculated. In these watersheds, other pollution control requirements may obviate the need for a TMDL. One alternative to a TMDL, the Category 4b approach, is applicable in those watersheds where a TMDL is not required because the waterbody is expected to meet standards due to other pollution control requirements.



Staff inspect stream bank erosion in the Little Alamance Creek mainstream

NCDOT is partnering with the Cities of Burlington and Graham to prepare a joint Category 4b Demonstration Plan. The Plan will provide a historical overview and description of the watershed and waterbody, summary of potential problems and stressors on biological integrity, description of existing and anticipated pollution controls, and schedule for implementing and tracking effectiveness of pollution controls. Over the past year, the project partners participated in a watershed tour to evaluate potential locations for implementing pollution controls, prepared an inventory of existing water quality data and watershed information, prepared a report outline, conducted a field inventory of outfall locations, and coordinated with DWR regarding project schedule, deliverables, and team responsibilities. For additional information on the field outfall inventory in the Little Alamance Creek watershed, please see the Stormwater System Inventory Program summary.



Little Alamance Creek near Graham, NC



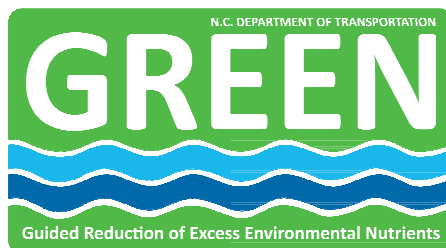
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GREEN Program Receives NC EMC Approval

North Carolina Department of Transportation's (NCDOT's) new development program for compliance with the Jordan Lake nutrient management rules was approved by the North Carolina Environmental Management Commission (EMC) on November 8, 2012. Implementation of the program, referred to as the Jordan Lake Guided Reduction of Excess Environmental Nutrients (or GREEN) Program began in January 2013. The GREEN program was initiated by NCDOT to integrate and enhance NCDOT's stormwater and nutrient management practices and to support compliance with the Jordan Lake Rules. Although the GREEN Program will ultimately encompass requirements for both new and existing development, the program currently addresses new development activities (both road and non-road development) as required by the rules.



Nutrient Scientific Advisory Board Support

The Jordan Lake Rules established requirements for local governments and state and federal entities in the Jordan Lake watershed to reduce nutrient loading from existing developed lands. Established in July 2010, the Nutrient Scientific Advisory Board (NSAB) is charged with improving the tools needed to address nutrient loading from existing development in any watershed where nutrients are of concern. NCDOT's continued membership on the NSAB over the past year included active participation in NSAB subcommittees tasked with providing recommendations on modeling, nutrient reducing measures, and nutrient accounting tools.

Program Objectives and Management Measures

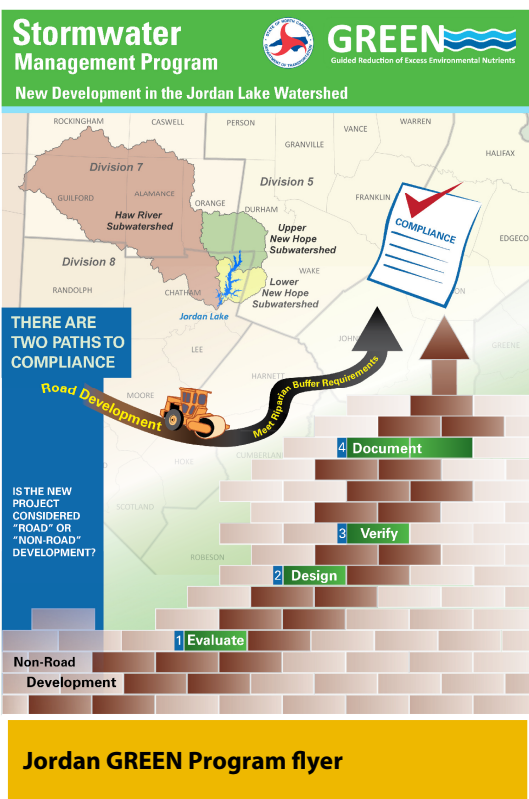
Jordan Lake Rules:

15A North Carolina Administration Code (NCAC) 02B .0262 - .0311, and NC Session Laws 2009-216, 2009-484

The Jordan Lake Rules allow the use of existing management programs and annual reporting mechanisms to implement the rule. NCDOT intends to use the HSP annual reporting process as well as the following HSP programs:

- Illicit Discharge Detection
- BMP Toolbox
- Post-Construction Stormwater Program
- Research Program
- Industrial Activities
- Retrofits
- Internal Education
- External Education

It is anticipated that reporting on the Falls Lake Rule will also be included in the future.



Nutrient Management Training

NCDOT prepared and distributed a two-page flyer and Microsoft PowerPoint® presentations to educate staff and contractors on the project-specific requirements in the Jordan Lake watershed. These materials were used in formal training sessions involving NCDOT staff from Divisions 7, 8, and 5 and Facilities Management Division, and informal communications with staff and contractors. The formal training sessions were performed in early and mid-2013 and included a review of the key rule requirements, NCDOT's new non-road review and approval process, nutrient management strategies for NCDOT industrial facilities, and stormwater pollution prevention best management practices for fertilizer storage, handling, and application. NCDOT also prepared a special project provision that requires all applicators who apply fertilizers on highway rights-of-way in the Jordan Lake watershed to complete Nutrient Management Training through the NC State Department of Soil Science and to present a valid certificate to NCDOT prior to performing the work. In addition to this training, NCDOT partnered with the North Carolina Department of Agriculture and Consumer Services (NCDA&CS) to analyze soil samples and provide recommendations on fertilizer composition and application rates.



GIS assessment of non-road area at a NCDOT county maintenance yard

NCDOT Road and Non-Road Land Use Analysis in the Jordan Lake Watershed

In 2012, the NSAB, in conjunction with NCDENR and the Triangle J Council of Governments, hired a consultant to develop a watershed model for Jordan Lake. The model will be used to establish nutrient load estimates for municipalities, counties, and state and federal entities with jurisdiction in the watershed. To support the modeling study, NCDOT prepared a right-of-way (ROW) and impervious area land use analysis of NCDOT road and non-road area in the Jordan Lake watershed for the model baseline period (2001) and current period (2012). NCDOT's ROW area for the baseline and current periods were estimated to be 40.9 mi² and 43.1 mi², respectively. NCDOT's impervious area for the baseline and current periods were estimated to be 18.2 mi² and 19.3 mi², respectively. NCDOT's area as a percentage of the total watershed was estimated to be 2.4% for the baseline period and 2.6% for the current period.

New Development Projects in 2013

No new non-road project development projects were initiated over the past year in the Jordan Lake watershed. Future annual reports will include a list of certified projects, descriptions of the projects and Stormwater Control Measures (SCMs), project-specific copies of the NCDOT-Jordan/Falls Lake Stormwater Nutrient Load Accounting Tool (JLSLAT) and other supporting calculations, and a summary of changes in nutrient loads associated with these activities.



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