How to Breeze Through Your Post-Construction Review

North Carolina Department of Environmental Quality
Post-construction Permitting
Overview

- Site design to limit long term water quality impact

- Serves to protect *after* close out of E&SC plans

- Permit must be issued before constructing any BUA

- Permits enforceable in perpetuity
Where is it required?

Stormwater Management Program Areas in North Carolina

Legend:
- Neuse NSW Strategy Area
- Tar-Pamlico NSW Strategy Area

DESCRIPTION:
- Falls Lake Watershed
- Goose Creek Watershed
- Jordan Reservoir Watershed
- Randleman Reservoir Watershed
- Sixmile Creek Watershed
- Waxhaw Creek Watershed
- Water Supply Watersheds
- ORW
- HQW (non-coastal)
- SA (Shellfish Areas)

Legend:
- NPDES-Exempt Phase II Municipalities + ETJs
- NPDES Permit - Phase I MS4/Military
- NPDES Permitted Ph II MS4/Military
- NPDES Permitted Phase I MS4
- NPDES Permitted Phase II MS4
- Phase II MSIs (from 2011 Boundaries)
- Designated Phase II Municipalities
- Future MSIs (2010 Delineations)
- Urbanized Areas (2000 Census)
- NEW Urbanized Areas (2010 Census)
- Phase II Tipped Counties (Post-Construction)
- Coastal Stormwater (CAMA Counties)

Post-Construction Areas per Session Law 2006-246 and Coastal Stormwater Rules.

Note - Although Brunswick, New Hanover, and Onslow are Phase II Tipped Counties, projects there are subject to the Coastal Stormwater Rules.
Post-construction Program Website
Permit Thresholds

- Non-coastal:
  - NPDES MS4 & Urbanizing Areas – 1 acre of disturbance
  - HQW/ORW – E&SC Plan required by NCGS 113A-57

- Coastal:
  - E&SC Plan required by NCGS 113A-57
  - CAMA Major Development Permit required by NCGS 113A-118
  - Non-residential projects that cumulatively add 10,000 sf of BUA
  - Residential projects within ½ mile of and draining to SA waters that cumulatively add more than 10,000 sf of BUA and >12% BUA

- Any site with existing permit
Where to start?
Permitting Options

- Standard Permitting
- Express Permitting
- Fast-track Permitting
Standard vs. Express

Standard Permitting – 15A NCAC 02H.1042
- Types of projects: New, Major Modifications, Minor Modifications, Transfers, and Renewals
- Fee: $505 for most applications
- Per NC Statute: 90 days from the receipt of a complete application to either issue the permit or request additional information
- Goal: 60 days or less

Express Permitting – authorized by NCGS 143B-279.13
- A voluntary program for qualified projects within the 20 coastal counties
- Types of projects: New, Major Modifications, and Minor Modifications
- Eligible projects
  - High density projects with up to 5 SCMs (up to 8 may be allowed by supervisor if shown to be similar or minor changes to ensure the review can meet the timelines)
  - The project will meet the MDC and do not propose alternative designs or variations to the rules or MDC.
  - The project will not impact, overlap, or cause another permit to become out of compliance. Exception: if the necessary resolution is also submitted and accepted into the Express program for review at the same time.
  - Projects must either not have compliance issues or those issues must be resolved by the proposed submittal.
- Fee: Higher application fees ranging from $500 to $4,000 (depending on the type of project) to support the staff dedicated to this program
- Goal: Permit issued within 30 calendar days after being accepted
The complete application package is mailed to the appropriate reviewing office:
- Central Office
- Washington Regional Office
- Wilmington Regional Office

A completeness review is conducted to ensure all the pieces and parts are there

Once found complete, the project is accepted, assigned a reviewer, and logged into the database
Express Process

• An Express request form is submitted to the Express Coordinator in the applicable Regional Office along with:
  • Narrative
  • Site plan
  • Vicinity map

• The Express reviewer reviews the request to confirm that the project is eligible (see the previously listed criteria) and does not have any obvious stumbling points (correct water classification, surface waters and vegetated setbacks identified, etc.)

• If acceptable, a submittal meetings is scheduled
  • Necessary to allow the reviewer to dedicate time to review and process the application

• At the submittal meeting:
  • All parties (consultant, applicant, and reviewer) will sit down to discuss the project and application documents
  • The reviewer will provide initial comments and determine if the package is complete
  • If complete, the project is accepted and logged into the database
  • If minor fixes that can be quickly resolved (2 days or less) – mail in submittal to be accepted on that date
  • If major changes or revisions will take longer than (2 days) – reviewer will work with the parties to schedule a new submittal date

• Scheduling timelines:
  • WARO is scheduling submittal meetings 1-2 weeks out
  • WIRO is scheduling submittal meetings 8-12 weeks out (due to a very high demand)
Fast-Track Permitting

• Two Phase Permitting
  • Authorization to Construct (ATC)
    • Before commencing construction
    • No technical review
    • 30 day review period (assuming no add info requests)
  • Final permit when construction complete
    • Similar application process to standard permitting
    • Review as-buils for compliance

• Design professional signs and seals certification that project will meet design criteria

• Compliance issues found after construction need to be resolved before issuing final permit

• Much riskier and potentially time-consuming and costly process
Additional Information Requests

- Sent to consultant via email when deficiencies found in design or documentation

- Applicant has 30 days to respond or project returned as incomplete [15A NCAC 02H.1042(3)(a)(i)]

- Maximum of two (2) additional information requests before project is returned as incomplete
Common Documentation Issues
General Required Documentation

- Application Form
- Deed Restrictions & Protective Covenants
- Supplement Form and O&M
- Permit Application Fee
- Detailed narrative
- USGS map
- Sealed, signed, and dated calculations
- Two sets of plans
- Geotechnical investigation
- Property Deed
- Secretary of State Documentation

![SUPPLEMENT-EZ COVER PAGE](image)

**Operation & Maintenance Agreement**

Project Name: 
Project Location: 

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**State of North Carolina**
Department of Environment and Natural Resources
Division of Energy, Mineral and Land Resources

**STORMWATER MANAGEMENT PERMIT APPLICATION FORM**

This form may be photocopied but not as an original.

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1. **GENERAL INFORMATION**
   - Project Name: 
   - Project Location: 
   - Applicable Basin: D.C. Basin, D.C.
   - Permit Number: 

2. **Location of Project (Exact address):**
   - City:
   - County:
   - Zip:

3. **Directions to project from nearest major intersection:**

4. **Signature:**
   - County:
   - Witness:

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5. **PERMIT INFORMATION:**
   - 1. Specify whether project is to be used:
      - Single structure, High density, or Small
   - 2. Specify the type of project:
      - Stormwater management, Major, or Minor
   - 3. Specify the type of permit:
      - Stormwater Management, Major, or Minor
   - 4. Additional Project Requirements:
      - Stormwater Management Information on regulated stormwater permits can be obtained by contacting the Customer Service Center at 1-877-878-4808.
   - 5. If any of these permits have already been acquired please provide the Project Name, Project Permit Number, Issue Date, and the type of each permit.

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Common Errors: Stormwater Plans and Calculations

- Excessive calculations submitted
  - E&SC calculations
  - Large amounts of routing data

- Excessive plans submitted
  - E&SC
  - Roadway profiles
  - Utility plans
  - Lighting plans
  - Extraneous details

- Show project area and all DAs on full size plans

- Show wetlands, streams, buffers or note that none exist
Common Errors: Application Form

- Leaving sections incomplete
- Inaccurate GPS coordinates
- Signing official
- Drainage area table
- Property Owner Authorization & Applicant’s Certification
Common Errors: Application Form

- Leaving sections incomplete

- Inaccurate GPS coordinates

- Signing official

- Drainage area table

- Property Owner Authorization & Applicant’s Certification
Common Errors: Application Form

- Leaving sections incomplete
- Inaccurate GPS coordinates
- Signing official
- Drainage area table
- Property Owner Authorization & Applicant’s Authorization
15A NCAC 02H .1040 PERMIT ADMINISTRATION

(1) SIGNATURES ON PERMIT APPLICATION FORMS. Application forms shall have an original signature by one of the following entities unless the application is accompanied by a letter of authorization signed by the appropriate authority as designated in Sub-Items (a) through (d) of this Item authorizing the signature of another entity:

   (a) in the case of a corporation, by a principal executive officer of the level of vice-president or his authorized representative. In the case of a limited liability corporation (LLC), by a manager or company official as those terms are defined in G.S. 57D "North Carolina Limited Liability Company Act;"

   (b) in the case of a partnership, by a general partner or a managing partner. In the case of a limited partnership, by a general partner;

   (c) in the case of a proprietorship, by the proprietor(s); or

   (d) in the case of a municipal, state, or other public entity, by either a principal executive officer, ranking official, or other duly authorized employee.
(2)(b) when the applicant is a corporation or limited liability corporation (LLC):

(i) documentation showing the corporation or LLC is an active corporation in good standing with the NC Secretary of State; and

(ii) documentation from the NC Secretary of State or other official documentation showing the titles and positions held by the person who signed the application pursuant to Rule .1040(1) of this Section;
Common Errors: Application Form

- Leaving sections incomplete
- Inaccurate GPS coordinates
- Signing official
- Drainage area table
- Property Owner Authorization & Applicant’s Authorization
10. Complete the following information for each drainage area identified in Project Information item 9. If there are more than four drainage areas in the project, attach an additional sheet with the information for each area provided in the same format as below.

<table>
<thead>
<tr>
<th>Basin Information</th>
<th>Drainage Area</th>
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<tbody>
<tr>
<td>Receiving Stream Name</td>
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<td>Stream Class *</td>
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<td>Stream Index Number *</td>
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<td>Total Drainage Area (sf)</td>
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<td>On-site Drainage Area (sf)</td>
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<td>Off-site Drainage Area (sf)</td>
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<td>Proposed Impervious Area** (sf)</td>
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<td>% Impervious Area** (total)</td>
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<tr>
<th>Impervious** Surface Area</th>
<th>Drainage Area</th>
<th>Drainage Area</th>
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<tbody>
<tr>
<td>On-site Buildings/Lots (sf)</td>
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<td>On-site Streets (sf)</td>
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<td>On-site Parking (sf)</td>
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<td>On-site Sidewalks (sf)</td>
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<td>Other on-site (sf)</td>
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<td>Future (sf)</td>
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<td>Off-site (sf)</td>
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<tr>
<td>Existing BUA*** (sf)</td>
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<td>Total (sf):</td>
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* Stream Class and Index Number can be determined at: [http://portal.ncdenr.org/web/wq_ps/csru/classifications](http://portal.ncdenr.org/web/wq_ps/csru/classifications)

** Impervious area is defined as the built upon area including, but not limited to, buildings, roads, parking areas, sidewalks, gravel areas, etc.
Common Errors: Application Form

- Leaving sections incomplete
- Inaccurate GPS coordinates
- Signing official
- Drainage area table
- Property Owner Authorization & Applicant’s Authorization
Common Errors: Authorizations

9. Copy of any applicable soils report with the associated SHVT elevations (Please identify elevations in addition to depths) as well as a map of the boring locations with the existing elevations and boring logs. Include an 8.5"x11" copy of the NCRS County Soils map with the project area clearly delineated. For projects with infiltration BMPs, the report should also include the soil type, expected infiltration rate, and the method of determining the infiltration rate. (Infiltration Devices submitted to WIRC Schedule a site visit for DEMIR to verify the SHVT prior to submittal, 919.376-7338)

10. A copy of the most current property deed. Deed book: Page No:

11. For corporations and limited liability corporations (LLC): Provide documentation from the NC Secretary of State or other official documentation, which supports the titles and positions held by the persons listed in Contact Information, Item 1a, 2a, and/or 3a per 15A NCAC 2H.1009(e). The corporation or LLC must be listed as an active corporation in good standing with the NC Secretary of State, otherwise the application will be returned.

http://www.secretary.state.nc.us/Corporations/CSearch.aspx

VII. DEED RESTRICTIONS AND PROTECTIVE COVENANTS

For all subdivisions, outparcels, and future development, the appropriate property restrictions and protective covenants are required to be recorded prior to the sale of any lot. If lot sizes vary significantly or the proposed RUA allocations vary, a table listing each lot number, lot size, and the allowable built-up area must be provided as an attachment to the completed and notarized deed restriction form. The appropriate deed restrictions and protective covenants forms can be downloaded from http://portal.ncdcr.gov/web/ncwater/StormwaterForms.doc. Download the latest versions for each submittal.

In the instances where the applicant is different than the property owner, it is the responsibility of the property owner to sign the deed restrictions and protective covenants form while the applicant is responsible for ensuring that the deed restrictions are recorded.

By the notarized signature(s) below, the permit holder(s) certify that the recorded property restrictions and protective covenants for this project, if required, shall include all the items required in the permit and listed on the forms available on the website, that the covenants will be binding on all parties and persons claiming under them, that they will run with the land, that the required covenants cannot be changed or deleted without concurrence from the NC DEMIR, and that they will be recorded prior to the sale of any lot.

VIII. CONSULTANT INFORMATION AND AUTHORIZATION

Applicant: Complete this section if you wish to designate authority to another individual and/or firm (such as a consulting engineer and/or firm) so that they may provide information on your behalf for this project (such as addressing requests for additional information).

Consulting Engineer: ____________________________
Consulting Firm: ____________________________
Mailing Address: ____________________________
City: __________________ State: __________________ Zip: __________________
Phone: __________________ Fax: __________________
Email: __________________

IX. PROPERTY OWNER AUTHORIZATION (If Contact Information, Item 2 has been filled out, complete this section)

I, (print or type name of person listed in Contact Information, Item 2), ____________________________ certify that I own the property identified in this permit application, and thus give permission to (print or type name of person listed in Contact Information, Item 2) ____________________________ with (print or type name of organization listed in Contact Information, Item 2) ____________________________ to develop the project as currently proposed. A copy of the lease agreement or pending property sales contract has been provided with the submittal, which indicates the party responsible for the operation and maintenance of the stormwater system.

As the legal property owner I acknowledge, understand, and agree by my signature below, that if my designated agent (entity listed in Contact Information, Item 2) dissolves their company and/or cancels or defaults on their lease agreement, or pending sale, responsibility for compliance with the DEMIR Stormwater permit reverts back to me, the property owner. As the property owner, it is my responsibility to notify DEMIR immediately and submit a completed Name/Ownership Change Form within 30 days; otherwise I will be operating a stormwater treatment facility without a valid permit. I understand that the operation of a stormwater treatment facility without a valid permit is a violation of NC General Statute 143-215.1 and may result in appropriate enforcement action including the assessment of civil penalties of up to $25,000 per day, pursuant to NC G.S. 143-215.6.

Signature: ____________________________ Date: ____________________________

I, ____________________________, a Notary Public for the State of ____________________________, County of ____________________________, do hereby certify that ____________________________ personally appeared before me this ___ day of ____________________________, 20___, and acknowledge the due execution of the application for a stormwater permit. Witness my hand and official seal.

SEAL

My commission expires ____________________________

X. APPLICANT’S CERTIFICATION

I, (print or type name of person listed in Contact Information, Item 3a) ____________________________, do hereby certify that the information included on this permit application form is, to the best of my knowledge and belief, correct and complete, and that the project will be constructed in conformance with the approved plans, that the required deed restrictions and protective covenants will be recorded, and that the proposed project complies with the requirements of the applicable stormwater rules under 15A NCAC 2H.1000 and any other applicable state stormwater regulations.

Signature: ____________________________ Date: ____________________________

I, ____________________________, a Notary Public for the State of ____________________________, County of ____________________________, do hereby certify that ____________________________ personally appeared before me this ___ day of ____________________________, 20___, and acknowledge the due execution of the application for a stormwater permit. Witness my hand and official seal.

SEAL

My commission expires ____________________________
Common Errors: Deed Restrictions

- Required for all subdivisions
- Shall be signed by applicant and notarized
- Shall submit wet signature
- Shall outline BUA for all lots
  - State BUA allowable in sf
- Section on form for all lots if uniform
- Include table with allowable BUA by lot if not uniform

Low Density Residential Subdivisions
Deed Restrictions & Protective Covenants

In accordance with Title 15 N.C.A.C. 2H.1000 and S.L. 2006-246, the Stormwater Management Regulations, deed restrictions and protective covenants are required for Low Density Residential Subdivisions where lots will be subdivided and sold. Deed restrictions and protective covenants are necessary to ensure that the development maintains a "built-upon" area consistent with the applicable regulation governing the density level.

I, ________________________________, acknowledge and affirm by my signature below, that I will cause the following deed restrictions and protective covenants to be recorded for prior to the sale of any lot:

1. The following covenants are intended to ensure ongoing compliance with State Stormwater Management Permit Number: ___________________________ as issued by the Division of Energy, Mineral and Land Resources under the Stormwater Management Regulations.
2. The State of North Carolina is made a beneficiary of these covenants to the extent necessary to maintain compliance with the stormwater management permit.
3. These covenants are to run with the land and be binding on all persons and parties claiming under them.
4. The covenants pertaining to stormwater may not be altered or rescinded without the express written consent of the State of North Carolina, Division of Energy, Mineral and Land Resources.
5. Alteration of the drainage as shown on the approved plan may not take place without the concurrence of the Division of Energy, Mineral and Land Resources.
6. The maximum allowable built-upon area per lot is ____________________ square foot. This allotted amount includes any built-upon area constructed within the lot property boundaries, and that portion of the right-of-way between the front lot line and the edge of the pavement. Built-upon area includes, but is not limited to, structures, asphalt, concrete, gravel, brick, stone, slate, and coquina, but does not include raised, open wood decking, or the water surface of swimming pools.
7. In the case of a lot within CAMA's regulated AEC, where the Division of Coastal Management calculates a different maximum allowable built-upon area for that lot than is shown herein, the governing maximum built-upon area for that lot shall be the most restrictive of the two.
8. Filling in or piping of any vegetative conveyances (ditches, valves, etc.) associated with the development except for average driveway crossings is strictly prohibited by any persons.
9. Each lot will maintain a 30' foot wide vegetated buffer between all impervious areas and surface waters.
10. All roof drains shall terminate at least 30' foot from the mean high water mark of surface waters.

*50 foot for projects located in the 20 coastal counties.

Signature: ___________________________ Date: ___________________________

I, ________________________________, a Notary Public in the State of ___________________________, County of ___________________________,
do hereby certify that ________________________________________ personally appeared before me this the ________ day of ___________________________, 20____, and acknowledge the due execution of the foregoing instrument. Witness my hand and official seal,

______________________________
Signature

My Commission expires ___________________________

Form DRPC-5 Rev.2 05Nov2009   Page 1 of 1
Common Errors: Supplement EZ Form

- Often not submitted
- Required for all projects – not just high density
  - Note: Offsite not currently included
- Must be signed and sealed by design engineer
- Include information for each drainage area and SCM
- Include design info for low density
- Info in Supplement EZ should match plans, application, be backed up in calcs etc.
- Available on Stormwater Design Manual website (as of April 21, 2021)
Common Errors:
O&M Plan & Agreement

- Shall be signed and notarized by applicant
- Required for all permits – including low density
  - Low density provides options for different types
    - Dispersed flow only
    - Dispersed flow w/ vegetated conveyances
    - Curb outlet swales
- Must hit “Click to Update O&M Manual”
- Always use most up-to-date version
Common Errors: Geotechnical Investigation

• Often not submitted

• Required for all SCMs with SHWT requirements
  • Infiltration Systems
  • Bioretention Cells
  • Permeable Pavement
  • Sand Filters
  • Dry Ponds

• Shall include investigation of depth to SHWT

• For any SCMs relying on infiltration, must include infiltration testing
Common Design Issues
Common Design Errors

• New MDC vs. pre-2017 SCM requirements

• Common General MDC mistakes

• Common low density mistakes

• Common SCM-specific MDC mistakes
Common Errors: New vs. Old Requirements

• All new projects shall meet current rules and MDC

• Exception: projects that received approval before new rules took effect (January 1, 2017) [15A NCAC 02H .1001(5)]

• Common issues:
  • LS-FS no longer required
  • All SCMs can be used for peak flow control
  • Sand filter requirements are significantly changed

• Note: All Fast-Track Projects must meet current design requirements
Common Design Errors

• New MDC vs. pre-2017 SCM requirements

• Common General MDC mistakes

• Common low density mistakes

• Common SCM-specific MDC mistakes
Common Design Errors: General MDC

- Sizing (MDC 1)
- Erosion Protection (MDC 4)
- Dewatering (MDC 6)
- Maintenance Access and Easements (MDC 8 & 9)
- O&M Plan and Agreement (MDC 11 & 12)
Common Design Errors: Sizing (General MDC 1)

**GENERAL MDC 1. SIZING.**
The design volume of SCMs shall take into account the runoff at build out from all surfaces draining to the system. Drainage from off-site areas may be bypassed. The combined design volume of all SCMs on the project shall be sufficient to handle the required storm depth.

- Only net increase in BUA required to be treated on development [15A NCAC 02H .1003(3)(d)]
- Offsite BUA and amount of BUA ≤ existing can be bypassed
- Regardless of minimum required treatment area, SCM *shall* be sized for all surfaces draining to the system
- Must hold entire volume – can’t rout design storm through system
Common Design Errors: General MDC

- Sizing (MDC 1)
- Erosion Protection (MDC 4)
- Dewatering (MDC 6)
- Maintenance Access and Easements (MDC 8 & 9)
- O&M Plan and Agreement (MDC 11 & 12)
• Often not submitted

• Riprap or other outlet calculations required

• Calculations should be in accordance with current Erosion and Control Planning and Design Manual
Common Design Errors: General MDC

- Sizing (MDC 1)
- Erosion Protection (MDC 4)
- Dewatering (MDC 6)
- Maintenance Access and Easements (MDC 8 & 9)
- O&M Plan and Agreement (MDC 11 & 12)
Common Design Errors: Dewatering (General MDC 6)

- To have a method for emptying an SCM for maintenance in case of failure
- Designers often simply specify “Other” on Supplement EZ
- Need to specify what the method is if choosing “Other”
Common Design Errors: General MDC

• Sizing (MDC 1)

• Erosion Protection (MDC 4)

• Dewatering (MDC 6)

• Maintenance Access and Easements (MDC 8 & 9)

• O&M Plan and Agreement (MDC 11 & 12)
Common Design Errors: Maintenance Access and Easements (General MDC 8 & 9)

- Often not shown on plans

- Easements must include entire SCM and maintenance access and extend to nearest public ROW

- Easements not usually required on public projects or single-family residential lots, but maintenance access is
Common Design Errors: General MDC

- Sizing (MDC 1)
- Erosion Protection (MDC 4)
- Dewatering (MDC 6)
- Maintenance Access and Easements (MDC 8 & 9)
- O&M Plan and Agreement (MDC 11 & 12)
Common Design Errors

• New MDC vs. pre-2017 SCM requirements
• Common General MDC mistakes
• Common low density mistakes
• Common SCM-specific MDC mistakes
Common Design Errors: Low Density

- Excessive piping/concentration of stormwater
- Insufficient design of vegetated conveyances
- Not showing proposed swale contours
- Not delineating drainage areas to vegetated areas
- Specifying non-vegetated liner in conveyances
- Curb outlet swales
15A NCAC 02H .1003(2) DESIGN REQUIREMENTS FOR LOW DENSITY PROJECTS

(a) DENSITY THRESHOLDS.

(b) DISPERSED FLOW. Projects shall be designed to maximize dispersed flow through vegetated areas and minimize channelization of flow.

(c) VEGETATED CONVEYANCES. Stormwater that cannot be released as dispersed flow shall be transported by vegetated conveyances. A minimal amount of non-vegetated conveyances for erosion protection or piping for driveways or culverts under a road shall be allowed by the permitting authority when it cannot be avoided. Vegetated conveyances shall meet the following requirements:

(i) Side slopes shall be no steeper than 3:1 (horizontal to vertical) unless it is demonstrated to the permitting authority that the soils and vegetation will remain stable in perpetuity based on engineering calculations and on-site soil investigation; and

(ii) The conveyance shall be designed so that it does not erode during the peak flow from the 10-year storm as demonstrated by engineering calculations.
Common Design Errors: Low Density

- Excessive piping/concentration of stormwater
- Insufficient design of vegetated conveyances
- Not showing proposed swale contours
- Not delineating drainage areas to vegetated areas
- Specifying non-vegetated liner in conveyances
- Curb outlet swales
(a) VEGETATED CONVEYANCES. Stormwater that cannot be released as dispersed flow shall be transported by vegetated conveyances. A minimal amount of non-vegetated conveyances for erosion protection or piping for driveways or culverts under a road shall be allowed by the permitting authority when it cannot be avoided. Vegetated conveyances shall meet the following requirements:

(i) Side slopes shall be no steeper than 3:1 (horizontal to vertical) unless it is demonstrated to the permitting authority that the soils and vegetation will remain stable in perpetuity based on engineering calculations and on-site soil investigation; and

(ii) The conveyance shall be designed so that it does not erode during the peak flow from the 10-year storm as demonstrated by engineering calculations.

• Applies to all vegetated conveyances on-site – including roadside ditches
Common Design Errors: Low Density

- Excessive piping/concentration of stormwater
- Insufficient design of vegetated conveyances
- Not showing proposed swale contours
- Not delineating drainage areas to vegetated areas
- Specifying non-vegetated liner in conveyances
- Curb outlet swales
Common Design Errors: Low Density

• **Curb outlet swales**: curb and gutter with breaks or other outlets used to convey stormwater runoff to vegetated conveyances or other vegetated areas.

• Does not mean you can pipe everything to swales!
Common Design Errors

• New MDC vs. pre-2017 SCM requirements

• Common General MDC mistakes

• Common low density mistakes

• Common SCM-specific MDC mistakes
Common Design Errors: Infiltration Systems

- Failure to provide soil testing within proposed footprint (MDC 1)
- Failure to provide pretreatment (MDC 4)
Common Design Errors:
Soil Investigation (Infiltration MDC 1)

INfiltration MDC 1: Soil Investigation.
A site-specific soil investigation shall be performed to establish the hydraulic properties and characteristics of the soil within the proposed footprint and at the proposed elevation of the infiltration system.

• Must be within footprint of proposed infiltration system

• Infiltration testing required to establish hydraulic conductivity

• SHWT testing to verify separation (2 ft separation as required by Infiltration MDC 2)
Common Design Errors: Infiltration Systems

- Failure to provide soil testing within proposed footprint (MDC 1)
- Failure to provide pretreatment (MDC 4)
• Required for all infiltration SCMs

• Don’t specify type of pretreatment or design requirements

• Intent to give a lot of flexibility
Common Design Errors: Bioretention Cells

• Separation From the SHWT (MDC 1)

• Maximum Ponding Depth and Peak Attenuation Volume (MDC 2 & 3)

• Media Depth (MDC 5)

• Media Mixture and P-index (MDC 6 & 7)

• Planting Plan (MDC 10)
• Separation From the SHWT (MDC 1)

• **Maximum Ponding Depth and Peak Attenuation Volume (MDC 2 & 3)**

• Media Depth (MDC 5)

• Media Mixture and P-index (MDC 6 & 7)

• Planting Plan (MDC 10)
Common Design Errors: Maximum Ponding Depth & Peak Attenuation (Bioretention MDC 2 & 3)

**BIORETENTION MDC 2: MAXIMUM PONDING DEPTH FOR DESIGN VOLUME.**
The maximum ponding depth for the design volume shall be 12 inches above the planting surface.

**BIORETENTION MDC 3: PEAK ATTENUATION VOLUME.**
Bioretention cells may store peak attenuation volume at a depth of up to 24 inches above the planting surface. The peak attenuation outlet shall be a maximum of 18 inches above the planting surface.
Common Design Errors:
Maximum Ponding Depth & Peak Attenuation (Bioretention MDC 2 & 3)
Common Design Errors: Bioretention Cells

- Separation From the SHWT (MDC 1)
- Maximum Ponding Depth and Peak Attenuation Volume (MDC 2 & 3)
- Media Depth (MDC 5)
- Media Mixture and P-index (MDC 6 & 7)
- Planting Plan (MDC 10)
Common Errors:
Media Depth (Bioretention MDC 5)

- Must correspond with submitted planting plan (Bioretention MDC 10)

- Internal water storage required unless in-situ soil infiltration rate ≥ 2 in/hr (Bioretention MDC 4)

- Media depth does not include any stone underlay for underdrain
Common Design Errors: Bioretention Cells

- Separation From the SHWT (MDC 1)
- Maximum Ponding Depth and Peak Attenuation Volume (MDC 2 & 3)
- Media Depth (MDC 5)
- Media Mixture and P-index (MDC 6 & 7)
- Planting Plan (MDC 10)
Common Design Errors:
Media Mix and P-index
(Bioretenion MDC 6 & 7)

- Both must be specified on design plans
- Type of organic matter must be defined
- Mulch does not count as organic matter

**BIORETENTION MDC 6: MEDIA MIX.**
The media shall be a homogeneous soil mix engineered media blend with approximate volumes of:
(a) 75 to 85 percent medium to coarse washed sand (ASTM C33, AASHTO M 6/M 80, ASTM C330, AASHTO M195, or the equivalent);
(b) 8 to 15 percent fines (silt and clay); and
(c) 5 to 15 percent organic matter (such as pine bark fines).

**BIORETENTION MDC 7: MEDIA P-INDEX.**
The phosphorus index (P-index) for the media shall not exceed 30 in NSW waters as defined in 15A NCAC 02B .0202 and shall not exceed 50 elsewhere.
Common Design Errors: Bioretention Cells

• Separation From the SHWT (MDC 1)

• Maximum Ponding Depth and Peak Attenuation Volume (MDC 2 & 3)

• Media Depth (MDC 5)

• Media Mixture and P-index (MDC 6 & 7)

• Planting Plan (MDC 10)
Common Design Errors
Planting Plan (Bioretention MDC 10)

- Must submit a planting plan
- Must have appropriate media depth
- If sod is used, specify that it’s not grown in soil that has an impermeable liner, such as clay
- Difficult to ensure at outset that coverage will be obtained over 5 years – should be special condition in maintenance plan
Common Design Errors
Wet Ponds

- Main pool depth (MDC 2)
- Sediment storage (MDC 3)
- Forebay (MDC 5)
- Drawdown time (MDC 7)
Common Design Errors:
Main Pool Depth (Wet Pond MDC 2)

MDC 2: MAIN POOL DEPTH.
The average depth of the main pool shall be three to eight feet below the permanent pool elevation. The applicant shall have the option of excluding the submerged portion of the vegetated shelf from the calculation of average depth.

Average depth ≠ physical depth

Equation 2. Average depth when the shelf is not submerged or the shelf is being included in the average depth calculation

\[ D_{avg} = \frac{V_{PP}}{SA} \]

Where:
- \( D_{avg} \) = Average depth (feet)
- \( V_{PP} \) = Main pool volume at permanent pool elevation (feet\(^3\))
- \( SA \) = Main pool area at permanent pool elevation (feet\(^2\))
**Equation 3. Average depth when the shelf is partially or fully submerged and the shelf is being excluded from the average depth calculation**

\[
D_{avg} = \frac{V_{PP} - V_{shelf}}{A_{bottom \text{ of shelf}}}
\]

Where:
- \(D_{avg}\) = Average depth (feet)
- \(V_{PP}\) = Main pool volume at permanent pool elevation (feet\(^3\))
- \(V_{shelf}\) = Volume over the shelf only (feet\(^3\)) – see below
- \(A_{bottom \text{ of shelf}}\) = Area of main pool at the bottom of the shelf (feet\(^2\))

\[
V_{shelf} = 0.5 \times \text{Depth}_{\text{max over shelf}} \times \text{Perimeter}_{\text{perm pool}} \times \text{Width}_{\text{submerged part of shelf}}
\]

Where:
- \(\text{Depth}_{\text{max over shelf}}\) = Depth of water at the deep side of the shelf as measured from the permanent pool (feet)
- \(\text{Perimeter}_{\text{perm pool}}\) = Perimeter of main pool at the bottom of the shelf (feet)
- \(\text{Width}_{\text{submerged part of shelf}}\) = Width from the deep side to the dry side of the shelf as measured at permanent pool (feet)
Common Design Errors
Wet Ponds

• Main pool depth (MDC 2)
• Sediment storage (MDC 3)
• Forebay (MDC 5)
• Drawdown time (MDC 7)
Common Design Errors: Sediment Storage (Wet Pond MDC 3)

- Sediment storage must be added after other MDC are met.
- Design entire wet pond and then excavate additional 6 inches.

MDC 3: SEDIMENT STORAGE.
The forebay and main pool shall have a minimum sediment storage depth of six inches.
Common Design Errors
Wet Ponds

• Main pool depth (MDC 2)
• Sediment storage (MDC 3)
• Forebay (MDC 5)
• Drawdown time (MDC 7)
Common Design Errors:
Forebay (Wet Pond MDC 5)

MDC 5: FOREBAY.
A forebay that meets the following specifications shall be included:
(a) Forebay volume shall be 15 to 20 percent of the volume in the main pool;
(b) The forebay entrance shall be deeper than the forebay exit;
(c) The water flowing over or through the structure that separates the forebay from the main pool shall flow at a nonerosive velocity; and
(d) If sediment accumulates in the forebay in a manner that reduces its depth to less than 75 percent of its design depth, then the forebay shall be cleaned out and returned to its design state.

• Depth from bottom of forebay to permanent pool shall be greater at inlet than at weir between forebay and main pool

• Sediment accumulation is maintenance issue – usually addressed by cleaning when forebay sediment storage full
Common Design Errors

Wet Ponds

• Main pool depth (MDC 2)
• Sediment storage (MDC 3)
• Forebay (MDC 5)
• Drawdown time (MDC 7)
• Drawdown time based on volume from water quality event (usually 1.5” in coastal counties and 1” in other)

• Steps:
  • Calculate water quality volume
  • Find storage elevation above permanent pool that provides storage for water quality volume
  • Design orifice that will provide average outflow to allow storm to drain in two to five days assuming average head of H/3
Common Design Errors:
Sand Filter

- SHWT Separation (MDC 1)
- Two Chamber System and Sizing (MDC 2 & 3)
- Sand Media Specification (MDC 6)
- Media Depth (MDC 7)
Common Design Errors:
Sand Filter

- SHWT Separation (MDC 1)
- Two Chamber System and Sizing (MDC 2 & 3)
- Sand Media Specification (MDC 6)
- Media Depth (MDC 7)
Common Design Errors:
Two Chamber System and Chamber Sizing (Sand Filter MDC 2 & 3)

SAND FILTER MDC 2. TWO CHAMBER SYSTEM.
The sand filter shall include a sediment chamber and a sand chamber. Storage volume in each chamber shall be equivalent.

SAND FILTER MDC 3. SEDIMENT/SAND CHAMBER SIZING.
The volume of water that can be stored in the sediment chamber and the sand chamber above the sand surface combined shall be 0.75 times the treatment volume. The elevation of bypass devices shall be set above the ponding depth associated with this volume. The bypass device may be designed to attenuate peak flows.

• Sediment chamber acts as forebay

• Can use adjusted design volume of 0.75 * treatment volume

• Sand chamber must be able to store at least 50% of adjusted design volume below outlet

• Sediment chamber can be oversized to attenuate peak flows
Common Design Errors: Sand Filter

- SHWT Separation (MDC 1)
- Two Chamber System and Sizing (MDC 2 & 3)
- Sand Media Specification (MDC 6)
- Media Depth (MDC 7)
Common Design Errors:
Sand Media Specification
(Sand Filter MDC 2 & 3)

SAND FILTER MDC 6. SAND MEDIA SPECIFICATION.
Sand media shall meet ASTM C33 or the equivalent.

• Sand media must be specified on plans
• Sand should cover entire sand chamber
• Cannot use old design manual calculations to determine size of sand chamber
Common Design Errors: Sand Filter

- SHWT Separation (MDC 1)
- Two Chamber System and Sizing (MDC 2 & 3)
- Sand Media Specification (MDC 6)
- Media Depth (MDC 7)
Common Design Errors: Sand Media Specification (Sand Filter MDC 2 & 3)

- Sand media (C33 or equivalent) must be 18 inches everywhere except above underdrain pipe

- Underdrain can be embedded in sand layer provided sand layer above pipe is at least 6”

- If gravel layer used under sand for underdrain, not included in media depth
Common Design Errors: Permeable Pavement

- Separation From the SHWT (MDC 1 & 2)
- Runoff from Adjacent Areas (MDC 7)
- Infiltrating Permeable Pavement – how to present within the application documents?
Common Design Errors: Soil Investigation (Permeable Pavement MDC 1 & 2)

**PERMEABLE PAVEMENT MDC 1: SOIL INVESTIGATION**
For infiltrating pavement systems, site-specific soil investigation shall be performed to establish the hydraulic properties and characteristics within the proposed footprint and at the proposed elevation of the permeable pavement system.

**PERMEABLE PAVEMENT MDC 2: SHWT REQUIREMENTS**
The minimum separation between the lowest point of the subgrade surface and the SHWT shall be:
(a) two feet for infiltrating pavement systems; however, the separation may be reduced to no less than one foot if the applicant provides a hydrogeologic evaluation that demonstrates that the modified soil profile allows for infiltration of the design volume within 72 hours; and
(b) one foot for detention pavement systems.

- SHWT testing to verify separation (1-2 ft separation as required by Permeable Pavement MDC 2)
- For infiltration systems, testing within footprint of proposed pavement area(s) is required to establish hydraulic conductivity
• Separation From the SHWT (MDC 1 & 2)

• Runoff from Adjacent Areas (MDC 7)

• Infiltrating Permeable Pavement – how to present within the application documents?
• Need to show grading contours / spot elevations for adjacent areas on the plans

• The additional adjacent BUA contributing runoff cannot exceed a 1:1 ratio.

• If screened rooftop runoff contributing runoff, show collection system and provide a screen detail
Built-upon Area Credit for Infiltrating Pavement

Infiltrating permeable pavement that is designed per the MDC may be considered as 100% pervious for the following purposes:

1. On new projects: As a tool to keep a project below the BUA threshold for high density or to reduce the volume of the SCM that is treating the balance of the project.

2. On existing projects: As a tool to add a driveway, parking area, road, patio or other paved area while still adhering to a BUA restriction imposed by development covenants, SCM design or permit conditions.

The BUA credit for infiltrating permeable pavement cannot be used to create an exemption from the permit requirements in 15A NCAC 02H.1001(1)(f) [Applicability] or 15A NCAC 02H.

• List each area as a separate drainage area / SCM in the application documents

• The pavement area must be considered as BUA when sizing the system and in the application documents

• Doesn’t get the credit until the MDC have been met and the SCM is approved
Common Errors: Final Submittal Requirements

- 15A NCAC 02H .1042(4) requires submittal of:
  - Designer’s Certification Form
  - Copy of recorded deed restrictions and protective covenants
  - Copy of recorded drainage easements

- O&M Agreement must be referenced on final plat and recorded with County Register of Deeds
Any Questions?
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