

Engineering has reviewed the plans for the Woodfield Wilmington project submitted April 11, 2017 and have the following comments:

### **Stormwater Management Design Narrative**

**Note only:** Reference the Wet Detention Basin Supplement Form located at the following link:

<http://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permit-guidance/stormwater-bmp-manual/forms>

1. Pond #1 (NC DEQ Retention Requirements):
  - a. The average depth provided does not appear to be correct (5.50' vs. 5.00'). See comments for average depth calculation for Pond #1.
  - b. SA/DA Ratio appears to be incorrect based on average depth discrepancies (4.20 vs. 4.65).
  - c. Required PP SA appears to be incorrect and therefore the provided PP SA appears to be too small (6,733sf vs. 7,454sf).
  - d. Permanent Pool Volume appears to be incorrect. See comments for stage/storage.
  - e. Total Required Forebay Volume appears to be incorrect. See comments for stage/storage.
  - f. Drawdown times appears to be inaccurate. Check that the correct Total Elevation Head for the 1.5" and the temporary pool is being used for each drawdown determination. The Total Elevation Head is different for each one.
  - g. Stage/Storage-Forebay 1: The Incremental Volumes and Cumulative Volumes at elevation 3.00 should be 0 and 0 for the stage/storage calculations to be consistent.
  - h. Stage/Storage Below Permanent Pool: The Incremental Volumes and Cumulative Volumes starting at elevation 6.00' appear to be calculating incorrectly.
  - i. Avg. Depth Calculations Pond #1; Option 1: Check the volume of the PP with the stage/storage corrected from earlier comment. I calculate  $29,845 - 1,136 = 28,710$  for the volume and 4.09' for the  $d_{av}$ .
  - j. Avg. Depth Calculations Pond #1; Option 2: The Depth is the bottom of the shelf (9.5') minus the sediment storage elevation (2.0'). With all other values in the formula correct, the  $d_{av}$  calculated is 5.01'. The average depth to be used is then rounded down to the nearest 0.5' which would be 5.00'.
2. Pond #2 (NC DEQ Retention Requirements):
  - a. Verify Bottom of Pond Elevation-Main Bay and Sediment Storage Elevation-Main Bay. It appears they need to be switched.
  - b. Verify Sediment Storage Volume. See Stage/Storage comments for Pond #2.
  - c. The average depth provided does not appear to be correct (5.00' vs. 4.50'). See comments for average depth calculation for Pond #2.
  - d. SA/DA Ratio appears to be incorrect based on average depth discrepancies (4.37 vs. 4.87).
  - e. Required PP SA appears to be incorrect and therefore the provided PP SA appears to be too small (7,272sf vs. 8,104sf).
  - f. Provided Volume-Forebay and Total Forebay % will be revised based on Stage/Storage comment for Pond #2.
  - g. Drawdown times appears to be inaccurate. Check that the correct Total Elevation Head for the 1.5" and the temporary pool is being used for each drawdown determination. The Total Elevation Head is different for each one.
  - h. Stage/Storage-Forebay 1: The Incremental Volumes and Cumulative Volumes at elevation 6.00 should be 0 and 0 for the stage/storage calculations to be consistent.
  - i. Avg. Depth Calculations Pond #2; Option 2: The Depth is the bottom of the shelf (13.0') minus the sediment storage elevation (5.0'). The  $A_{bot\_pond}$  should exclude the sediment storage (330 vs. 165). With all other values in the formula correct, the  $d_{av}$  calculated is

- 4.67'. The average depth to be used is then rounded down to the nearest 0.5' which would be 4.50'.
3. Pond #3 (NC DEQ Retention Requirements):
    - a. Provided Treatment Volume (12,436cf) should match the volume in the Stage/Storage (12,384cf).
    - b. Bottom of Pond Elevation-Forebay and Sediment Storage Elevation-Forebay do not agree with the Stage/Storage elevations.
    - c. The average depth provided does not appear to be correct (3.50' vs. 3.00'). See comments for average depth calculation for Pond #3'.
    - d. SA/DA Ratio appears to be incorrect based on average depth discrepancies (5.50vs. 6.30).
    - e. Required PP SA appears to be incorrect, but the provided PP SA appears to still be adequate (Required: 4,309sf vs. Provided: 4,711sf).
    - f. Drawdown times appears to be inaccurate. Check that the correct Total Elevation Head for the 1.5" and the temporary pool is being used for each drawdown determination. The Total Elevation Head is different for each one.
    - g. Stage/Storage-Forebay 1: The Incremental Volumes and Cumulative Volumes at elevation 13.00 should be 0 and 0 for the stage/storage calculations to be consistent.
    - h. Avg. Depth Calculations Pond #3; Option 2: The Depth is the bottom of the shelf (17.0') minus the sediment storage elevation (12.0'). With all other values in the formula correct, the  $d_{av}$  calculated is 3.10'. The average depth to be used is then rounded down to the nearest 0.5' which would be 3.00'.
  4. Hydrograph Report: Stage/Storage Tables: It appears there are minor discrepancies between the stage/storage contour areas in the report and the NCDEQ Retention Requirements for the ponds.
  5. While there doesn't appear to be an HGL issue, I would like you to submit the pipe calcs that provide the HGL for the 10-year and 50-year storms with an appropriate tailwater assigned. Permanent pool elevations are not an appropriate tailwater condition.
  6. Energy dissipater calculations were not resubmitted.
  7. *Previous comment: Provide any required calculations for the permeable pavement, i.e. stone base and drawdown time.* Because you are taking credit for the pervious concrete, the PC must meet all requirements of the NCDEQ Stormwater Design Manual (C-5 Permeable Pavement). What is not required is routing of the PC as if it were acting as an SCM. If the PC was considered 100% impervious, then the requirements wouldn't have to be met, but credit is clearly being taken for the PC.

**Note only:** Pervious Concrete can now receive 100% credit per the MDC.

#### **Wet Detention Basin Supplements**

8. Recheck all supplements based on calculations review comments.
9. You must round down to the nearest 0.5 ft to determine average depth used. The current supplement form on NCDEQ's website shows the 'rounding down to the nearest 0.5' for Option 2.
10. Please provide Permeable Pavement Supplements and O&M's.
11. Construction Management is also performing a concurrent review of the proposed improvements within Independence Boulevard. I will forward CM comments to you once I receive them.

#### **Stormwater Submittal Plans**

##### **General**

12. Based on an email from Rob Gordon, dated May 19, 2017, the proposed sidewalk along the frontage of the project will instead be a 10' multi-use path. Please refer to that email for design

specifics. Add a MUP detail to the plans. Let me know if you need me to send you a copy of email or the MUP detail.

13. Please show locations of observation wells for the PC in the plans as well as a detail for the observation wells. Signage for the PC is also recommended to encourage proper maintenance of the PC.

#### **CS-102 & CS-103 (Enlarged Site Plans)**

14. You are correct that edge restraints are not required around the perimeter of PC in MDC 11, but I am referring to the intersection of the pervious concrete with the conventional asphalt (also in MDC 11). For PC and conventional asphalt, a concrete curb that extends below the permeable base should be provided to protect the subgrade under the conventional asphalt. Please add the header curb to the site plan and add the detail to the plans.
15. Revise the 25' radius on the northern most driveway to tie into the existing edge of pavement.

#### **CG-102 thru CG-105 (Grading Plans)**

16. *Previous comment: Please provide drainage areas for each Pervious Concrete area. The maximum ratio of additional built-upon area that may drain to permeable pavement is 1:1. Drainage areas that exceed the 1:1 ratio must be revised. It is preferable to keep the permeable pavement out of the low areas (sag conditions) and to relocate the pipe system inlets out of the permeable pavement and into the drive aisles and/or conventional asphalt parking areas. Permeable pavement would be best located at the upper end of a drainage area where the drainage area of the PC is no more than the footprint of the PC. Stone base thickness will need to be calculated for each PC section.* This comment is still valid since BUA credit is being taken.
17. *Previous comment: Runoff from adjacent pervious areas shall be prevented from reaching the permeable pavement except for incidental, unavoidable runoff from stable vegetated areas.* This comment is still valid since BUA credit is being taken.
18. CG-102: Please provide more proposed grade spot elevations to better illustrate the installation of the entrance drive and turn lane into the project. Please show existing grade spot elevations along Independence Boulevard to better understand how IB is graded and the existing drainage pattern. How is the runoff generated by the new impervious to be conveyed?
19. CG-103: The pipe system layout around the pool area is a little hard to follow, particularly on the left side of the pool. Can you adjust the lineweight or linetype of the pipe system so I can better understand the layout?
20. CG-104: Cannot see the entrance drive with connection to Independence Boulevard. Comment #12 valid here for this entrance as well.
21. CG-105: Comment #12 valid here for this entrance as well.

#### **CG-501 (Storm Drainage Details)**

22. Pervious Concrete Detail: Per the Permeable Pavement Recommendation 2: Geogrids, Geotextiles and Geomembranes, geotextiles are not recommended under the aggregate base in an infiltration design because they can accumulate fines and inhibit infiltration.

#### **CN-501/CN-502/CN-503 (Stormwater Management Details)**

23. *Previous comment: Per the technical standards (Ch. V.D.4.g and h), please provide the 10' maintenance access and 5' landscape zone around the periphery of the pond. How are maintenance vehicles to gain access to the ponds? Please submit the landscape plan for review of the plantings required around the periphery of the pond.* The 10' maintenance access has been provided around the periphery of the pond. The 5' landscape zone does not appear to be shown. There should be a 15' access/zone area from the top of pond outward per the technical standards. Please demonstrate how equipment gets to the maintenance access from the parking areas. How does equipment physically get to Pond #1? Will vehicles go between Buildings 1 and 2 to access Pond #2? Can equipment perform all necessary maintenance to Pond

#3 from the parking areas? I do not see the required 5 foot landscape zone around the ponds. The landscape plan does not appear to agree with SD 15-16. There does not appear to be clustered landscape areas around the periphery of the pond from the top of bank outward.

Please submit a \$500 re-submittal fee (required after 2<sup>nd</sup> submittal per the CoW Fee Schedule) one complete set of plans, application (if necessary), supplements, narrative, calculations and any other supporting documentation to Engineering for additional review. Please call or email if there are any questions. Thank you.