Engineering has reviewed the plans for the WTC- Partial Hospitalization Center project submitted February 28, 2017 and have the following comments:

Stormwater Management Permit Application Form

1. Page 1 of the application appears to be completed for the Wilmington Treatment Center project located at 2520 Troy Drive and not the WTC Partial Hospitalization Center located at 2651 Carolina Beach Road. Please verify I. General Information and II. Permit Information.
2. IV. Project Information; Line Item #5: There appears to be a miscalculation for Total Project Area. Please revise.
3. IV. Project Information; Line Item #9:
    a. The impervious amounts in the table do not equal 208,757sf. Please revise.
    b. There still appears to be some discrepancy between the Total Onsite Newly Constructed Impervious Surface table and the Impervious Coverage information provided in the Site Data on the Site Plan (C201). The information should match. Please keep separate the amount of Impervious Pavement from the amount of Pervious Pavement. Provide the square footage of the PP both without and with credit taken, but do not combine it with the Impervious Pavement. Line Items 10, 11, 12 and 13 may change once #9 has been corrected.
4. IV. Project Information; Line Item #14:
    a. Provide impervious breakdowns for BMP's #1 thru #4.
    b. There appears to be a discrepancy with the impervious breakdowns for BMP #6 thru #13. The pervious number should be the sf with the credit applied (25%). The total impervious area is the pervious pavement sf (credit applied) added to the impervious pavement amount. Be sure the impervious area for each PP BMP is broken down (pavement, sidewalk, etc.).
    c. Write in the 'with 75% credit applied' as it is in line item #9 of the application.
    d. Correct Percent Impervious Area (%).
    Note only: See MDC for latest guidance on credit for pervious concrete.
5. IV. Project Information; Line Item #15: There does not appear to be any offsite impervious included in the drainage areas of the BMP's. Therefore, this section can be left blank or enter a 'N/A'.
6. *Previous comment: VI. Property Owner Authorization: This section is not required to be completed as Section III(2) was not filled out. Please clear this section.* This section was not left blank in the resubmitted application. Please revise.

Drainage Report

Narrative

7. The Pre-Drainage Area table does not appear to match the Pre-Developed Drainage Map. Please verify.
8. The information in the Water/Quality Treatment paragraph does not appear to agree with the Post-Drainage Area table. Please verify.
9. Treatment Calculations:
    a. Wet Detention Pond Volume:
        i. Provide stage/storage calculations for the main bay, forebay and total pond (main bay + forebay) in addition to the stage/storage above the permanent pool. Be sure to include the vegetated shelf (top and bottom elevation and areas) and the permanent pool in the stage/storage calculations.
        ii. The Cumulative Volume Above the Permanent Pool does not appear to be calculated correctly. Please verify.

iii. At what elevations are the permanent pool and temporary pool? Make certain these numbers are consistent throughout all documents.

b. Underground Infiltration Basin:
   i. Provide calculation of Storm Capture surface area (5,720 sf).
c. Underground Detention:
   i. Provide calculation of Storm Capture surface area (3,740 sf).
d. Bio-Retention 1: The design volume for a bioretention cell is equivalent to the volume that is contained above the planting surface to the invert of the bypass mechanism for the design storm. It would appear that this cell does not have the required volume for the 1.5' storm between the bypass mechanism (51.75') and the top of the planting surface (51.00'). Per the MDC, you may not use anything below the planting surface to achieve the design volume.

Calculations

10. Bio-Retention; Bio 1: Rework areas, elevations, volumes, etc. to meet required design volume. Cannot use any voids below planting surface to achieve required volume. Bio 2 appears to meet the design volume above the planting surface.
11. Wet Detention Pond:
    a. Main pool depth must be calculated using Option 2 under MDC 2 since the vegetated shelf is partially submerged.
    b. Because you are using the HRT Method and not the SA/DA method, the SA/DA %, SA Provided and SA Required calculations can be omitted.
    c. Please provide calculations (Stage/Storage) showing the forebay is adequately sized. Exclude the sediment storage from the design.
    d. Note only: the vegetated shelf can be a minimum of 6 feet wide and no steeper than 6:1.
    e. Please provide calculations showing that the design volume will drawdown between two and five days. Also, if there is additional volume stored above the design volume, which there does appear to be, it will need to drawdown in less than five days.
    f. Per the Technical standards, show that the elevation of the pond dam is a minimum of 0.5 feet above the peak surface elevation for the 50-year storm.
12. Pervious Pavement:
    a. Please see Built-upon Area Credit for Infiltrating Pavement. NCDEQ just released new guidance for Permeable Pavement…can be considered 100% pervious for new projects if designed to MDC requirements. Make sure all documents show that 100% pervious credit is being taken.
    b. Permeable Pavement MDC 7: Runoff from Adjacent Areas: The maximum ratio of additional built-upon area that may drain to the PP is 1:1. Screened rooftop runoff shall not be subject to the 1:1 loading limitation. PP #1, #2, #4, #6 and #7 greatly exceed the 1:1 loading limitation. Please revise.
    c. Runoff from adjacent pervious areas shall be prevented from reaching the PP except for incidental, unavoidable runoff from stable vegetated areas. Please limit the amount of pervious area draining to the PP.
    d. Please provide Drawdown Time calculations.
13. Underground Detention: It would appear that Post-Drainage Area 22 drains to the Underground Detention (with infiltration). The underground detention appears to be providing treatment for Area 22. The underground detention is acting as Area 22's BMP. Provide calculations, supplement, O&M, etc. since the underground detention is a BMP. Update drainage report.
14. Node Summary: It appears that the rims and inverts do not match the rims and inverts listed on sheet C402. Please verify.

15. Bio-Ret-1: Why is it an orifice instead of a weir? I would have thought that the software would allow input for an 11.33 foot weir at elevation 51.75'. The orifice appears to be undersize based on the detail for the outlet structure. The detail depicts a 28"x40" inside dimension for the outlet structure for both retention basins? Please explain.
16. What is stor-06?
17. It would appear UGI1 is missing the 4' orifice shown on the outlet structure detail.
18. The wet pond stage/storage will need to be updated based on earlier comments.
19. The outlet structure for the wet detention pond seems to be undersized. Again, why are there only orifices and not a weir input for the pond?

Supplements

20. Since the design appears to incorporate the new MDC guidelines, the supplements submitted for each SCM may not be suitable for use any longer and must utilize the Supplement EZ Form found at:
    http://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permit-guidance/stormwater-bmp-manual
    Comments are based on review of provided supplements.
21. All Supplements: 1. Project Information; Drainage Area Number: Drainage Area Number should coincide with the BMP number assigned in the SW permit application in line item #14.

Bioretention Cell Supplement (Post DA 1):

22. II. Design Information; Storage Volume: Non-SA Waters; Volume Provided: Verify volume provided based on comment for the drainage report section.
23. Provide calculations for the Drawdown times for verification.
24. Verify if grassed cell or not. Details in plans show mulch.
25. Depth of mulch? Details show 3" versus 24" listed in supplement.

Bioretention Cell Supplement (Post DA 2):

26. Provide calculations for the Drawdown times.
27. Verify if grassed cell or not. Details in plans show mulch.
28. Depth of mulch? Details show 3" versus 24" listed in supplement.

Wet Detention Basin Supplement

29. Provide calculations to verify the storage volume provided. This can be shown in the stage/storage in the drainage report.
30. It would appear that you are providing additional storage above the state-required permanent pool. Please revise supplement under Elevations section.
31. II. Design Information: Please recheck all entries in this section based on comments for the drainage report.
32. Drain mechanism for maintenance or emergencies must be provided. Either show a valve assembly at the bottom of the outlet structure or note that a pump would be provided in order to pump the pond dry.

Infiltration Basin Supplement

33. Provide calculations to verify the design volume provided.
34. Infiltration rate is listed as 10 in/hr. How did you determine this rate?
35. Please provide drawdown time calculation.
36. Bottom covered with 4 inches of clean sand? Answered 'yes', but detail does not support that.

Permeable Pavement Supplements

All Supplements

37. Adjacent BUA directed to PP: Cannot exceed 1:1. Please revise all supplements where this occurs.
38. Flow must directed away from pervious surfaces as much as possible.

39. A second layer of #57 stone? Leave blank if just one layer.
40. Minimum total aggregate depth for design rainfall: Revise this depth with the reduction of adjacent BUA directed to PP. Check that all supplements list correctly calculated Dwq.
41. Please provide all drawdown/infiltration time calculations (Dwq and D10).
42. Actual provided total aggregate depth may change based on the reduction of adjacent BUA run-on.
43. Please clarify how all soil subgrade at bottom of permeable pavement is 0%.
44. Provide spot elevations on plans to verify 2% slope of PP surface.
45. Answer 'Required signage specified on plans?'

Post DA 4

46. How is 10-yr, 24-hr storm handled? Bypassed? Where is the bypass for this PP SCM?
47. Overflow elevation? 52.50 is the top of the PC. Larger storms will pond without a bypass provided. Please revise design.
48. Pavement Design Summary: SA of PP, Adjacent BUA : doesn't match calculations.

Post DA 5

49. II. Design Information; Pavement Design Summary: line items 2 thru 5 appear to be for a different PP system. Please verify.

Post DA 10

50. II. Design Information; Pavement Design Summary: line items 2 thru 5 appear to be for a different PP system. Please verify.
51. Overflow elevation? Please clarify where this elevation is.

Post DA 11

52. II. Design Information; Pavement Design Summary: line items 2 thru 5 appear to be for a different PP system. Please verify.
53. Overflow elevation is listed at 53.00'. Please explain where the overflow occurs and where the overflow drains to.

Post DA 15

54. II. Design Information; Pavement Design Summary: line items 2 thru 5 appear to be for a different PP system. Please verify.
55. Actual provided total aggregate depth is listed at 24"? Detail on plans does not support that.
56. Overflow elevation is listed at 53.50'. Please explain where the overflow occurs and where the overflow drains to.

Post DA 13

57. II. Design Information; Pavement Design Summary: line items 2 thru 5 appear to be for a different PP system. Please verify.
58. Minimum total aggregate depth for design rainfall does not match calculations.
59. Verify aggregate depth to infiltrate 10-yr, 24-hr storm and drawdown time.
60. Overflow elevation must be raised slightly to give runoff a chance to infiltrate through PC instead of exiting through CB4.

Post DA 14

61. II. Design Information; Pavement Design Summary: line items 2 thru 5 appear to be for a different PP system. Please verify.
62. Minimum total aggregate depth for design rainfall does not match calculations.
63. Verify aggregate depth to infiltrate 10-yr, 24-hr storm and drawdown time.
64. Verify Overflow elevation. Does not match storm drainage structure CB5.
65. Verify bottom elevation at subgrade.

Post DA 16

66. II. Design Information; Pavement Design Summary: line items 2 thru 5 appear to be for a different PP system. Please verify.
67. Minimum total aggregate depth for design rainfall does not match calculations.
68. Overflow elevation is listed at 52.50'. Please explain where the overflow occurs and where the overflow drains to.

Operation & Maintenance Agreement Forms

69. Since the design incorporates the new MDC guidelines, the Operation & Maintenance Agreement Forms submitted for each SCM may not be suitable for use any longer and must utilize the O&M EZ Form found at: http://deq.nc.gov/about/divisions/energy-mineral-land-resources/energy-mineral-land-permit-guidance/stormwater-bmp-manual
70. All O&M's: BMP drainage area numbers should coincide with the BMP numbers assigned in the SW permit application and Supplement. Bioretention BMP's and Permeable Pavement can be covered under one O&M. Need one O&M for every other BMP (WDP (1), and UIT (2) - 5 O&M's in total).
71. All O&M's must be signed and notarized and the original submitted to the CoW.

Wet Detention Basin Operation and Maintenance Agreement

72. Permanent pool depths in the main pond and forebay should not be elevational but based on depth. For example, the sediment shall be removed from the main pond when the depth reads 4 feet (49.50-45.50) instead of an elevation of 50.00 feet.
73. Basin Diagram may need updating based on drainage report comments.

Plans

74. C100 – Debris in existing drop inlet is to be cleaned out. Add note to plans.
75. C201 – Building Coverage and Impervious Coverage need to match with each other and with the application.
76. C300 – Previous comment - The grading plan is not sufficient to support the inlet drainage area map. Please add spot elevations to the grading plan to better detail the proposed drainage patterns. I did not receive C301. I still do not see adequate spot elevations to support the drainage patterns.
77. C400 – The Pre-Developed Drainage areas do not appear to match the drainage calculation narrative for the Pre-drainage areas.
78. C400 & C401 – Please add the routing exhibits to the drainage report.
79. C401 – Add 'w/o pervious credit' to the pervious concrete header in the table.
80. C402:
    a. CB5 rim does not match surface elevation of PC7.
    b. CB16 invert is lower than CB7 invert.
    c. OS1 rim elevation doesn't match OS1 detail or calculations.
    d. CB5 to CB15 to UIT is an 18" pipe to a 12" pipe. Is that correct?
    e. EW5 to EW8 is flat (inverts at 49) yet pipe chart has 2.50% slope.
    f. Drainage Note F should state that the roof runoff from the building must be directed to the UIT.
81. C403 – Areas to pervious pavement systems need to note that the total pervious concrete areas listed are either the footprint or without credit.
82. C404 –
    a. The flow path from the northern forebay looks to create short-circuiting.
    b. The forebays appear to be too shallow. Forebays and main pools must have sediment storage per the MDC. Forebay sizing should be a minimum of 15% of the main pond.

c. The forebay berm elevation cannot be higher than the permanent pool elevation.
d. Side slopes can be 2:1 below the PP and 3:1 above the PP.
e. The vegetated shelf can be 6 feet wide with a 6:1 slope.
f. Show the PP elevation in the pond section.
g. Design storms in the pond section are missing the associated water surface elevations.
h. Can EW3 and EW4 show two pipes coming into one headwall?
i. Please address pond vegetation per MDC 11.
j. Per the technical standards, show how the 10' maintenance access and 5' landscape zone requirements are met.

83. C406 – Show the 3" mulch layer in the section to match the bioretention detail.
84. C408:
    a. Are this site's former land uses considered a stormwater hotspot per MDC 3? Pervious concrete is prohibited in such areas.
    b. Please show the location of the required observation wells. Provide a detail as well.
    c. Please show edge restraints per the MDC. Provide a detail as well.
    d. Provide a detail for the pervious concrete signage per the MDC.
    e. Show how volumes larger than the design storm will bypass each pervious concrete section. Some pervious concrete areas have catch basins located within the PC footprint. Others do not. Any runoff that doesn't infiltrate and jump the curb and flow offsite during the 2, 10 and 25 year storm events will need to be factored into the pre/post calculations.
    f. Raise the rims of the proposed curb inlets slightly to give the runoff the chance to pond and infiltrate through the PC before entering the catch basins.
85. C411:
    a. The elevation of the top of the wet pond outlet structure does not appear to be correct.
    b. What is the elevation at the top of the weir in OS2?
    c. OS3 needs to be labeled as the Bio 2 outlet structure.
    d. The bioretention section references the wrong sheet in the labels.
86. C412 – Please provide sidewalk, curbing, etc. details to the detail sheets.

Please submit one complete set of plans, application, calculations and any other supporting documentation to Engineering for additional review and comments. Please call or email if there are any questions. Thank you.