Engineering has reviewed the plans for the **CoW-Haynes/Lacewell Police and Fire Training Facility** project submitted November 27, 2017 and have the following comments:

**Stormwater Management Permit Application Form**

1. II. Permit Information; #3: Check all applicable permits required. 404/401 permit? Check if required.
2. III. Contact Information; #2: This section is to be left blank following the instructions from the checked box in Section III.1.b.
3. IV. Project Information; #14: It would appear that not all of the newly constructed impervious surface area is being collected and directed to one of the two proposed stormwater wetlands. All runoff at build out from all impervious surfaces must be collected and treated.
4. IV. Project Information; #15: This section is for any offsite impervious area listed within the drainage area(s) of BMPs listed in #14. In this case, there does not appear to be any offsite impervious, so this should be left blank.

**General**

5. Provide approved wetland delineation map and wetland impact permit once they have been obtained.

**Narrative Statement and Design Calculations**

6. Narrative Statement; Project Description: The site consists of all hydrologic soil groups. The pre- and post-development curve numbers must be weighted accordingly.
7. Stormwater Management Methodology; Stormwater Quantity: The second paragraph speaks of an 'analysis of the ponds'. Replace 'ponds' with 'stormwater wetlands'.
8. Revise the header from 'Basin' to "Analysis Point' in the pre/post table for clarification purposes.
9. Wetland Sizing: It would appear that the sizing for Wetland 1 was omitted from the calculations.
10. SW Pre/Post-Development Analysis; SW Analysis Points: Provide weighted curve numbers based on the soils present within the watersheds and provide calculations.
11. Hydrograph Reports:
    a. Update the curve numbers (see earlier comments regarding composite CNs).
    b. Use Type III for the Distribution.
12. Pond Report BMP 1: Per the technical standards, an emergency spillway shall be provided (TSSM Ch. V.D.4). Stormwater Wetlands #1 does not appear to have an emergency spillway. Also provide a 50-year storm routing for the each stormwater wetland with the principle spillway obstructed as per the TSSM. Also, provide the 100-yeaar analysis to demonstrate that the emergency spillways can handle the event per the technical standards. Any designed stabilization material must be from the top of the spillway down to natural grade.
13. Storm Drainage/Hydraulic Grade Line Analysis:
    a. There appears to be discrepancies between the structure From/To and sheet C301 in plan view or in the schedule. Please verify.
    b. There appears to be discrepancies between the inlet areas in the analysis and sheet C304.
14. Channel Design: Be it an open channel or a swale, the bottom width per the technical standards (Ch. V.D.3.c and g) must be a minimum of 3 feet. Several channels show bottom widths less than 3 feet.

**Supplement-EZ Form**

15. Supplement #1 may need to be revised since the entrance drive impervious will need to be collected and treated.
16. #6: **Note only**: A drawdown orifice is not a preferred method for dewatering wetlands. Pumping is an acceptable method. The outlet structure detail indicates the use of gate valves (drawdown

orifice) to dewater the wetlands for maintenance. General MDC 6 recommends pumping down wetlands rather than using a gate valve at the bottom of the wetland to avoid discharging sediment.

17. Need Wetland #1Sizing calculations to verify supplement input values for wetland #1.
18. #15: It appears the side of the wetlands are being sodded. Is the sod not a non-clumping turfgrass? See NCDEQ Stormwater Design Manual for Stormwater Wetlands, MDC 15.

**Design Plans**

19. C100: A, B, C and D soils are present on this site based on the soils map provided. Composite curve numbers should be determined using the HSG of the soils that are present on-site.
20. C100: Please add the stormwater approval block to this sheet. Make sure all sheets in the plan set have the stormwater approval block.
21. C101: For informational purposes: Are the brick pavers (E) and the #57 washed stone considered pervious or impervious? I see a detail for the pavers, but not for the gravel. Provide a cross section detail of the #57 washed stone.
22. C301:
    a. Make sure the labels for the drainage structures are all correctly labelled and match the schedule.
    b. Note #10 under the Grading Notes talks about roof drains. If the roof drain layout has been determined, please add it to the plan set so that the inlet drainage areas can be verified. The roof drain system needs to support the drainage areas for the wetlands.
    c. Per Wetland MDC 6 (Forebay) found in the NCDEQ Stormwater Design Manual, the forebay entrance (pipe invert) shall be deeper than the forebay exit. The pipes outfall into the wetlands at the permanent pool elevation (24' and 26'). The PP elevation is not lower than the exit of the forebay (23.5' and 25.5'). The inlet pipe inverts need to be lowered to meet this requirement.
    d. The entrance into D4 from Channel #2 is at a difficult angle. Provide an entrance that is parallel to channel #4 and perpendicular to Channels #2 and #3.
    e. The angle between pipe C2-C3 and the SCM #1 outlet pipe may pose a constructability issue. Can the SCM outlet pipe be rotated from the outlet structure to be perpendicular with C2-C3 and a structure be added to make the connection?
    f. Pull back and realign pipe D2-D3 so that the outlet protection can be installed outside the wetland delineation.
    g. Provide spot elevations along both sides of the proposed Hurst Street sidewalk to ensure ADA compliance and constructability.
    h. Provide labels that all pipe outlets are to have flared end sections per the technical standards.
23. C303/C304: Please adjust the map to allow for better distinction of the drainage area lines. The small scale and line thickness makes it hard to follow. C305 is a good example of how C303/304 should look.
24. C303/C304/C305: The entrance drive must be collected and treated in an SCM. The runoff from this impervious area will not be allowed to drain into Hurst Street. Typically, the rear of the concrete driveway sidewalk acts as a grade break not allowing runoff to enter the public right-of-way.
25. C304: Chart drainage areas CI and D1 to not appear to agree with the delineated drainage area. C1 and D1 appear to be too small.
26. C305: Update SCM Drainage Area to collect the entrance drive.
27. C500/C501:

a. Relocate water meter from under the proposed Hurst Street sidewalk. The technical standards do not allow this.
b. Verify that there will not be any utility conflicts (@ crossings). Particularly between stormdrain and sanitary sewer pipes.
c. Add appropriate city standard details to the detail sheets for the installation of utilities and the repair of city streets due to utility installation (SD 1-04, 1-05, 1-07).

29. C601:
    a. There appears to be a lot of vegetation, particularly trees, proposed to be planted in close proximity and even over top of stormdrainage pipes. Please relocate trees to avoid future maintenance issues.
    b. Drop inlet C3 appears to have a lot of landscaping proposed around it as well. From the drainage area for C3, it appears that this structure could get easily clogged.
    c. Stormwater wetlands are subject to the city stormwater facility landscaping plan (SD 15-16). Please revise landscaping plan accordingly. Add detail to the plan set.
    d. Demonstrate how technical standards (g) and (h) are being met (Ch. V.D.4.).
30. C706-710: CFPUA detail sheets are not needed and can be omitted from future plan submittals.
31. C715:
    a. Is there a mechanism to prevent clogging of the drawdown structures? See NCDEQ SW Design Manual for reference.
    b. Stormwater Wetland #1 shall have an emergency spillway.
    c. Throughout the plan set the wetlands are labelled 1 and 2. The wetland Schedule uses A and B. Please revise to 1 and 2 to follow plan set.

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