THOMPSON Engineering Consultants, Inc.

September 20, 2016

Ms. Rita Harmon, P.E.
Senior Engineer, Hydrology Section
Planning Department, Development Review Services
City of Albuquerque
600 2nd Street NW
Albuquerque, NM 87102

Re: REVISED HYDRAULIC ANALYSIS ADDENDUM TO THE AMENDMENT TO THE DMP TRAILS UNITS 1, 2, AND 3
DRAINAGE REPORT, ENGINEER'S STAMP DATED 9-14-2016 (FILE: C09D001)

Dear Ms. Harmon:

Attached is the revised Hydraulic Analysis Addendum to the Amendment to the DMP Trails Units 1, 2, and 3. This addendum reflects the changes made to address your comments in a letter dated January 2, 2015. The following is a list of your comments with our responses in bold font.

1) In general, electronic models need to be documented in printed and PDF format so that any information needed in the future can be obtained without having the program itself. This review would have been greatly facilitated if the program inputs and outputs had been printed.
    - It would have been helpful if Appenix A (the as-builts) were in printed form showing which pipes correspond to XPSWMM links, and which manholes correspond to nodes. In my review, I have noted this on the as-builts and included in the binder
      Printed as-builts have been included in Appendix A. Plate 1 now includes our model with all of the nodes and links clearly labeled. Per discussions in the meeting on September 16, 2016, you have in your notes which manholes and pipes correspond to the nodes and links in the model. Therefore, labeling the as-builts was not necessary.

    - Provide an overall printed plan showing the XPSWMM model, with the nodes and links labeled. Indicate the meaning of the blue, green, and red nodes. Indicate that dashed links are orifice plates.
      See updated Plate 1 in Appendix E

    - Provide the link and node data in tabular format. Can the "XP Table List" function/button and the "Link Summary" tab be used to print out the pipe lengths, diameters, invert elevations, max flow, time of peak, etc.?
      See Tables 2 & 3, Plate 1, Appendix E

    - Provide printed forms of the "Inflow Hydrograph" at each node where AHYMO "punch hyds" were input. At each AHYMO ID, note which basins are included -or Plate 2 of TEC Trails DMP showing which basins are included in each AHYMO ID.
      See updated Appendix C and Plate 1 in Appendix E

- Provide hard copies of the "Stepwise Linear Storage" and the hydrograph for each pond

  See updated Appendix B

- Print out orifice data used in model

  See updated Table 5 on Plate 1

- Print a summary of all input values: N-values, C-values, and other pertinent analysis parameters

  See PCSWMM Parameter Summary in Appendix C

2) Node 163 and AHYMO ID #75 peak flows do not match. Model uses 104.03 cfs, AHYMO has 146.48 cfs. However, AHYMO #73, which does not include Basins D5 and D6, does have a peak of 104.03 cfs. It appears Basins D5 and D6 are not included in the model.

   The hydrograph entering at Node 163 has been changed from AHYMO ID #75 to #73. This updated hydrograph reflects basins D5 and D6 being removed and the adjustments to Pond D1 located upstream. See PCSWMM model for updated hydrograph with a peak flow of 164.5 cfs.

3) Node MH58 and AHYMO ID #21 peak flows do not match. Model uses 28.1 cfs, AHYMO has 29.29 cfs.

   AHYMO ID #21 enters the system at node MH53. Assuming "MH58" is a typo, the hydrograph in the PCSWMM model has been adjusted to reflect the AHYMO hydrograph.

4) Modeling around Pond H has the following comments:
   - Link 182: As built shows 5418.65 for D/S RIM, model says 5422.8' for D/S surface for Scenario 1 (and 5423.6 for Base). Why is the WSEL used rather than the actual RIM?

     Link 182 ties into the actual pond. The data was combined between the surge manhole SDMH 45 and the actual Pond H together to simulate the surge function of the pond.

   - MH4 was not modeled correctly. MH4 is a SAS line. It should be SDMH-45 from as-built. (730084, sht 37)

     MH4 has been deleted. See updated PCSWMM model.

   - It seems that a node where the overflow enters back into the system should be between node MH4 (or SDMH45) and MH 46 to be reflective of the actual system.

     Overflow enters the system at Node 177 which is in between Pond H and SDMH 46. See updated PCSWMM model.

- What is the purpose of Node177 and why is it green? Can't node MH4 (MH46) be used in place of Node177 since the orifice is being modeled in Link203? Can LinkL-H be ommitted altogether?

  This was done to model the orifice plate correctly and due to constraints placed by the model. Node 177 is a fictitious node used to simulate the orifice plate. That is why it was green in the XPSWMM model. Blue nodes are locations where hydrographs are added, and red nodes are regular manholes with no inflow data associated in XPSWMM. See the legend in Plate 1 for the description of PCSWMM symbols.

- Table 3 show Q_{out} = 27.4 cfs, but the peak outflow from the XPSWMM model OVERFLOW links, there should not be any contributing flows from these links as they would only be used if the orifice is clogged.

  See updated PCSWMM model and Table 3 on Plate 1. Now there is no water spilling over the emergency spillway.

- The "Stepwise Linear Storage" for Pond H does not match the "Pond Volumes" Table. Stepwise depth 8.85', corresponds to elevation 5421 with the area = 1.27 Ac. Model shows 0.81 Ac. at this depth. Similarly, area at 9.85' depth (5422 elev) should be 1.52 Ac. rather than 1.27 Ac.

  The Pond H storage curve was updated in the PCSWMM model to reflect the correct elevations and areas in the rating curve. Please see Appendix B.

- The Pond H emergency overflow has a grate elevation of 5422.04, but the hydrograph shows max water elevation at 5422.96'. It seems that there would be spill out of the system. While the "OVERFLOW 1" link at U/S Invert = 5422.5, it seems that it should match the overflow grate elevation of 5422.05. BHI calculated the WSEL to be 5421.9, so I would expect the invert of the overflow link to be 0.14' above the max WSEL as well.

  Invert elevation for OVERFLOW 1 has been adjusted and the max water surface elevation matches BHI's calculations, so now there is no spill out of the system.

- The OVERFLOW links are 1' dia. And may be too small. How do you know water is not spilling out of the system? Or that they are not restricting the flow?

  SWMM software does not allow pipes to stick out above ground; therefore a 1 ft diameter pipe was the maximum circular pipe that could be used. The overflow has been remodeled as a rectangular pipe that is 0.5' X 6' (Height X Width) to simulate the overflow while ensuring plenty of capacity. See updated PCSWMM model.

- The Time of Peak for Link L-H is 5.11 hrs, but TEC Trails DMP indicates 2.4 hrs. Why the disrepency?

  Time to peak is controlled by pond outflow and will not match due to routing effects.

- BHI calculated 26.8 cfs through the orifice area of 1.14 sq.ft, with a head of 10.36', why does the SWMM Model calculate a much smaller value (15 cfs) ?

  PCSWMM calculates orifice outflow rates dynamically accounting for backwater effects providing a more realistic flowrate.

- Pond H modifications indicate a 36" pipe beyond orifice plate. As-builts show 30". What is the actual pipe dia?

  Actual pipe diameter is 36". See BHI field survey.

- L106 has an adverse slope and is modeled as such. Is there sediment that should be considered? Verify that it is a 48" dia. pipe as there is conflicting info on plan view of CPN 730084, and CPN 730075 is calling it a 54" pipe. *****

  L106 in the PCSWMM model has been updated to be a 54" pipe. The adverse slope remains unchanged.

- The Design Capacity of Pond H is 3.07 Ac. in Appendix C. (Appendix B)?

  The discrepancies have been addressed, the volume for Pond H is now consistantly 3.11 ac-ft.

- Pond H: Why is the Peak Storage in Tbl. 2 2.98 Ac-ft, as opposed to the full pond volume since it is overtopping. Furthermore, "Continuity Balance" Tab in the "Table List" function shows 3.94 Ac-ft for the Volume for Scenario 1. Could it be that Tbl. 1 was not updated?

  See updated Appendix B and Tables on Plate 1

- Orifice Plate in Pond H is to be 1.83 sq. ft.

  See updated orifice plate and resulting flow rates in the PCSWMM model.

- BHI states that their field survey indicated that the pipe out of Pond H is 36" dia, rather than 30" as indicated on the As-builts. (Links L-H and L104)

  Actual pipe diameter is 36" and is modeled as such. Pipe diameter also verified in the field.

5) Link L108, D/S Rim elev. is 5415, D/S invert is 5400.07 – neither match 730084. What CPN Job No is this taken from?

   D/S invert elevation for L108 is based off the SURV-TEK survey (NAVD 88) attached in Appendix A.

6) It seems that Table 1 needs to be updated.
All tables have been updated.

7) Pond G:
   - As-built for Pond G (730084, sheet 11/51) shows MH Rim at 16.29 (vs. 15.67)
The rim for the surge pipe is not input into PCSWMM, the pond begins storing water at an elevation of 5416 to accurately model the functions of a surge pond.

   - Link L-13: D/S Invert is 5403.05 (the design value) but the As-built value is 5402.03 per CPN 730084 Sheet 20/51 for a difference of 1'. The HGL is 5410.98 and adding 1' makes it 5412. The Rim is 5411.23, so the HGL is above the Rim.
Updated PCSWMM model reflects as-built invert value.

   - The links from Pond G to Universe have a significantly different Hydrograph when comparing the Base to Scenario 1. Can you explain why?
This is due to the modification to the orifice configuration at Pond G.

   - Link L-24 and Link 180 discharge into Pond G through slotted manholes. Are the areas of the slotted manholes taken into account? If not, the required opening area needs to be stated on Table 3 as part of the improvements to Pond G (or any pond with slotted manholes).
The orifice downstream (ORF_G) with a diameter of 1.23 ft (1.188 square feet) will control. Therefore, the slotted manhole lids were not considered and the model was not changed.

   - Verify negative peak flows in Links L-27 and L-29 make sense. Time to Peak Velocity for Link L-27 is 37.2, why so much later?
The negative peak flows and time to peak were due to how the XPSWMM model was set up. The PCSWMM model does not reflect these results.

8) Pond F:
   - Orifice area is 4.25 for the Base Scenario but should be 1.63 sq. ft.
Base scenario is no longer included. This model was originally included to demonstrate that XPSWMM results are not drastically different than AHYMO.

   - Link L-56 and L-63 are noted as elliptical on the record As-builts
As-builts note these pipes as 60" equivalent arch RCP. No changes were made to the model.

   - L-63 shows HGL at 22.83 and upstream MH is 23.27, which is somewhat close.
The HGL remains below the manhole rim and will function adequately.

- Orifice plate is modeled downstream of SDMH 34, which is in Treeline Ave. Since the area is less than 3.14 sq. ft., a sluice gate (or similar device) is required. The installation of such a device at this location seems complicated. What are some possibilities for such a device here?

  A Type D inlet will be added at this location during design, likely adjacent to the pond outlet. This design will be provided with the DRC plans.

- Table 3 should be revised. Qin should change.

  See Table 6 on Plate 1 in Appendix E, which reflects an updated Table 3.

9) Pond D:
   - Why in the Base Scenario are there links from Pond D to Pond F5?

     In the previous model, there were several scenarios modeled. The links were a part of a previous scenario but were turned off in the previous proposed scenario.

   - The Stepwise Linear Storage for the Base scenario is similar to that for Scenario 1 and does not reflect the Pond as designed in the TEC.

     See updated PCSWMM model for modified Pond D rating curve.

   - Q_{in} on Table 3 should be revised, as it states 102.5 cfs. Q_{in} should be the same as from the TEC. The AHYMO Summary file ID No. 75 says 146.48 cfs. However, Table 2 from the TEC shows $Q_{100,in}$ = 154.87 and Q_{bypass} = 13.77 cfs. The Q_{in} should be the sum or 168.64 cfs. It is not clear why there is a discrepency.

     Table 6 in Plate 1 was updated tomatch the PCSWMM model. There is no longer a discrepancy between Qin in the table and in the input hydrograph for the model.

10) Pond F5:
    - There is an inflow Hydrograph associated with Pond F5 but is not noted on Plate 1. What basins or AHYMO ID is this hydrograph from? If this is from Basins D5 and D6, I would expect the peak to be about 42.44 cfs (the addition of peaks from both basins D5 and D6) but the peak of this hydrograph is 27.4 cfs.

      There is no hydrograph entering at the Pond F5 directly. Basins D5 and D6 are included in the hydrograph (AHYMO ID 41) entering at Node 191 immediately upstream of the pond. The updated hydrograph has a peak flow rate of 52.5 cfs.

    - The SpillCrest in the XPSWMM model is 5428, but should be 5427.

      An emergency spillway will be provided at an elevation of 5426.30. It is reflected in the PCSWMM model, Tables 1 & 4, and in the pond rating curve. The design will be included in the DRC plans.

11) Pond J:
    - The Spill crest is 5418 in XPSWMM but the emergency spillway is at 5417 from Table 2.

The spillway crest elevation is 5417.00 in the updated PCSWMM model.

12) Where is as-built information for Link 213 and 215 in order to verify diameters

Stamped drawings containing information for Link 213 and 215 has been added to Appendix A

13) Pond K: Emergency spillway at 5410.3 per As-built rather than 5409 on Table 2.

See updated Table 1 (previously Table 2) with an emergency spillway elevation of 5410.30.

If you should have any questions regarding this submittal please do not hesitate to contact me.

Sincerely,

David B. Thompson, P.E.

Cc: Mr. Hugh Floyd, P.E.

Enclosures