



EDWARD B. WALSH & ASSOCIATES, INC.
Complete Civil Engineering Design / Consultation Services
Lionville Professional Center
125 Dowlin Forge Road
Exton, PA 19341

December 21, 2012

Tredyffrin Township
Attn: Stephen Burgo, P.E., Township Engineer
1100 DuPortail Road
Berwyn, PA 19312

RE: Pennsylvania Turnpike Commission Mile Post 320 – 326
Total Reconstruction and Widening Project
Hydrologic and Hydraulic Report Review #1
Tredyffrin Township, Chester County

Dear Mr. Burgo:

Per the Township's request, Edward B. Walsh & Associates, Inc. (EBWA) has completed a review of the Hydrologic and Hydraulic (H&H) Reports for three (3) culvert extensions and one (1) bridge replacement for the Pennsylvania Turnpike Commission Mile Post 320 – 326 Total Reconstruction and Widening Project. The below listed reports have been submitted for review:

1. Hydrologic and Hydraulic Report Pennsylvania Turnpike Structure EB-735A, MP320 to MP326. Culvert Extension. MP 322.96 over a Tributary to Valley Creek #1. S-36 Upstream (North) of Culvert, S-19 Downstream (South) of Culvert, prepared by Benesch, dated August 2011, last revised October 2011.
2. Hydrologic and Hydraulic Report Pennsylvania Turnpike Structure EB-736, MP320 to MP326. Bridge Replacement. MP 323.46 over Valley Creek #1. S-22 Upstream (South) of Bridge, S-33 Downstream (North) of Bridge, prepared by Benesch, dated April 2006, last revised October 2011.
3. Hydrologic and Hydraulic Report Pennsylvania Turnpike Structure EB-741, MP320 to MP326. Culvert Extension. MP 325.44 over Trout Creek. S-27 Upstream (South) of Culvert, S-30 Downstream (North) of Culvert, prepared by Benesch, dated August 2011, last revised October 2011.
4. Hydrologic and Hydraulic Report Pennsylvania Turnpike Structure EB-743, MP320 to MP326. Culvert Extension. MP 325.64 over Tributary #1 of Trout Creek. S-28 Upstream

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(South) of Culvert, S-29 Downstream (North) of Culvert, prepared by Benesch, dated October 2011.

The above referenced documents have been reviewed for compliance with Article V – Flood Hazard District of the Township Zoning Ordinance and Ordinance No. HR-375 – Chapter 174, Stormwater Management. This review is limited in scope of work related to the compliance with applicable Township Ordinance requirements and general engineering practices for H&H studies. A structural review of the culverts and bridge replacement design has not been completed. In addition, a technical review of the wetlands impacts has not been completed. It is my understanding that a Pennsylvania Department of Environmental Protection (PA DEP) Joint Permit Application has been submitted by the PA Turnpike Commission (PTC) for all wetland / stream impacts.

The following comments and recommendations are offered for the Township's evaluation of project:

1. The Flood Hazard District Area, as defined by the Township Zoning Ordinance Section 208-6, is *that land which includes the floodway or floodway fringe adjoining any perennial stream, as shown on the most recent United States Geological Survey (USGS) quadrangle,and extends for such additional distance from said banks as is, or may be, subject to flooding in a one-hundred-year flood....* All submitted plans must clearly identify the Flood Hazard District boundary lines.

H&H studies have been completed for four stream crossings. As per the latest USGS quadrangle, there are two (2) additional stream segments located within the project corridor that are not addressed by the submitted H&H Reports. The approximate stream locations are 1165+50 and 1265+75. The Flood Hazard District boundary lines must be delineated for these areas and the impacts analyzed.

2. Zoning Ordinance Section 208-15.B.10 – No permit shall be issued until all other governmental permits required by state and federal laws have been obtained. As stated in the May 31, 2012 EBWA review, the Post Construction Stormwater Management plans must include a detailed tabulation of the required permits, applicable permit number (when received) and the status of the permit (obtained, pending...).
3. Zoning Ordinance Section 208-15.1. Use Regulations.
 - a. Within the Flood Hazard District, all uses not allowed as permitted uses or authorized by grant of variance shall be prohibited. Per Section 208-15.1.F, culverts and bridges approved by the commonwealth are a permitted use.
 - b. Per Section 208-15.1.H - A change in grade by either cut or fill, or a combination of both, may be permitted as a conditional use, but only upon the following conditions:
 - i. The effect is not to alter the cross-sectional area of the profile of the floodplain.
 - ii. The effect is not to increase the elevation of the one-hundred-year flood.

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iii. The effect is not to increase the runoff characteristics of the area disturbed.

Per Section 208-15.1.I – The following uses and activities are specifically prohibited in any Flood Hazard District:

- i. Removal of topsoil.
- ii. Cutting or removal of trees or other flora.
- iii. Fences.
- iv. The filling or relocation of any watercourse.

It is recommended that the PTC design professionals prepare and submit an exhibit detailing the proposed impacts to all Flood Hazard District Areas including but not limited to the locations of any proposed right-of-way fence, limits of clearing and stream adjustments. The exhibit should include a tabulation of the proposed impacts and listing of the corresponding section of the Township Zoning Ordinance which permits the impact.

4. Scour Analysis:

- a. Preliminary Scour Calculations have been provided within each submitted H&H Report. The preliminary scour analyses are based upon estimated streambed material size and the report indicates *final scour analysis requires streambed bag sample*. The sampling must be completed and the scour calculations must be revised to reflect the results of the sampling.
- b. Final construction details for the scour design must be submitted to verify compliance with the scour analysis.
- c. The final scour calculation must include an analysis of the temporary condition that will occur when the cofferdam and bypass piping, as applicable, is installed.
- d. The cofferdam construction detail included with the erosion and sedimentation control plans must be reviewed by the design professional in charge of the scour analysis to determine if adequate based upon the temporary condition scour analysis.

5. Bridge Replacement Structure EB-736 at MP 323.46 over Valley Creek #1, Culvert Extension - Structure EB-743 at MP 325.64 over Tributary #1 of Trout Creek and Culvert Extension Structure EB-741 at MP 325.44 over Trout Creek are structures located within FEMA studied areas. Approval from FEMA must be obtained for this work.

6. All H&H Reports indicated the Preliminary Line and Grade approval is pending for the culverts / bridge projects. The design professional must verify the data within the H&H report is consistent with any applicable changes to the Final Line and Grade.

7. General Comments

- a. All plans within the exhibits of the H&H Studies must be to scale. As submitted, the reduced size plans along with the full size plans are not to scale.
- b. Parcel boundaries along with parcel identification numbers and names must be added to the plan to assist with the review of potential impacts.

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- c. Based upon meeting minutes located within the H&H Reports, the PTC and PA DEP have had discussions related to fish passage ways within the culverts. We defer to PA DEP on this issue.

8. Structure EB-735A. Culvert Extension at MP 322.96 Tributary to Valley Creek #1

a. Project Description

Culvert extension of PTC Structure EB-735A located at MP 322.96. The culvert conveys a Tributary to Valley Creek from north to south under the Pennsylvania Turnpike. The existing structure is an approximate 115-foot long 8-foot span by 5-foot high concrete arch bridge constructed in 1949.

Due to the widening, the PTC is proposing to expand the existing structure on both sides approximately 102-feet (29' downstream and 73' upstream). The proposed extensions are designed to be 12-foot span by 5-foot high concrete arches. The hydraulic opening of the existing structure is 32 square feet and the culvert extensions are proposed to be 51 square feet.

- b. This tributary to Valley Creek is not a studied stream per FEMA. The calculated floodplain must be depicted on the plans (PCSWM plans and H&H Plans) based upon the H&H Study.
- c. During the culvert extension construction process, two (2) 36-inch temporary pipes will be installed to convey the stream. An analysis of the 36-inch pipes was performed for only the two-year storm event. Justification for use of only this two-year storm must be provided. Consideration should be given to analyze the impacts for a larger storm event. .
- d. On page 9 of the H&H Report – Hydraulic Analysis, there is a recommendation that the stream should be realigned to a point that is approximately 36-feet upstream of the end of the proposed wingwall. The submitted design plans do not reflect any modifications to the stream alignment. The design engineer must review this recommendation from the H&H Study and determine if changes are required.
- e. Downstream of the proposed culvert extension, the PTC is proposing to complete restoration work on the existing stream channel. It is my understanding this restoration work is required as part of the PA DEP Joint Permit application review.
 - i. Further explanation regarding this stream work must be provided for the Township review. The additional data must include why the work is being proposed, the existing conditions of this stream and the proposed improvements.
 - ii. A temporary construction easement is proposed to be obtained at this stream channel modification area. It is recommended that the construction

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easement including language regarding short term (construction phase) and long term maintenance (post construction) of the stream restoration.

- f. Page 9 of the H&H Report must be revised to indicate the storm event which overtops the Turnpike (year event is labeled as XXX).

9. Structure EB-736. Bridge Replacement at MP 323.46 Valley Creek #1

- a. Project Description. Bridge replacement of PTC Structure EB-736 located at MP 323.46. The bridge spans Valley Creek which flows from south to north under the Pennsylvania Turnpike. The existing single span steel I-beam bridge has a span of 57-feet and the proposed span will be 119.5 feet.
- b. This area of Valley Creek is located within a detailed flood insurance study area and the bridge is located within the Zone AE (Base Flood Elevations determined).
- c. Valley Creek #1 is a Wild Brown Trout Stream therefore construction within the stream channel is prohibited between March 1 and June 15. The applicable erosion and sedimentation control plans must clearly identify all required construction restrictions.
- d. As noted on page 5 of the H&H Report, discrepancies were noted between the FEMA data and the data gathered during the preparation of this study (benchmark elevations and HEC-2 model). The conclusion of the H&H Report is that there are inconsistencies with the original FEMA data. A draft letter to FEMA dated August 26, 2011 is included in Appendix S regarding this analysis. Final copies of the letter must be submitted to FEMA and copied to the Township (if not already complete). Changes to the H&H Report and HEC-RAS model as a result of FEMA's evaluation of this issue, if applicable, must be resubmitted to the Township for review and approval.
- e. Within the report, various appendices are empty (noted as pending or references information under separate cover). Applicable data for the appendices must be included in the report (erosion & sedimentation control information, wetland report...).
- f. As noted in comment 3.b. above, per Zoning Ordinance Section 208-15.1, within the Flood Hazard District, all uses not allowed as permitted uses or authorized by grant of variance shall be prohibited. Per Section 208-15.1.F, impoundment basins approved by the commonwealth are a permitted use. Additional data related to Bioretention Basin 8B and the surrounding improvements must be provided for the Township review. The submitted information must detail the benefits of this facility within the Flood Hazard District and the water surface elevations for the various storm events (ie. flood elevation for the 2-100-year storm events).

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- g. The applicable design professionals must evaluate and provide commentary on the below listed improvements located within the floodplain area. A tabulation of the floodplain elevations for all storm events verses the elevations of the applicable outlets structure, berm height, spillway elevation and outfall inverts must be provided.
 - 1. Bioretention Basin 8B
 - 2. Infiltration Basin 8 proposed discharge and downstream fill below the basin.
 - 3. Underground Vault 9 and the proposed discharge
- h. The plans, cross sections and the HEC-RAS analysis within this H&H Report must be revised to accurately reflect the proposed retaining wall at approximate station 1252+00 to 1257+50 left and proposed grading surrounding the proposed bridge replacement as depicted on the stormwater management control plans.

10. Structure EB-741. Culvert Extension at MP 325.44 Trout Creek

a. Project Description

Culvert extension of PTC Structure EB-741 located at MP 325.44. The culvert conveys a Trout Creek from south to north under the Pennsylvania Turnpike. The existing structure is an approximate 111-foot long, 24-foot span by 12.5-foot high single span concrete arch bridge constructed in 1949.

Due to the widening, the PTC is proposing to expand the existing structure on both sides approximately 38-feet (30' downstream and 8' upstream) with the same span and underclearance as the existing. The hydraulic opening of the existing structure is 230 square feet and the culvert extensions are proposed to be 264 square feet.

- b. This area of Trout Creek is located within a detailed flood insurance study area and the culvert is located within the Zone AE (Base Flood Elevations determined).
- c. Per page 5 and 6 of the H&H Report, there is a discussion regarding the FEMA HEC-2 flow rates and the consultant TR-55 calculated flow rates. The floodplain analysis utilizes the lower rates calculated by the TR-55 method but has also analyzed the 100-year flow rate per FEMA HEC-2 information.
 - i. Notes must be added to the Water Surface Elevation Summary charts and the Channel Velocity Summary charts indicating the source of the flow data for the "Turnpike" storm and the "FEMA" storm events (for clarity purposes).
 - ii. Due to the differences between the flow data (FEMA vs. calculated), the design professional should review the Township's Trout Creek Watershed Study completed by Borton-Lawson and CH2MHill to compare the flow data. A comparison of the flow data should be included within the H&H Report.

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- d. As noted on page 7 of the H&H Report, discrepancies were noted between the FEMA data and the data gathered during the preparation of this study (benchmark elevations and HEC-2 model). The conclusion of the H&H Report is that there are inconsistencies with the original FEMA data. A draft letter to FEMA dated October 12, 2011 is included in Appendix P regarding this analysis. Final copies of the letter must be submitted to FEMA and copied to the Township (if not already complete). Changes to the H&H Report and HEC-RAS model as a result of FEMA's evaluation of this issue, if applicable, must be resubmitted to the Township for review and approval.
- e. During the culvert extension construction process, cofferdams will be utilized to divert the creek outside the work zone. A HEC-RAS analysis was completed for the two-year storm event during the construction process.
 - i. Justification for use of only this two-year storm must be provided. Consideration must be given to analyze the impacts for a larger storm event.
 - ii. Additional data is requested for the impacts to the surrounding parcels during the construction phase. The H&H Report details a 1.32-foot water surface flow elevation change at Station 5602.93. This station is located outside the PTC right-of-way. Temporary water level rises must be contained within the PTC right-of-way otherwise flowage easements must be obtained. Copies of all easements must be supplied to the Township.
 - iii. A graphic representation of the water surface elevation rises for all storms (2-year to the 100-year) for areas located off the PTC property must be provided.
- f. The H&H Report on page 10 recommends the stream to be regraded for approximately 75-feet upstream and downstream of the proposed culvert wingwalls. The proposed construction plan does not address this. Clarification is requested regarding this recommendation.
- g. The H&H Report do not accurately reflect the proposed retaining wall and grading surrounding the culvert. The design professional must review the HEC-RAS analysis and determine if modifications are required. The plans with the H&H Report must be revised accordingly.

11. Structure EB-743. Culvert Extension at MP 325.64 Tributary #1 of Trout Creek

a. **Project Description**

Culvert extension of PTC Structure EB-743 located at MP 325.64. The culvert conveys Tributary #1 of Trout Creek from south to north under the Pennsylvania Turnpike. The existing structure is an approximate 121-foot long, 24-foot span by 12.5-foot high single span concrete arch bridge constructed in 1949.

Due to the widening, the PTC is proposing to expand the existing structure on both sides approximately 38-feet (15.4' downstream and 2.1' upstream) with the same span and underclearance as the existing. The hydraulic opening of the existing

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structure is 235 square feet and the culvert extensions are proposed to be 267 square feet.

- b. This area of Tributary to Trout Creek is located within a detailed flood insurance study area and the culvert is located within the Zone AE (Base Flood Elevations determined).
- c. Per page 5 and 6 of the H&H Report, there is a discussion regarding the FEMA HEC-2 flow rates and the consultant TR-55 calculated flow rates. The floodplain analysis utilizes the rates calculated by the TR-55 method but has also analyzed the 100-year flow rate per FEMA HEC-2 information. The calculated TR-55 flow rates and the HEC-2 rates are generally consistent with each other.
 - i. Notes must be added to the Water Surface Elevation Summary charts and the Channel Velocity Summary charts indicating the source of the flow data for the "Turnpike" storm and the "FEMA" storm events (for clarity purposes).
 - ii. Due to the differences between the flow data (FEMA vs. calculated), the design professional should review the Township's Trout Creek Watershed Study completed by Borton-Lawson and CH2MHill to compare the flow data. A comparison of the flow data should be included within the H&H Report.
- d. As noted on page 8 of the H&H Report, discrepancies were noted between the FEMA data and the data gathered during the preparation of this study (benchmark elevations and HEC-2 model). The conclusion of the H&H Report is that there are inconsistencies with the original FEMA data. A draft letter to FEMA dated October 13, 2011 is included in Appendix P regarding this analysis. Final copies of the letter must be submitted to FEMA and copied to the Township (if not already complete). Changes to the H&H Report and HEC-RAS model as a result of FEMA's evaluation of this issue, if applicable, must be resubmitted to the Township for review and approval.
- e. During the culvert extension construction process, cofferdams will be utilized to divert the creek around the work zone areas. A HEC-RAS analysis was completed for the two-year storm event during the construction process.
 - i. Justification for use of only this two-year storm must be provided. Consideration must be given to analyze the impacts for a larger storm event.
 - ii. Additional data is requested for the impacts to the surrounding parcels during the construction phase. The H&H Report details a 1.55-foot water surface flow elevation change at Station 1026.61 and the rise extends for 480-foot upslope of the culvert. The Report also details that a temporary flowage easement is required for flow outside the PTC right-of-way. Further analysis of the impacts must be completed and detailed within the Report and on the plans. Copies of all easements must be supplied to the Township.

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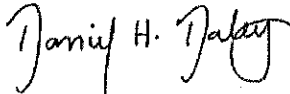
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iii. A graphic representation of the water surface elevation rises for all storms (2-year to the 100-year) for areas located off the PTC property must be provided.

f. As reviewed with the Township, there is a significant amount of debris and sediment within the channel directly downstream of the existing Turnpike culvert. It is recommended that provisions be incorporated into this project / PA DEP permitting to provide debris / sediment removal to restore the channel capacity. The design professional should evaluate the channel design to determine if existing analysis is accurate with the current condition of the channel.

If you should have any questions or require any additional information, please feel free to contact me.

Very truly yours,
EDWARD B. WALSH & ASSOCIATES, INC.



Daniel H. Daley, P.E.

