

February 18, 2014

Tredyffrin Township
Attn: Stephen Burgo, PE
Township Engineer
1100 Duportail Road
Berwyn, PA 19312-1079

*Scientists, Engineers &
Environmental Planners
Designing Innovative
Solutions for Water,
Wetland and Soil
Resource Management*

**Re: Wayne Glen Independent Stormwater Review
Tredyffrin Township, Chester County, Pennsylvania
pH No. 1380.001**

Dear Steve,

Princeton Hydro is pleased to provide Tredyffrin Township with this letter which summarizes our review of the revised stormwater management plan for the Wayne Glen development. The contents of our previous letters have been discussed with Mr. Duckworth and representatives from Pennoni. Prior to the completion of this letter we have discussed project-related comments with the applicant and their engineers. Since our receipt of the application package they have responded to comments and provided revisions to project documentation which include multiple modifications to the design plan itself as is further detailed in this letter.

Since the submission of the revised plan set we have met with the applicant on two occasions and had multiple phone call discussions. The purpose of this correspondence was to provide the applicant with comments on an ongoing basis so that they would have a chance to respond to comments and make revisions prior to the February meeting. While multiple rounds of comments and consequent responses/revisions have been made, we have not had ample time to review the revised materials in their entirety as the revised material has been received by our office as recently as Friday February 14th. It should be understood that due to the density and complexity of the site many of the comments tend to create chain reactions where modifications to individual elements result in the need to modify downstream elements. These revisions are undoubtedly time consuming.

Therefore the purpose of this letter is to update the Planning Commission on the nature of recent our comments on the revised plan and also summarize the applicant's response to date. Due to the ongoing nature of the revisions we cannot confidently assert that the plan in its current condition meets the Township Stormwater Ordinance and Trout Creek Overlay Ordinance.

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Documents Reviewed

The following documents were provided to us by the applicant's engineer for the purpose of our review. This material referenced below was received by our office on December 20th. However, based on our review and consequent discussions with the applicant, Pennoni has made various rounds of modifications to the submitted documents which have been submitted on an ongoing basis up to and including Friday, February 14th.

- Post-Construction Stormwater Management Report, Wayne Glen Tredyffrin Township, Chester County, PA, prepared by Pennoni, dated April 22, 2013, latest revision February 14, 2014.
- Wayne Glen Conditional Use Submission, Tredyffrin Township, Chester County, Pennsylvania, 50 Sheets, prepared for Arcadia Tredyffrin, LLC, prepared by Pennoni, dated April 22, 2013, latest revision December 16, 2013.
- Post-Construction Stormwater Management Operations & Maintenance Document Wayne Glen, Tredyffrin Township, Chester County, Pennsylvania, prepared for Arcadia Tredyffrin, LLC, prepared by Pennoni, dated April 22, 2013, latest revision December 16, 2013.
- HEC-RAS Study of the Trout Run Tributary through the Richter Property, Tredyffrin Township, Chester County, PA, prepared by Herbert E. MacCombie, Jr., PE Consulting Engineers & Surveyors, dated March 19, 2012.
- Engineer's Report, Wayne Glen Dam Floodplain Consistency, Tredyffrin Township, Chester County, PA, prepared for Arcadia Tredyffrin, LLC, prepared by Pennoni, dated December 16, 2013.
- Engineer's Report, Wayne Glen Dam Breach, Tredyffrin Township, Chester County, PA, prepared for Arcadia Tredyffrin, LLC, prepared by Pennoni, dated December 16, 2013.
- Wayne Glen Dam Operations & Maintenance Plan, Tredyffrin Township, Chester County, PA, prepared for Arcadia Tredyffrin, LLC, prepared by Pennoni, dated December 16, 2013.
- Emergency Action Plan Surveillance, Warning and Evacuation Procedures Wayne Glen Dam, Tredyffrin Township, Chester County, PA, prepared by Pennoni, dated December 16, 2013.

General Comments

The total number of units has been slightly reduced to 104; however the size of the proposed carriage homes has increased and therefore the reduction in units does not significantly impact the overall density of the proposed plans from a stormwater standpoint. From a stormwater perspective, the main changes to the plan relative to the previous submission can be summarized to include the following. Infiltration Basin 2 has been relocated from an area with active karst features and is now located

adjacent to the regional basin. This change was in response to previous comments and concerns over the karst features in the previous location. The permeable pavers were formerly proposed on individual unit driveways and sidewalks. The permeable paver systems with underground storage beds are now proposed within the roadways. The main reason for this modification is improved performance from both maintenance and constructability standpoints; we believe that the relocation of the permeable pavers is an improvement to the plan. Modifications to the proposed Bioretention Basins have been made to accommodate the slight revisions to the site layout. One of the previously proposed underground systems has been relocated in an effort to avoid existing karst features and has been re-envisioned as two surface bioretention basins. Surface basins are preferable in areas where karst is a concern due to increased visibility and maintenance access. The proposed stream crossing has been revised to ensure that runoff from the roadway is now captured by the proposed stormwater measures. Other more minor modifications and improvements have also been made to the plan.

The following bulleted list summarizes our comments which have been provided to the applicant since the latest submission. The list also briefly outlines the applicant's response to the comments.

- **Permeable Paver Systems**

The permeable paver systems are a critical component to the site's proposed stormwater function. The applicant's proposed method of complying with the ordinance heavily relies on how they are designed and assumed to function. The importance of the Loading Ratio calculation was previously explained in our August 22, 2013 letter. In the revised plan the calculation took credit for all areas that ultimately flow into the proposed permeable paver systems which are now proposed in the roadways. While we concur that the engineer should take credit for the dispersed BMPs in series, we contend that they should only take credit in the loading ratio calculations for the drainage area which the systems can effectively contain the two-year runoff volume therefrom. The systems were originally proposed with a one foot effective storage depth. Direct rainfall on the permeable paver areas themselves during the two-year storm would occupy eight (8) inches, leaving only four (4) inches of storage for additional storage for contributory drainage area. Based on this comment the calculations and plans were revised and five of the seven proposed systems were essentially doubled in size from one foot to an average effective depth of two feet. This modification had a ripple effect on other calculations and structures. In response to this comment Pennoni also revised other details of the loading ratio calculations.

- **Depth to Bedrock Considerations**

Based on the revisions to the proposed permeable paver systems and review of the findings of the geology report, it became apparent that one of the

systems (Road D) would likely not have the necessary separation from bedrock and as proposed may necessitate cut *into* the bedrock. Pennoni relocated this section of the permeable paver system to a different portion of the site. This modification also had a ripple effect which required the modification (enlargement) of Infiltration Basin 1.

- **Discrepancy in Regional Basin Performance**
Pennoni provided the digital input data for both the hydrologic model (HEC-HMS) and hydraulic model (HEC-RAS) used to demonstrate compliance with the TCO Ordinance. Using the files provided by Pennoni we were not able to duplicate the results referenced in the Floodplain Consistency and Stormwater Management reports. The discrepancy directly impacted the plan's ability to demonstrate compliance with the 20% peak flow rate reduction for the 100 year storm. The discrepancy could not be explained and ultimately Pennoni revised the outlet structure configuration for the proposed dam in an effort to achieve the required 20% reduction.
- **Inconsistencies between the Hydraulic and Hydrologic Models**
Regional basin characteristics were not consistent between the two models. Pennoni revised both models and has resubmitted the digital files for both.
- **Revisions to Bioretention Basin 9**
Due to discussions regarding the existing sinkhole located at Bioretention Basin 9, the basin was reshaped in an effort to avoid the sinkhole.

Floodplain Mapping

While a complete review is still ongoing, the floodplain mapping shown on the revised "by-right" plan (Sheet CS0403) is not expected to substantially change. The current plan shows 25 lots which results in 112 units. If a lot were to be eliminated it would result in 108 units which would not impact the 104 currently proposed units. It should be noted that the recently submitted Floodplain Consistency Report is a major improvement over the previously submitted report as it contains the necessary level of detail to adequately review and substantiate its results.

Summary and Conclusions

As was previously discussed we have been in contact with the Township and the applicant's engineer in an effort to provide an ongoing review of the revised documentation. Due to the ongoing nature of the revisions, this letter serves as a status update on the progress and direction of the revisions

I look forward to meeting with you to discuss this report in detail and answer any questions you may have. Please do not hesitate to contact me with any questions. We appreciate the opportunity to provide Tredyffrin Township with these services.

Sincerely,



Clay Emerson, Ph.D. PE CFM
Princeton Hydro, LLC

Cc: Geoff Goll, PE, Vice President Princeton Hydro
John Miller, PE CFM, Princeton Hydro
Encl: (0)