Stantec

Memo

To:	Glenn Clancy Town of Belmont	From:	Deb Duhamel Stantec
File:	Sleep Hollow Road	Date:	March 2, 2017

Reference: Sleepy Hollow Road – Stormwater Peer Review

Compiled below is a list of questions from Stantec and responses from Gala Simon Associates Inc. related to the stormwater peer review for Sleepy Hollow Road. The questions and responses occurred via email.

Proposed Individual Residential Infiltration Systems

1. Question: Please provide a detail for the infiltration systems? How were the storage volumes and various exfiltration rates (in cfs) determined? From the plan view looks like some type of chamber system with different numbers of chambers at different locations? Guessing the number of chambers is based on the runoff and exfiltration rates to handle the 100-year storm.

   Response: Detail 3 on sheet C-3 has a standard detail for the concrete leaching pits that are proposed. There is a variation in height and the number of units per lot, based on lot specific ground water elevations and runoff being captured. They are sized for the 100 year storm (8.57"), with storage volumes calculated based on the capacity of the leaching chambers, and surrounding crushed stone. Exfiltration rates were calculated using Rawls rates, and the base area of the systems.

   Follow-up Question: Could you provide the backup for the calculations of the drawdown times provided in Table 7 and the determination of the "outlet device" discharge rates for the infiltration systems used in HydroCAD?

   Response: The Rawls rate for Sandy Loam, HSG B, 1.02 in/hr, was used for all of the systems. Even Though Al found Loamy Sand, HSG A, 2.41 in/hr, in all of his test pits, we used the 1.02 in/hr rate because of the conflicting soil survey info at the time and the test pits not being exactly where the systems are proposed. Drawdown times were taken from the hydrographs produced in HydroCAD, which we can include with the table. The exfiltration rate for each infiltration system was calculated using the 1.02 in/hr rate and base area of the system. I will put together a breakdown of these calculations.

   Status: Accepted. Recommendation: Prior to construction, preform test pits as recommended in the "Site Criteria for Infiltration Basins" in the Massachusetts Stormwater Handbook (Volume 2, Chapter 2, Page 88). The criteria recommend a minimum of three samples for each infiltration basin with these samples being taken at the actual proposed basin location.

Reference: Sleepy Hollow Road – Stormwater Peer Review

2. Question: How are the "infiltrated areas" being directed to the infiltration systems. For example, I am looking at Infiltration System 2. The proposed delineation plan indicates that Infiltration System 2 will be receiving runoff from the driveway and roof of the house on that site. How does the runoff get into the infiltration system? Guessing the roof leaders could be sent to the infiltration system, but I am not sure how the driveway runoff is directed to the system? This is perhaps even more pronounced as I am looking at Infiltration System 1 where the driveway is down gradient from the infiltration system?

   Response: We have not detailed the connections to the infiltration systems at this time since the house and driveway footprints/layouts are generic. At the time of each individual lot design, when we know the definitive layout, all of these aspects will be specified, as well as new soil testings at the intended locations of the infiltrations systems (which could very well change). Driveway runoff will most likely be routed through a trench drain, and then a sump box before entering the infiltration systems. If the elevations are a problem with Lot 1 we could move the system closer to Marsh Street, on the other side of the driveway. The intention of this initial infiltration system sizing was to show what would be required, and then the details, and any revisions be solidified in the individual lot stormwater design, and review process.

   Follow-up Question: As I understanding the Infiltration Systems are individual manholes with rock beneath and around, correct? Is there an external housing for these (not sure, but the plan shows a double line around the manholes). Also, will there be some sort of feeder system to spread the runoff among the units? I am a bit unclear on how they will work together to create the volume?

   Response: Correct, the double line is a woven filter fabric. 10" pipe, with no slope, connects the systems at the bottom.

   Status: Accepted.

3. Question: What is being used for pretreatment at the individual property infiltration systems?

   Response: There is no pretreatment proposed for clean roof runoff, but the trench drains in the driveways will first route to a sump box before the infiltration systems.

   Status: Accepted.

Reference: Sleepy Hollow Road – Stormwater Peer Review

Stormwater Management for Proposed Roadway

4. Question: Do you have a detail of the Stormwater Detention Area? Looks like the outflow control structure is a manhole with an 8" opening at elevation 89.00 on the detention area side and an 18" discharge pipe at invert 88.2 to the outside of the detention area? Also, the bottom of the basin appears to be at 87.5, so 1.5 feet of standing water could accumulate (although the volume might be reduced because maybe rocks will be included as the void area in HydroCAD appears to be 33%?). Did we discuss that soils in this area wouldn't support infiltration (my memory isn't great so I could have that wrong since a leaching pit is proposed nearby)?

   Response: There is no custom detail of the Detention Area at this time, but we will prepare one before the filing. Your observations in regards to the control structure are correct, and a 33% void ratio was used. The soil maps in the area show Type D soils, but AI found loamy sand (Type B) at TH1, right near the proposed system. This actually seems to agree with the dual hydrological group designation from the most current soil survey that you sent for Sawnsea muck (51A). We did not account for infiltration of the detention pond in our HydroCAD calculations in an effort to be conservative with the design. But in reality, the system will infiltrate, and the bottom of the detention area is 3.1' from the ESHGW at TH1 (mottling). Since it is not 4' from the ESHGW it will require a groundwater mounding study, which we will get together for the filing.

   Follow-up Question: When you put together your mounding study will you also calculate the drawdown for the storage volume below the outlet invert? Just want to confirm standing water will not be an issue with the detention area.

   Response: We'll make sure to calculate the drawdown of the detention pond.

   Status: Accepted. Detention pond has been changed to a detention/infiltration pond.

5. Question: Please provide calculations for the riprap apron at the discharge from the stormwater detention area (per standard 1).

   Response: The riprap apron had not been calculated yet, but we do have the information now and will get it over to you. The final result was a 4.5' (at the discharge), 17.5' (at the base), and 13.0' long, apron.

   Status: Acceptable.

6. Question: What is the volume of water reaching the leaching pit for the roadway drainage? How was the leaching pit sized to treat the required water quality volume?

Response: The leaching pit was originally included to meet TSS removal requirements, so we will have to revisit the design, taking required recharge volume into consideration.

Follow-up Comment: As a clarification - Based on your TSS removal calculations, appears that the treatment train from the roadway runoff has been designed to meet the TSS removal requirement, therefore the water quality volume is in question, not the recharge volume. As I understand, the required recharge volume is being met through the individual lot "infiltration systems." Have I misunderstood?

Response: We'll check the water quality volume calculation for the TSS train, and yes, currently the required recharge volume is met with the individual infiltration systems.

Status: Accepted. Updated design for meeting recharge and water quality requirements has been provided. Both the required recharge volume and the required water quality volume are met through the proposed detention/infiltration pond.

7. Question: The pipe from the leaching pit to the stormwater detention area is not labeled. Assuming this is an 18-inch HDPE. The slope appears to be around 0.022 ft/ft? How will the energy be dissipated at the inlet to the detention area?

   Response: The pipe is 18" HDPE, but the slope has changed to accommodate a rise in the bottom of the detention pond to allow 4' of separation from the eshgw [estimated seasonal high ground water]. We are currently sizing a riprap apron for the inlet.

   Status: Accepted.

8. Question: Please provide sizing calculations for the roadway closed pipe drainage system? What is the diameter of the laterals? What size storm was the piped system designed to handle? Does the town have design criteria that were followed? The Town's "Sanitary Sewer and Storm Drain Connection – Permit Application" were provided. This document indicates that minimum depth of cover for storm drain connections is 4 feet.

   Response: We are preparing the calcs for the selection of the size of the pipe for the main. I believe the regs from the Town are for lateral connections. We designed the main based on the attached, which is from the Board of Survey regulations. It calls for 2.5' (30") of cover, minimum.

   Comment: Please provide a statement about the structural properties of HDPE with 2.5 feet of cover. Just want to confirm the pipe and cover are acceptable.

   Status: Accepted.

Reference: Sleepy Hollow Road – Stormwater Peer Review

Calculations

9. Question: Interestingly when I use the USDA NRCS web soil survey, the results provide different hydrologic soils groups for some soils. In particular, Narragansett silt loam (map unit symbol 416B) has a rating of A. Whereas, in the data provided in the drainage report, that same soil is listed as hydrologic group B. Looks like the data you provided came from a hard bound resource? Please provide the resource reference for completeness.

   Response: We were unaware of the hydrological soil group layer on the web soil survey. Up to this point we had been referencing, the USDA & NRCS, "Soil Survey of Middlesex County, Massachusetts," report, "Table 18." It is interesting that the hydrological group of the Narragansett silt loam has changed from B to A. Since we are currently in the process of revising our delineation and calculations, we will make sure to revise the previous soils information, and use the current hydrological group classifications that you have sent. Thank you for bringing this to our attention.

   Comment: Using a different HSG may change your recharge requirement.

   Response: The recharge requirement will most likely increase with the current soil survey conditions being better than we had first believed them to be.

   Status: Accepted.

10. Question: Was soils testing performed at the location of the infiltration practices? Was in-situ saturated hydraulic conductivity determined?

    Response: We sized the infiltration systems using the, "Static Method," which does not require a field-derived infiltration rate, as it would if it was sized using the, "Dynamic Field," method.

    Status: Accepted.

11. Question: Please review the delineation for existing and proposed area 1S.

    Response: The project surveyor has corrected their contours at the front of the lot (near Don's existing house), which you will see reflected in our revised delineation.

    Status: Accepted.

12. Question: According to the Town's stormwater management bylaw (section III, E, 3) please confirm that your precipitation depths are from the Northeast Regional Climate Center (http://precip.eas.cornell.edu).

    Response: Our precipitation depths do come from the NRCC, however the original design was done about a year ago now, and it is likely that they have changed slightly since. Unfortunately I can't locate the original extreme precipitation tables right now, but I will continue to look, and also check if the NRCC keeps historical data we can access.

    Status: Accepted. Calculations have been updated with latest NRCC precipitation depths.

Proposed Roadway Culvert

13. Question: Culvert – What is the 4,801 cf of storage in HydroCAD for the roadway culvert representing? How were the size and number of pipes for the culvert determined? Was consideration given to a single structure instead of multiple pipes? Recognize this isn't a stream crossing so the guidelines don't apply, nonetheless, concerned about habitat segmentation from the roadway fill. Ideal would be something like a single 3-sided structure with a natural bottom. Please provide your design guidance for the dissipater pool. Various design guidances exist for plunge pools with differing criteria for length, depth, slopes, etc. Also please provide a plan detail of the pool (scale on overall site plan difficult to review); how far from the pipes on either end does the flat portion of the pool extend? Has the riprap been sized for this pool?

    Response: The storage on the culvert is the combined volume of the pipes. We considered a culvert similar to what you are suggesting, but I will have to go back, and look at our culvert calculations, as I do not remember the exact reasons for deciding against it. I will also get our calcs together for the dissipator pool, with the standards we used. There is a detail of it, Section B-B, on sheet C-3, detail #5.

    Status: Accepted.

Additional review information:

Regarding Water balance –
From the Massachusetts Stormwater Handbook Volume 3, Chapter 1, page 17

"Evaluate Where Recharge Is Directed

The infiltration BMP must be evaluated to determine if the proposed recharge location will alter a Wetland Resource Area by causing changes to the hydrologic regime. For example, if Watershed "A" contains a vernal pool within a Bordering Vegetated Wetland, and the vernal pool is fed by groundwater, and runoff from Watershed "A" is proposed to be directed to Watershed "B" for infiltration, an evaluation is necessary to determine if redirecting the runoff will cause an alteration to the vernal pool. In such instances, Water Budgeting using the

Reference: Sleepy Hollow Road – Stormwater Peer Review

Thornthwaite method or equivalent must be employed. TR-20/TR-55 methods are not sufficient for water budgeting purposes. Water budgeting analysis is not required, if the recharge is directed to the same subwatershed where the impervious surfaces are proposed."

Reviewing the drainage area delineations and discharge location for existing and proposed:

Final Discharge	Existing Trib Area (sf)	Proposed Trib Area (sf)	Difference (sf) (prop – exist)	Difference (%)
Street	20,713	21,358	+645	3.1
Site Depression	384,149	382,197	-1,952	-0.5
Woodbine Depression	654,021	654,526	+505	0.1
BVW	54,672	55,474	+802	1.5
Total	1,113,555	1,113,555	0	

From this review, appears that the drainage areas tributary to resource areas are changed slightly under proposed conditions.

Nonetheless, Table 1 in the drainage calculations report indicates that the peak runoff rate and runoff volumes are most significantly reduced to the Site Depression after development. The peak runoff rate reduction to the Site Depression is approximately 24% and the reduction in runoff volume is about 18% (similar for the three storm events reported). During our meeting, GSA indicated that the Site Depression does not have a vernal pool. According to GSA, vernal pools are located in the BVW and the ILSF near Woodbine Road. The greatest reduction in peak runoff to the BVW is approximately 10% and the greatest reduction in runoff volume is approximately 6%. The reduction to peak runoff to the Woodbine Road ILSF is approximately 0.2% with reduction in runoff volume of approximately 0.3%.

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