Nitsch Engineering

www.nitscheng.com
186 Lincoln Street, Suite 200
Boston, MA 02111-2403
T: 617-338-0063
F: 617-338-6472

MEMORANDUM

TO: Brian Monahan

FROM: Aaron Gallagher, PE, LEED AP

DATE: 4/22/2010

RE: Wayland High School Technical Review Response Memo

This memo is meant to provide responses to Technical Review letter sent by Lisa Eggleston, PE of Eggleston Environmental, dated March 31, 2010 and to provide an update on the revision of the plans and calculations based on additional comments from a meeting on April 7, 2010 where Nitsch Engineering met with Lisa to discuss her technical review comments for the submission. Also attending the meeting were Steven Millington (HMFH Architects), John Moynihan (Town of Wayland), and Brian Monahan (Town of Wayland).

Lisa's comments are in italics and Nitsch Responses are in Bold.

1. The drainage areas used in the hydrologic analysis are not consistent with the project plans with respect to where runoff is discharged under pre-and post-development conditions. Under existing conditions, some portion of the roof drainage from the field house and all of the area to the north and west of the field house drain in a northwesterly direction, not toward the 24-in outfall as shown. It appears that the roof drainage from the building in the northwestern corner of the school campus also flow in that direction, since there is no apparent connection with the drains serving subarea EX1. Some or all of the runoff from this northwestern corner of the site enters a closed drainage system that ultimately discharges to the stream system to the south of the school facility. It should not, however, be included in the flows tributary to the existing 24-inch outfall.

The drainage area map and calculations have been modified slightly to show the area to the north and west of the field house as part of EX-1 flowing to the closed drainage system just east of the existing playing fields. This closed drainage system flows south to the existing stream. The Design Point for EX-1 was considered to be the stream itself and not just the 24" outfall. While portions of the site are discharged from three different outfalls they all ultimately flow into the existing stream and are close enough to each other to be considered one design point. The drainage report narrative has been updated to make this a little clearer.

2. There is no basis is for EX1 and EX3 being modeled as two separate subareas when there is no drainage divide between them. Runoff from subarea EX1 flows through EX3 to the existing 24-inch outfall.

EX-1 and EX-3 have been combined to form one drainage area EX-1 with its design point being the existing stream as described above.

3. Under post-development conditions, subarea PR5 will not drain to the existing 24in outfall as indicated in the Stormwater Report, but rather to an existing 8-inch outlet from DMH214. It needs to be determined where this pipe discharges and whether it has capacity for the increase in flow proposed.

Correct, PR5 does not drain to the 24" outfall it drains to DMH219 after being routed through the underground infiltration system #4. The 8" outlet from DMH #219 flows southwest and discharges to the existing stream. This 8" line will be removed and replaced with a new 24" CPP drain line and a new

headwall at the stream as shown on the project utility and drainage plans.

4. The area to the northwest of the field house will continue under post-development conditions to drain in a northwesterly direction and then through the closed drainage system between the field house and the football field. No new stormwater BMPs are proposed in that area, however some improvement will occur through the removal of pavement in the area, and the filtering and infiltration of runoff provided by the vegetated area that will replace it. I do recommend that the storm drain outfall(s) from the drainage system conveying the runoff be field-located to determine where they discharge, and consideration given to relocating any stormwater outfalls that discharge within the Zone I of the water supply well. The DEP stormwater regulations prohibit any discharge of stormwater within a Zone I.

The runoff in the closed drainage system between the field house and the athletic fields conveys runoff to an existing 12" outlet at a headwall located just west of the access road to the Happy Hollow wells. This headwall is within the Zone 1 however the project at this time is not proposing to alter or move the headwall. It is an existing discharge and no alterations to the upstream closed drainage system that flows to the headwall is proposed.

5. The Stormwater Report indicates that the proposed storm drain system is designed to convey flows for up to a 10-yr design storm. Wayland's subdivision regulations call for conveyance of up to a 25-yr design storm for most land uses, so what is the basis for using a smaller storm at this site?

The closed drainage system was designed for the 10-year design storm which is consistent with MA DOT standards for their roadway design and is standard practice in most of the municipalities that we have done work in. We worked under the assumption that Wayland Town Standards follow the MA DOT standards and also require the closed drainage systems to be designed for a minimum 10-year storm event.

6. Consideration needs to be given to where storm runoff that exceeds the design capacity of the drainage system will go. The proposed plan puts the parking areas further away from the low points on the site, and the buildings in between, therefore it may be necessary to provide drainageways around the buildings for the excess parking lot runoff.

Excess runoff during storm events larger than the 10-Year storm will tend to pond around low spots at the catch basins and within the rain gardens. The grading around the buildings has been designed to sheet flow runoff away from entry ways which will force excess runoff away from the buildings and towards the rain gardens and vegetated areas. Additional area drains can be added in areas that are of specific concern to the conservation commission. Drainageways around the buildings are not really feasible based on the grading and topography of the site but the proposed drainage design should be sufficient to protect the buildings during larger storm events. Some minor ponding at low spots and within the rain gardens should be expected during larger storm events (> 10-year) but should dissipate quickly.

7. The plans need to clearly show where curbing is proposed on the site and where it is not. Without this it is difficult to tell where the pavement runoff will go.

Please refer to the landscape plans for limits and types of curbing proposed for the project.

8. An additional catchbasin is needed to collect roadway drainage in the corner near sand filter #4.

An additional catch basin has been added (CB 265).

9. It appears from the proposed grading that roadway drainage will collect in the corner near sand filter #5

and the entrance to the proposed north building. Either the runoff needs to be directed into the adjacent rain garden or an additional catchbasin provided.

The proposed grading in the area near sand filter #5 is intended to pitch to grade away from the school building and loading dock area and towards the rain garden located to the north of the drive aisle/bus drop off area. Runoff should not collect anywhere in that area outside of the rain garden. A catch basin has been placed near the loading dock to facilitate as an overflow for any runoff that may pond from the rain garden during larger storm events.

10. Additional detail is needed on the proposed drainage swales along the eastern edge of the site driveway.

The drainage swales on the eastern edge of the site driveway are existing swales that are being modified slightly because of the proposed site driveway location. The existing swales help convey runoff from the vegetated slopes to the north and east of the site driveway to some existing catch basins that will remain in the final conditions of this project. These swales are not meant to be water quality or treatment swales.

11. No designated snow storage area is shown for the north parking lot or for the small lot in front of the main entrance to the school.

All lots now show proposed snow storage areas.

12. Further clarification is needed on how the pavement runoff from the proposed parking areas will be directed into the rain gardens. If they are to be curbed, then the curb inlets need to be shown on the plans and a detail provided. If the drainage is via sheet flow, curb stops should be added to keep cars out of the rain gardens but allow runoff in.

Enlargements of the rain gardens are now shown on Sheet L4.7. These enlargements show in detail how the runoff will be directed into the rain gardens.

13. The rain garden side slopes should be no greater than 3:1 to prevent erosion. Due to the narrow width of the parking islands, there is only room for a 3-ft filter strip (side slope) on either side of the rain gardens. Assuming that the drainage into the rain gardens is via sheet flow, I recommend that a stone diaphragm be added at the edge of pavement to enhance the pretreatment of the sheet flow from the parking lots. Even with these, however, the design does not meet DEP's 44% pretreatment requirement to allow infiltration from the rain gardens in a critical area (Zone II). Hence, it may be necessary to forgo the recharge from the rain gardens and line them with an impermeable barrier instead of the filter fabric.

Based on our meeting with Lisa on April 7th the pretreatment for the rain gardens will be achieved using one of the recommended pre-treatment options listed on page 25 of Volume 2/Chapter 2 of the Massachusetts Stormwater Handbook. The runoff from the parking lots will be filtered through a grass and gravel combination consisting of 8-12 inches of gravel followed by 3-5 feet of sod. This pretreatment should be sufficient to meet the 44% minimum TSS removal requirements for allowing the rain gardens to infiltrate within the critical area (Zone II).

14. The rain garden detail should specify the soil mix per the DEP specifications, and should show the area drains.

The rain garden detail has been modified to show the area drains and soil mix.

15. A planting plan for the rain gardens is needed; it was not included with the materials I reviewed. If trees and shrubs are proposed, the depth of the soil mix should be increased to 36 inches.

The depth of soil mix has been increased to 36 inches as shown on the rain garden detail on sheet C2.20. An enlargement of the rain gardens areas showing the plantings within the rain garden is included on Sheet L4.7.

16. The inverts of the area drains should be several inches above the level of the rain garden to allow ponding on the surface; the plans show them to be at grade.

The Rim elevations of the area drains will be 6 inches above the bottom of the rain gardens as shown on the detail on sheet C2.20. This will allow some minor ponding to occur in the rain gardens.

17. The area drain detail should be consistent with its proposed use in the rain gardens. The outlet pipe (where applicable) should be 12-in instead of 24-in, and the connection from the 6-in underdrain should be shown. I'm not sure that the 24-in sump is necessary.

The area drain detail has been modified as requested and shown on sheet C2.20.

18. On the drainage plan (Sheet C3.00) the rain garden underdrains appear to be sloped, however this is not indicated on the design detail and no inverts are provided.

The rain garden underdrains will be placed with no slope. The inverts for the area drains are shown on sheet C3.00 in the invert table.

19. Further clarification is needed on the proposed sand filter design, as it is not consistent with any of the standard designs in the DEP handbook or EPA fact sheet. While I recognize that the filters are designed to infiltrate, the underlying soil will likely have a lower hydraulic conductivity rate than the sand. Thus, there should be some way (e.g. through underdrains or an outlet at the base of the sand layer) for the excess filtered flow to be collected and discharged back to the storm drain system. Based on the design detail, it appears that the only flow entering the discharge chamber would be unfiltered flow that overtops the baffle. It may also be necessary to dewater the filters periodically for maintenance purposes, and consideration should be given to how the filter will function during freezing conditions.

The sand filters have been redesigned for this submission. Please see the revised design which should be more consistent with the DEP guidelines and typical designs. Because the site is tight elevation wise, the closed drainage system design does not allow for the excess filtered flow to be picked up in an underdrain and piped back into the drainage system. The filters will need to drain through infiltration and based on the soil types in the project area should drain fully within 24 hours. The filters will lose effectiveness in the colder winter months when freezing occurs however this is typical of any sand filter design used in the colder climates.

20. Dimensions and inverts for the sand filters are needed. The design calculations appear to be based on an 18-inch sand depth and a calculated surface area requirement, but the design detail just specifies the sand volume and calls for the use of tanks that are typically about 6-ft deep. Adequate surface area is necessary for pollutant removal; a smaller, deeper filter will not be as effective.

Details for the sand filters have been updated and include more information. The sand filters have been redesigned to a more typical layout and use an 18" depth of sand. It is a shallower design with more surface area for more effective pollutant removal.

21. It is not clear what inverts were used to calculate the "head above filter" in the sand filter design calculations.

The "head above filter" was calculated from the invert of the sand filter inlet pipe to the rim of the

farthest upstream catch basin for that drainage line.

22. The connections to and from the sand filters are not included in the schedule of inverts on Sheet C3.00. More detail is needed to show how the water quality volume is being diverted to the sand filters and higher flows by-passed.

The invert table on Sheet C3.00 and Sand Filter Details have been updated to include more detailed information about inverts and bypass elevations.

23. Inverts into and out of the sand filters and infiltration systems are not included in the schedule of inverts on Sheet 3.00.

Inverts into and out of the sand filters are included on the sand filter details.

24. The infiltration/detention system detail should include layout dimensions and inverts for each of the systems. Connection points and inspection ports should also be shown, as should the estimated high groundwater levels when that data becomes available.

The infiltration system details have been updated and a detail has been done for each individual infiltration system showing inverts, inspection ports and seasonal high groundwater levels.

25. Per the DEP regulations, exfiltration should be modeled over the bottom area only of the proposed infiltration/detention systems, not the surface area.

The exfiltration has been modeled over the bottom area only please see the revised calculations in the drainage report.

26. The hydrologic analysis uses a 6-ft diameter weir outlet on the infiltration systems, but the detail for the outlet control structures calls for a 5-ft diameter structure. The model should also take into account the piped outlets from the outlet control structures since they will also impact the rate of flow.

The model has been adjusted to use a 5' diameter weir for the outlet control structures. The piped outlets from the outlet control structures have been sized (similar to the rest of the closed drainage system) to handle the 10-year storm event. The underground infiltration systems handle flow up to the 2 year storm event. All other flows are bypassed. Any flows that exit the underground infiltration systems and overtop the weir in the outlet control structure will be smaller than the 10-year storm event flows and therefore the piped outlets from the outlet control structures will not create a restriction in outflow from the infiltration systems. The true restriction in flow out of the infiltration systems is the weir in the OCS which has been modeled in the calculations.

27. The OCS details give the height of the weir for each system, but there are no inverts to tie them to. Additional clarification is needed on the weir design as well. The section seems to indicate that the weir goes to the top of the structure.

The OCS details have been modified for additional clarification.

28. There is no OCS shown on the plan for detention/infiltration system #1, but there is a detail for an OCS#1. It is not clear whether this is the same as DMH 217, or a separate structure.

Sheet C3.00 has been changed to show OCS #1.

29. The detail for OCS#2 shows a 24-in outlet, but the outlet is shown as 15-in on the plan.

The detail has been corrected.

30. The details for OCS#s 2, 3 and 4 show a 12-in inlet from the infiltration systems, but the infiltration system detail shows a 24-in outlet.

The details have been corrected.

31. The detail for OCS#4 shows a 24-in outlet, but the outlet is shown as 12-in on the plan. The detail should also show the 12-in inlet from DMH 214.

The detail has been modified to show the 12" inlet from DMH 214.

32. The schedule of inverts on Sheet C3.00 lists the area drain and catchbasin outlet inverts in the wrong column. OCS2 and OCS 4 are missing from the schedule of inverts, and OCS1 appears to be mislabeled.

The schedule of inverts has been updated.

33. There appear to be two structures labeled DMH 214 on the plan (Sheet 3.00), one upgradient and one downgradient of OCS4. It is not clear which of these is listed in the schedule of inverts, as I can't find a CB264 anywhere on the plan.

The plan has been changed to show only one DMH 214 and the invert table has been updated.

34. In the TSS removal calculations, street sweeping on a quarterly basis does not qualify for 5% TSS removal unless a regenerative air or high efficiency vacuum sweeper is used, and treatment in the deep sump catchbasins and rain gardens is not additive since the two will function in parallel, not in series. Even so, it is clear that DEP's 80% TSS removal requirement will be met by the BMPs proposed, provided it can be demonstrated that they are properly designed and treat the entire water quality volume.

The 5% TSS removal for street sweeping has been removed from the treatment train however, as noted the project will still easily achieve the 80% TSS removal requirement with the rain gardens, sand filters and infiltration BMP's proposed.

35. The O&M Plan is intended to be for long term management of the site and the stormwater system. Short-term, construction related activities should be removed and included in the construction stormwater pollution prevention plan (SWPPP). A regular schedule of maintenance activities for the stormwater BMPs should be spelled out in the O&M Plan, the scheduling should not just be based on the thresholds listed. Catchbasins should be cleaned on an annual basis, and cleaning with a Vactor unit (or other means of protecting the hoods) specified. The rain gardens should be maintained in accordance with DEP guidelines, including periodic trash removal, mulching, and removing and replacing dead vegetation. The sand filters should be raked and sediment removed on a regular basis, and periodic replacement of the sand media may be needed. The O&M Plan should also include good housekeeping measures to be employed on the site, including those related to landscaping, deicing and snow management, spill control, and trash disposal practices.

The O&M plan has been updated as requested.

36. The Construction SWPPP needs additional detail regarding the sequencing of site preparation and construction activities, and the management of stormwater runoff throughout the construction period.

The SWPPP plans have been advanced as far as the design team can take them at the current time. Because of the complexities of the project logistics the sequencing of construction activities and site

preparation will remain a moving target throughout the course of the project. The SWPPP outlines the requirements that the contractor will need to adhere to during construction and the Turbidity testing requirement in the SWPPP should insure that the contractor will be diligent in their stormwater management practices throughout the project.

37. The SWPPP states that the Engineering Study conducted by McPhail Associates indicates that the soils on the site are primarily dense sand. It should also reiterate McPhail's findings that the existing fill and alluvial deposits have moderately high silt content, making them highly susceptible to disturbance (e.g. erosion and siltation) during the construction period in the presence of moisture.

The SWPPP has been updated to include this information.

38. The SWPP Plans (Sheets C0.02 and C0.03) should show grading proposed to accomodate the temporary facilities, e.g. in the student dropoff and fueling areas.

The SWPPP plans are meant to be a baseline for the contractor to work from and because the project logistics, phasing and staging are so complex it will be up to the contractor to work his site in the most efficient way possible while still maintaining the integrity of the SWPPP. It is difficult for the design team to advance the SWPPP and plans any farther than they are currently without limiting the contractor's options on how he sets up his site and complies with the requirements set forth in the SWPPP. The overall SWPPP and plans are very comprehensive and the contractor will need to comply with all the standards and requirements set forth within the SWPPP. How they ultimately achieve this will change multiple times throughout the project and to try and get that all on one plan would be very difficult and be very limiting to the contractor moving forward in the project. We feel that the baseline set up by the SWPPP will insure the project will adhere to the NPDES permit requirements however the contractor chooses stage the construction areas.

39. Note 18 of the SWPPP Plan (Sheet C0.02) states that all stockpiled materials are to be located at least 100 feet from the wetlands, yet I note that one of the designated materials storage areas includes a portion in the buffer zone.

The SWPPP Plan has been updated and does not included any stockpile areas within the 100' Buffer Zone to the wetlands.

40. Project plans should be stamped and dated, and revision dates noted on the plans.

Plans have been stamped and dated.