

EXHIBIT

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June 15, 2017

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**PLANNING BOARD
GRAFTON, MA**

FILE

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**Subject: The Village at Institute Road
Definitive Plan Review**

Dear Joe:

We received the following documents in our office May 23, 2017:

- Plans entitled The Village at Institute Road a Conventional Subdivision in Grafton, Massachusetts dated September 16, 2016 and last revised May 21, 2017, prepared by Guerriere & Halnon, Inc. for D&F Afonso Builders, Inc. (32 sheets)
- Document entitled Stormwater Report "The Village At Institute Road" Grafton, MA dated September 13, 2016 and last revised April 13, 2017, prepared by Guerriere & Halnon, Inc. for D& F Afonso Builder Corp.

Graves Engineering, Inc. (GEI) has been requested to review and comment on the plans' conformance with applicable "Rules and Regulations Governing the Subdivision of Land; Grafton, Massachusetts" revised through April 27, 2009; "Grafton Zoning By-Law" amended through May 9, 2016; Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Handbook and standard engineering practices on behalf of the Planning Board. As part of our initial review, GEI visited the site entrance on April 1, 2016.

This letter is a follow-up to our previous review letters dated November 8, 2016 and March 21, 2017. For clarity, comments from our previous letters are *italicized* and our latest comments to the design engineer's responses are depicted in **bold**. For brevity, comments previously addressed by the design engineer and acknowledged by GEI have been omitted. Previous comment numbering has been maintained.

Our comments follow:

Subdivision Rules and Regulations

1. *One waiver was requested. GEI reviewed the waiver request and the plans; we do not have technical concerns with the request to use low profile "Cape Cod" berm (§4.2.1.2) as long as vertical granite curb is used at the intersection radii and cul-de-sacs (as currently proposed) and as long as granite curb inlets are used at the catch basins (not currently proposed). We understand that the Planning Board will address any waiver requests. If this waiver is to be granted, then the plan-view sheets will need to be revised to show granite curb at the catch basins, the catch basin construction detail will need to be revised to specifically require a granite curb inlet*

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and the "Curb Transition Detail" on Sheet 26 will need to be revised to show a non-chamfered (aka "tip-down) transition curb instead of a chamfered transition.

March 21, 2017:

The plans were revised, but need to be further revised to be fully coordinated with the waiver requests. We don't have an issue with the waiver requests, they now propose a mix of bituminous Cape Cod berm, sloped granite edging (referred to on the plans as "sloped granite curb" and "sloped granite curbing") and vertical granite curb. The waiver requests ask for the use of Cape Cod berm at the Brooke Street cul-de-sac but Sheets 12 and 18 show a curbing line-type that is the same as vertical granite curbing at the Dylan Way cul-de-sac shown on Sheet 14. As for transitions, "tip down" stones are needed for transitions from vertical curb to Cape Cod berm and chamfered stones are required for transitions from vertical curb to sloped granite edging. Sheet 29 of the plans only proposes one type of transition stone – a "tip down" but instead of transitioning to Cape Cod berm, it proposes transitioning to sloped granite edging. The transition stone detail needs to be revised and a second transition stone construction detail needs to be provided.

Lastly, the "Catch Basin Detail" construction detail (Sheet 30) must be revised to specifically require a granite curb inlet instead of vertical granite curbing.
No plan revisions were made to address this comment.

3. *Bounds were only proposed along the rights-of-way. The plans must be revised to also include bounds at all angle points along the easements, access routes and open space areas. (§3.3.3.10 & §3.3.3.17 & §4.8.1)*

March 21, 2017

Although the design engineer responded that the plans were revised, no bounds are proposed at the easements or at the parcels (Parcels A, B and C). The plans need to be revised accordingly.

The plans were revised to propose bounds at the open space parcels and at most of the easements. Bounds were not shown at the snow easement on Lot 39 nor at the 44-foot wide drain easement on Lot 45, nor was an easement (with appropriate labeling) with bounds proposed for the sewer pump station off Westboro Road.

5. *The words "Deeds of Easements to be Recorded Herewith" must be included on each plan sheet. (§3.3.3.15)*
The words "Deeds of Easements to be Recorded Herewith" were added to Sheets 2-8. This language must be added to all plan sheets (including Sheets 1 and Sheets 9 to 32) unless directed otherwise by the Planning Department.
12. *The Engineer must provide pipe design flow calculations using the Rational Method for the 25-year storm event. (Rules and Regulations Governing the Subdivision of Land §3.3.3.19.d & Regulations Governing Stormwater Management §6.B.3.a)*

March 21, 2017:

The Engineer provided pipe design flow calculations for a portion of the drainage system (XC-DMH-1 to XC-DMH-3; DMH9 to DMH-17; DMH-18 to DMH-17; DMH1 to DMH-4; DMH-4 to DMH-5A; and DMH-5A to DMH-5). The Engineer must provide pipe design flow calculations for the entire proposed drainage system (CB1 through

CB33; DMH6 to HWB1; DMH8 to DMH16; the cross-country drainage system to the proposed stormwater management system behind Lot 16). Also, the submitted pipe design flow calculations show that the water velocity exceeds ten (10) feet per second (fps) at the four pipe segments between DI-2 and DMH-3. This drainage system must be revised so that the water velocity in the pipes is between two (2) fps and ten (10) fps per Regulations Governing Stormwater Management §6.B.3.d. Finally, the submitted pipe design flow calculations for the pipe between DMH-3 and DMH-4 use an incorrect pipe size, the calculations must be revised to be consistent with the plans.

Revised Rational Method calculations were submitted. GEI reviewed the calculations and found them to be in order except as follows:

- A. On the sheet labeled "Brooke St. Bas. #1", none of the inlets into DMH9 (five inlets total) account for the flow from the Dylan Way drainage system (1.09 acres of tributary area) and there are two inlets from CB18. The calculations need to be revised accordingly. With the additional flow from Dylan Way, there may or may not be adequate capacity in some of the pipes downstream of DMH9 (e.g. the pipes between: DMH9 and DMH10, DMH10 and DMH11, DMH13 and DMH14, DMH14 and DMH5, and DMH 15 and DMH16).
 - B. On Sheet 30, the following information is not consistent with the calculations: labeled pipe slope (2%) between DMH16 and DMH17; labeled pipe slopes (2%, 4%) and lengths (135' and 20') between DMH 17 and the discharge point into the basin; and the labeled pipe slope (2%), pipe diameter (36") and headwall invert elevation (371.20 feet) at the Basin #1 outlet. The design engineer needs to coordinate the information on the two documents. It appears that Sheet 30 needs to be revised.
14. The following construction details must be added to the plans: Pavement Markings, Guard Rail, Monument, Roof Drainage Recharge Chambers, Concrete Sidewalk, Cape Cod Berm and Erosion Control Blankets. (§3.3.3.21.b)

March 21, 2017

The plans were revised to include a guard rail, monument, roof drainage recharge chamber, concrete sidewalk, and cape cod berm construction details. As for the monument construction detail, the monument material (concrete) and length (36") do not comply with the Subdivision Rules and Regulations. Also, per Planning Department policy, the tops of the monuments must be installed flush in grassed areas or 6" to 9" above finished grade in wooded areas. The construction detail calls for the tops of bounds being set one foot above finished grade. The "Monument" construction detail must be revised.

No plan revisions were made to the monument construction detail to address this comment. The "Concrete Bound" construction detail needs to be revised to specify a granite bound with dimensions consistent with the Grafton Rules and Regulations and the policy noted above.

16. The Subdivision Rules and Regulations require street lights at all intersection and every three hundred (300) feet. The plans currently show street lights at the intersections and cul-de-sacs but not at every three hundred (300) feet. We

understand that the applicant will have to coordinate the final street light locations with the Grafton Board of Selectmen. (§4.7.6)

March 21, 2017

The design engineer responded that the street light locations will be coordinated with appropriate authority.

No further comment necessary.

19. *The plans show that Parcel C is dedicated to be an access/walkway path, with a proposed slope of approximately 25%. The slope of the access/walkway path must be revised. The pathway must have a slope equal to or less than eight (8) percent. (§4.10.4)*

March 21, 2017:

The Engineer revised the grading for the access/walkway path to Parcel C, however the slope still exceeds eight (8) percent and proposes a 2H:1V slope at the upper end of the path. Sheet 24 shows a note requesting a waiver from the slope requirement, however this is the only reference to such a waiver request. If the Engineer wishes to request a waiver from this requirement, they should address it within the waiver request letter, and in our opinion the 2H:1V slope should be revised to be similar to the grade elsewhere on the path.

No plan revisions were made to address this comment and GEI is not aware of the status of any waiver requests.

20. *The Engineer must revise the drainage pipe design to provide at least four (4) feet of cover over all drain pipes or provide Class V RCP pipe on the full length of drain lines that have less than four feet of cover anywhere along the line. Based on the plan and profile sheets, GEI estimated that the drainage pipe has less than four (4) feet of cover at the following locations: Audrina Lane Sta 4+80 to Sta. 8+35; Brooke Street Sta. 0+05 to Sta. 0+45 and Sta. 16+60 to Sta. 18+85; Dylan Way Sta. 0+00 to Sta. 2+15. (§5.4.2.2)*

March 21, 2017:

This comment was not addressed in its entirety. The proposed drainage system has been revised, however a minimum of four (4) feet of cover was not provided over all of the drain pipes nor do the plans note that Class V RCP pipe is to be used at all of the shallow cover locations. Based on the plan and profile sheets, GEI estimated that the drainage pipe has less than four (4) feet of cover at the following locations: Brooke Street Sta. 17+75 to Sta. 18+68; Dylan Way from CB-30 to DMH-7 and from CB-31 to DMH-7; and on the cross-country drain line from Sta. 2+75 to Sta. 3+84.

Although the drainage pipe between DMH-15 and DMH-16 was revised for another reason, no plan revisions were made to address this comment. Please note that the drainage pipes between Brooke Street station 18+35 and the headwall that discharges to the forebay have less than four feet of cover in addition to the other locations previously noted above.

Hydrology & Stormwater Management Review

22. *There is significantly less total land area modeled in the post-development hydrology calculations compared to the pre-development calculations; the difference is 595,700 square feet or approximately 13.7 acres. The total land areas must be consistent*

unless justified otherwise (e.g. if roof runoff for all storm events is to be collected and infiltrated with no overflow to the ground surface and supporting documentation is submitted to demonstrate such).

March 21, 2017:

The hydrology calculations were revised; however the pre-development land area is still 134,024 square feet (or approximately 3.08 acres) greater than the post-development land area. Furthermore, with the submittal of revised pre- and post-development drainage areas plans, we were able to further review the limits of the project's subcatchments. We disagree with the limits of the subcatchments at the southeast corner of the site (the southern parts of pre-development Subcatchments #1E and #2E and post-development Subcatchments #1P and #2).

First, the limits of the pre-development subcatchments extend approximately 300 feet farther south than the limits of the post-development subcatchments, thereby encompassing approximately 155,000 square feet (3.5 acres) of land. More importantly, in the pre-development conditions there is a drainage divide that separates north-flowing stormwater from south-flowing stormwater. This drainage divide passes through the existing high point (elevation 448+) at Brooke Street station 1+50+/- . Stormwater from the western portion of Lot 1, all of Lots 2 and 3, and the southern portions of Lots 4 and 5 flows southerly instead of northerly. The design engineer needs to review the subcatchment delineations and revise the hydrology calculations as necessary.

Acknowledged. The hydrology calculations were revised such that the total pre-development area and the total post-development area are consistent and the subcatchment areas at the southeast corner of the site were revised as noted in the preceding paragraph.

25. *In the post-development hydrology calculations, the modeling of the infiltration basin (Pond 5P) must include the outlet pipe. The outlet control structure has three inlet orifices in parallel and one outlet pipe in series with the three orifices. As currently configured the outlet pipe appears to be more restrictive to flow than the three orifices.*

March 21, 2017:

The hydrology calculations were not revised to address this comment. The calculations must model both this outlet pipe and the outlet pipe for Basin #2, a new basin.

The Rational Method calculations were revised to address the capacity of a 24" diameter outlet pipe at Basin #1, however, the capacity of the Basin #2 outlet pipe was not addressed. The capacity of the proposed 18" diameter pipe at Basin #2 is approximately two cubic feet per second less than the peak discharge during a 100-year storm event. A 24" diameter pipe needs to be proposed instead.

27. *The hydrology computations indicate that Basin #1 would discharge stormwater over the emergency spillway during the 100-year storm. Infiltration basins must be designed so that they do not use the emergency spillway for design storm discharges; the Engineer must revise as necessary.*

March 21, 2017:

The hydrology calculations were revised however Basin #1 will still discharge stormwater from the emergency spillway during the 100-year storm event (and the spillway was not included in the basin's hydrology model). Neither basin should experience stormwater discharges from the emergency spillways for any storm event, including the 100-year storm event.

Acknowledged. The plans were revised such that the emergency spillways will not discharge stormwater during a 100-year storm event.

29. The Engineer must revise the Pre-Development Plan and Post-Development Plan for the following reasons: the drainage plans must include the limits of each catchment in their entirety and the areas labeled on the Plans must be consistent with the values used in the hydrology calculations (specifically, the areas listed on the Plans for catchments DA #3E, DA #2P, and DA #3P do not match what was used in the hydrology calculations).

March 21, 2017:

The Pre-Development Plan and Post-Development Plan were revised to include the limits of each catchment in their entirety. The area label listed on the Pre-Development Plan for catchment DA #3E was revised and is now consistent with the hydrology computations. The areas labeled on the Post-Development Plan must be revised to be consistent with the values used in the hydrology computations, specifically catchments DA #2P, DA #3P, DA #4P, and DA #6P.

Also, the Engineer must revise the post development catchment delineations at Lots 24, 25, 39 and 46. The Post Development Plan shows two unlabeled subcatchments at these lots but the topography shows that runoff from these lots will flow to Audrina Lane and therefore these two catchments are part of DA #3P.

Acknowledged. The labels on the Pre-Development Plan and on the Post-Development Plan are now consistent with the latest hydrology calculations. Although the Post-Development Plan was not revised relative to the delineations at Lots 24, 25, 29 and 46, upon further review it is evident that the area in question is part of Subcatchment 3P and was modeled as such.

34. The Engineer must provide the following calculations: rip-rap apron sizing calculations, Basin #1 drawdown time calculations, required water quality treatment volume calculations and sediment forebay sizing calculations to demonstrate compliance with MassDEP Stormwater Management Standards 1, 3, and 4.

March 21, 2017:

The Engineer provided rip-rap apron sizing calculations, drawdown time calculations, and sediment forebay sizing calculations (for both basins) and the diverter manhole was eliminated (stormwater flow will not bypass the treatment train). However, the flowrate used for the Basin #2's rip-rap stone size calculation is incorrect (based on the hydroCAD results) and must be revised.

The riprap sizing calculations were not revised to address this comment.

General Engineering Comments

36. The plans show a sidewalk beginning at the intersection of Audrina Lane and Institute Road, extending southerly along Institute Road and terminating north of the

existing vernal pool. Consideration should be given to extending the sidewalk southerly along Institute Road from the currently proposed terminus to the intersection of Brooke Street to provide pedestrian access along Institute Road. Use of this section of Institute Road by pedestrians will be inevitable once the project is developed. In our opinion, the width of the pavement on Institute Road and the horizontal alignment of the road warrant that pedestrians should be separated from vehicular traffic. Please refer to Condition C6a of the Decision for Major Residential Permit MSRP 2014-10.

March 21, 2017

The Engineer responded that the area was reviewed in the field with the Conservation Commission Agent and it was determined that a sidewalk could not be constructed in the vernal pool area due to the impacts to the vernal pool. Potential alternatives to placing fill in or adjacent to the vernal pool could be explored (e.g. bridging the sidewalk over the vernal pool using a grated (or similar) decking material or locating the sidewalk on the opposite side of the street). We defer further consideration of this issue to the Planning Board and the Conservation Commission. **No further comment necessary.**

37. Per standard practices, drainage pipes must be designed to have velocities that do not exceed ten (10) to twelve (12) feet per second (fps) when flowing full. The following drain pipes as currently designed will have velocities that exceed twelve (12) fps: the eighteen-inch pipe from DMH#11 to DMH#12; the thirty-six-inch pipe from DMH#16 to the diverter manhole; the thirty-six-inch pipe from the diverter manhole to the infiltration basin's inlet; and the thirty-six-inch pipe from the infiltration basin's outlet control structure to the headwall (which we recommend should have a velocity no greater than 10 fps because it's located at the discharge point). Also, Grafton's Regulations Governing Stormwater Management limit the velocity to a maximum of 10 fps.

March 21, 2017:

The Engineer has revised the drainage pipes which has resulted in lower velocities within the system, however the following two drain pipes (as currently designed) will have velocities that exceed ten (10) fps (based upon pipe slope, these pipes were not yet included in the Rational Method calculations): the 24-inch diameter pipe from the stormceptor to the proposed headwall and the 36-inch diameter pipe from Basin #1's outlet control structure to the proposed headwall.

Acknowledged. The drainage system was revised where necessary and the Rational Method calculations were updated.

38. The Engineer must match either the pipe crown elevations or 0.8 pipe diameter elevations at manholes with changes in pipe diameter (unless a drop manhole is proposed, in which case the incoming pipes would be higher). For example, pipe inverts at DMH #4, DMH #8, and DMH #12 must be revised.

March 21, 2017:

The Engineer has revised the drainage system, but has not matched all of the pipe crown elevations or 0.8 pipe diameters at manholes where the pipe diameters change (specifically DMH #1, DMH#5, and DMH #15).

The pipe invert elevations at DMH #1 and DMH #15 were adequately revised. Based upon information on Sheet 18, it appears that the pipe invert elevations

at DMH #5 were adequately revised, but the DMH #5 information on Sheet 16 is not consistent with the information on Sheet 18; the information on the two plan sheets must be consistent. The drainage system at DMH #16 was not revised; the plans must be further revised to provide the requisite pipe elevations for drain manholes with changes in pipe diameter.

39. *The location of the outlet structure must be revised. According to the Plan View Basin Detail and the hydrology calculations, the inlet openings will be below the ground surface, preventing stormwater from draining out of the basin.*

March 21, 2017:

The topography adjacent to the Basin #1 outlet control structure was revised and the inlet openings are now above the ground. However, the proposed grading is too steep (up to 1H:1V). The outlet structure needs to be moved farther into the basin and the grading revised to be no steeper than 3H:1V. Likewise, the location of and grading adjacent to the Basin #2 outlet control structure needs to be revised.

The location of the Basin #1 outlet control structure was revised but the structure is now at a location such that the three orifices will be below the proposed ground elevation. The outlet control structure's location needs to be revised by perhaps as much as 18 feet; the lowest orifice is proposed at elevation 375.00 but the structure is located at elevation 381.4. At Basin #2, black lines that might represent two wing walls were added to the plans. The plans propose a narrow channel at elevation 370 for approximately twelve feet in length. This narrow channel needs to be avoided; the location of the outlet control structure needs to be moved farther into the basin. Lastly, the two black lines on the Basin #1 and Basin #2 outlet control structures need to be labeled or eliminated.

42. *The "Catch Basin" construction detail on Sheet 27 must be revised to comply with the Town's standards. We understand that the frame must be EJIW Model No. 5520Z, the grate must be EJIW Model No. 5520MB, and the catch basin hood must be an "Eliminator".*

March 21, 2017:

The "Catch Basin" construction detail was revised as requested. However, we (previously) cited a frame and grate for a cascade inlet instead of for a square-hole inlet. The model numbers will have to be revised to specify a 5523Z frame and a 5520M5 grate.

The plans were not revised to address our comment of March 21, 2017.

49. *The Engineer must revise the sewer and/or drain design following the reasons: on Sheet 17 there is a conflict or near conflict between CB#29 and the eighteen-inch reinforced concrete drain pipe; and on Sheet 18 there is a conflict or near conflict between CB#26 and the eight-inch polyvinyl chloride sewer pipe.*

March 21, 2017:

No sewer and/or drain design revisions were made to solve these potential conflicts. The plans were not revised to address this comment.

51. *The Engineer must revise the eighteen (18) inch drain pipe shown on the profile view of Sheet 17. The drain pipe is not drawn to the right scale between DMH #8 and DMH#10.*

March 21, 2017:

The pipes were revised to fifteen (15) inch diameter; however they were still shown incorrectly. The pipe heights are incorrect between DMH #8 and DMH #9 and only part of the top line for the pipe was drawn between DMH #9 and DMH #10.

Acknowledged. Sheet 17 was revised.

52. *On Sheet 23, STOP and STOP AHEAD signs need to be added in accordance with the last paragraph of Greeman-Pedersen Inc.'s correspondence dated September 16, 2016.*

March 21, 2017

The "Institute Road Improvements Plan" (now Sheet 25, formerly Sheet 23) was not revised to include STOP and STOP AHEAD signs.

Sheet 25 was revised to show the STOP and STOP AHEAD signs but their proposed locations on the plan view still need to be shown.

General Comments

53. *Sheet 8 must be revised to include the utility easement designated for the proposed sewer pump station.*

March 21, 2017:

The utility easement for the proposed sewer pump station is shown on Sheet 8, however the bearings and distances are missing from this easement. The bearings and distances need to be included on the plans along with bounds at the easement corners.

The plans were not revised to address this comment.

54. *Prior to the plan endorsement, all sheets of the plan set, including the cover sheet, must include the statement "See Sheet ___ for Planning Board Conditions of Approval", and the conditions must be inscribed on said sheet.*

No further comment.

57. *On Sheet 24, Note 18 references "Bellingham" and Note 21 references "Ashland". On Sheet 27 the "Precast Concrete Manhole Detail" references "M.D.P.W". The Engineer must remove all references to Towns and DPW's other than Grafton.*

March 21, 2017

It appears that the changes to the notes on the "Erosion Control Plan" (Sheet 27, formerly Sheet 24) were made but the text is illegible (see Additional Comments section). We will confirm the revisions when revised plans are submitted.

The notes on the "Erosion Control Plan" (Sheet 27) have been revised, however on Sheet 29, the "Typ. Precast Concrete Manhole Sanitary" construction detail references Ashland. The Engineer must remove all references to towns other than Grafton.

58. *GEI did not review the design of the sewer pump station or the sewer main design. We understand that the Grafton Sewer Commission will review the subdivision's sewer design.*

No further comment.

59. *GEI has not reviewed the plans with respect to the water main design. We understand that the Grafton Water District will review the subdivision's water design.*

No further comment.

Additional Comments, March 21, 2017

60. *The text throughout the plans is blurry and illegible, particularly the drainage and sewer systems' rim and invert elevations (plan and profile sheets), the Erosion and Sedimentation Control notes on Sheet 27, and the construction detail text on Sheet 29. There appears to be a problem with the way the plans were scanned or printed. Any new plans submitted must be clear and legible.*

Acknowledged. The revised plans are clear.

61. *Sheets 11 and 13 show proposed drainage lines, catch basins, and manholes throughout the wooded property to the north of Lots 17 through 23. These drainage elements are not part of the project; they appear to be left over from project design and drafting. Also, on Sheet 8, just south of the proposed sewer pump station easement and above the isolated wetlands there is a bearing and distance that do not relate to a property line. These drainage elements, bearing and distance need to be removed from the plan set.*

On Sheets 11 and 13, the drainage lines, catch basins and manholes previously shown have been removed. On Sheet 8, the bearing and distance that do not relate to the property line are still shown. The bearing and distance need to be removed from Sheet 8.

62. *The Post-Development Plan shows that the Subcatchment DA #1P discharges to a water quality swale treatment system. The Engineer must submit calculations to demonstrate that the proposed water quality swale treatment system (at the outlet pipe near the intersection of Brooke Street and Institute Road) is adequately sized to handle the required water quality volume.*

No information was submitted to address this comment. Water quality volume calculations and any necessary supporting information needs to be submitted to demonstrate compliance with MassDEP Standard #4.

63. *Infiltration Basins #1 and #2 must be revised to include one-foot of freeboard between the top of the berms and the 100-year peak water elevations. As currently proposed there will be 0.61 feet and 0.34 feet of freeboard at Infiltration Basins #1 and #2, respectively. The freeboard reported here accounts for the Basin #2 elevation discrepancy between the plans and the hydrology computations.*

Acknowledged. The plans and hydrology computations were revised such that each basin will have one-foot of freeboard.

64. *The design plans show that a proprietary treatment device (Stormceptor) for TSS removal is now proposed and as such the Engineer must provide backup calculations to demonstrate that the device was adequately sized (i.e. calculations in accordance with MassDEP's "Standard Method to Convert Required Water Quality*

Volume to a Discharge Rate for Sizing... Also, TARP and/or MASTEP Performance Evaluation data must be submitted to support the proposed TSS removal efficiency. **No information was submitted to address this comment.**

65. *The hydrology calculations show that subcatchment DA #6P (373,817 square feet) will discharge stormwater to a single-inlet catch basin. The single-inlet grate will not have adequate hydraulic capacity. Considering the calculated flowrates, up to 22 cubic feet per second (during a 100-year storm event), an alternative inlet(s) to the drainage system needs to be considered. The Engineer also must provide calculations to demonstrate that the inlet will have adequate hydraulic capacity.*
Acknowledged. The plans and Rational Method calculations were revised to provide multiple inlets to the subcatchment DA #6P drainage system. This system will capture stormwater runoff before it enters portions of Audrina Lane and Brooke Street.
66. *The notes for Basin #2's sediment forebay (on Sheets 12 and 31) use the wrong elevations and volume. These notes need to be revised to reflect the actual elevations and volume.*
Acknowledged. The notes on Sheets 12 and 31 were revised.
67. *The storage in Infiltration Basin #2 was modeled in HydroCAD using elevations ranging from elevation 369 to elevation 375. The plans (Sheets 12 and 31) show that the basin will be constructed between elevations 370 and 376. The plans or the HydroCAD model must be revised so that the elevations are consistent and are coordinated with the basin's outlet elevations.*
Acknowledged. The Basin #2 HydroCAD calculations were revised.
68. *On Sheet 30, the labeling of Infiltration Basin #1's outlet control structure outlet pipe size is inconsistent. In two locations, the pipe is labeled as being 24-inch in diameter and in a third location it is labeled as being 36-inch in diameter. The diameter of the outlet pipe must be consistent throughout the plans. Also, the plans label this pipe as being a PVC pipe, but RCP is required. Finally, this pipe is labeled as having a slope of 2.6% however we calculated a slope of 8% (based on invert elevations and length of pipe), which is too steep. A slope of 8% on the outlet pipe would result in an excessively high water velocity. As discussed in comment #37, the velocity must not exceed ten (10) fps. The Engineer must revise the outlet pipe as necessary.*
The labeling of Infiltration Basin #1's discharge pipe size is still inconsistent and the pipe's slope needs to be further revised. The pipe is labeled as 24-inch under the "Pr. Outlet Control Structure" leader note but is labeled 36-inch adjacent to the pipe and under the "Pr. Headwall" leader note. The labeling of the pipe material has been revised as being a RCP. Finally, the slope of the pipe has been revised to 2.6% (based upon invert elevations and pipe length) but was labeled as 2%. The pipe slope information must be consistent and the pipe slope must be such that the water velocity does not exceed ten feet per second.
69. *On the "Plan View Basin #2" construction detail (on Sheet 31), the invert elevations for the proposed headwall into the forebay and the DMH directly upstream of the headwall are incorrect (roughly ten feet higher than the adjacent ground elevations). The Engineer must revise these elevations.*

The construction detail has been revised. The pipe elevations are generally in order, except that the pipe that discharges into the forebay will have a 9% slope (water velocity will exceed 10 feet per second) and the headwall needs to be relocated so that the pipe invert will be at the proposed ground elevation (as currently proposed the pipe invert will be approximately 1.5 feet below the proposed ground elevation).

70. The diameter of the pipe between DMH-16 and DMH-17 is not labeled consistently on the "Plan View Basin Detail" construction detail (Sheet 30). The upstream manhole lists the invert out as a 36-inch pipe, the downstream manhole lists the invert in as a 24-inch pipe, and the plan view labels the pipe as a 36-inch pipe. The Engineer must revise the plans to consistently label the diameter of this pipe.

Acknowledged. The "Plan View Basin Detail" construction detail (Sheet 30) has been revised.

71. The Engineer must provide a TSS worksheet for the water quality treatment train (Subcatchment DA #1P) which demonstrates that eighty percent TSS is removed.

No information was submitted to address this comment.

72. As shown on the Plan View Basin Detail on Sheet 30, the emergency overflow elevation for Infiltration Basin 1 is set at 379.5 and the top of berm elevation is set at 380. The plans must be revised to provide a minimum elevation difference of one foot as measured between the emergency overflow spillway and the top of berm. Likewise, the forebay's spillway must also be one foot lower than the forebay's berm.

Acknowledged. The Plan View Basin Detail on Sheet 30 was revised.

73. A proprietary stormwater treatment unit is proposed at the Basin #1 forebay area. This unit will require maintenance by a (heavy) vacuum truck. The treatment unit needs to be located adjacent to the roadway for ease of maintenance access.

The plans were not revised to address this comment. The proprietary stormwater treatment units currently proposed at Basin #1 and Basin #2 need to be relocated to be adjacent to a street for ease on maintenance.

74. On Sheet 26, in the Phase 2 phasing narrative Lot 18 can't be released until the lot's access can be gained from a paved road. As currently proposed, road construction will occur on Brooke Street in front of this lot's driveway after the lot is released.

The plans were not revised to address this comment.

Additional Comments, June 15, 2017

75. On Sheets 10 and 30, the riprap formerly shown at the inlet and outlet of the Proposed Settling Basin (at the outlet of Basin #1) was omitted on these revised plans. The plans need to be revised to show the riprap. Similarly, on Sheet 31, the riprap at the discharge point into the Basin #2 forebay needs to be extended to the base of the 3H:1V slope.


76. On Sheet 12, there needs to be a label with rim and pipe invert elevations for drop inlet DI #5B located at the property line between Lots 29 and 30.

77. On Sheets 12 – 14, there need to be labels for pipe lengths, diameters, materials and slopes between drop inlets DI #2 and DI #6.

78. Upon further review, on Sheet 17 the rim elevation for catch basin CB#13 is only 2.00 feet above its outlet pipe's invert elevation. There will not be enough elevation difference to accommodate the pipe's diameter and wall thickness, the thickness of the catch basin's flat-top and the height of the catch basin's frame. We calculated that the elevation difference needs to be at least 2.50 feet.
79. Upon further review, the locations and elevations of the catch basins proposed along intersection radii at all four intersections need to be re-evaluated by the design engineer and revised as necessary so that they will collect stormwater. For example, at the intersection of Brooke Street and Audrina Lane, the rims (elevation 402.24 feet) of CB #9 and #10 will be approximately 0.12 feet above the Audrina Way centerline elevation at station 8+26 (elevation 402.12 feet). Furthermore, the catch basin rim elevations will also have to accommodate the fact that the Audrina Lane cross section will be transitioning from a crown to a continuous cross slope so that Audrina Lane can tie into the gutter line of Brooke Street. Likewise, at the intersection of Brooke Street and Institute Road, CB #12 will capture runoff from Institute Road but its rim elevation (443.35 feet) is too high to capture runoff from Brooke Street (centerline elevation at station 0+00 is proposed to be 443.21 feet).
80. To expedite any follow-up reviews, the design engineer needs to submit a response letter to accompany revised plans and supporting documents. The response letter needs to briefly identify where the plans (e.g. sheet number) were revised to address each review comment that warranted a plan revision.

We trust this letter addresses your review requirements. Feel free to contact this office if you have any questions or comments.

Very truly yours,
Graves Engineering, Inc.



Jeffrey M. Walsh, P.E.
Vice President

cc: Peter Lavoie; Guerriere & Halnon, Inc.
Normand Gamache, PLS; Guerriere & Halnon, Inc.