

September 30, 2024

Ms. Alison Manugian
Community Development Director
Town of Dracut
62 Arlington Street
Dracut, MA 01826

RE: Comprehensive Permit Site Plan Peer Review for "135 Greenmont Avenue", Chapter 40B Development in Dracut, Massachusetts - Fifth Review

Dear Ms. Manugian:

GCG Associates, Inc. (GCG) has reviewed the following information for The Comprehensive Permit Application for 135 Greenmont Avenue, (Tax Map #47, Lot 126) Chapter 40B Development in Dracut, Massachusetts.

Document References:

1. Stormwater Report, Greenmont Commons, prepared by Cornerstone Land Associates, LLC., (CLA), dated May 18, 2023, last revised August 20, 2024.
2. Peer review responds Letter prepared by CLA, dated August 20, 2024

Plan References:

1. "Site Plan in the Town of Dracut, Middlesex County, Commonwealth of Massachusetts, Greenmont Commons, 135 Greenmont Avenue, Dracut, MA., prepared by Cornerstone Land Associates, LLC., (Cornerstone), dated May 18, 2023, last revised 08/20/2024. Plan set consists of 8 sheets:
 1. C-102 Layout & Utilities Plan
 2. C-103 Grading and Drainage Plan
 3. C-104 Erosion Control Plan
 4. C-105 Landscape & Lighting Plan
 5. C-106 Details Plan
 6. C-107 Details Plan
 7. C-108 Details Plan
 8. C-109 Details Plan

Based upon our review of the above information, GCG offers the following comments with respect to compliance with the current Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00) and associated Stormwater Handbook, the Dracut Zoning By-Law, Town of Dracut By-Laws - Chapter 24 Stormwater and Erosion Control Bylaw, Stormwater Management Rules and Regulations and general engineering standard practice.

GENERAL COMMENTS:

The site is located in the Residential R-1 Zoning District where Multi-Family Dwelling's are prohibited. Hence, this project is seeking a Comprehensive Permit under Chapter 40B development. The site is in Flood Zone 'X' (Area of Minimal Flood Hazard) as shown on the FIRM panel 25017C0141E, effective

date 6/4/2010. There is no NHESP Estimated and Priority Habitats of Rare Species and Wildlife in the project vicinity as shown on MassMapper (MassGIS) layers. There is a wetland resource area delineated within the southwesterly lot corner and appears to be a Bordering Vegetated Wetland (BVW). A Notice of Intent should be filed with the Dracut Conservation Commission and MassDEP. The wetland resource area delineation requires the Conservation Commission approval. This project as shown is under the jurisdiction of MGL Chapter 131, Section 40 – Massachusetts Wetland Protection Act and 310 CMR 10.00 – Wetland Protection and the associated Stormwater Management Standards under the Massachusetts Stormwater Handbook (MSH). The State of Massachusetts Codes and Regulations are not subject to Chapter 40B Comprehensive Permit waivers.

This project exceeded the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) threshold. A NPDES GCP Notice of Intent shall be filed 14 days prior to the start of construction with the associated Stormwater Pollution Prevention Plan (SWPPP) prepared.

The Comprehensive Permit Site Plan is based on preliminary site plan in nature. Development details should be developed and provided on the Construction Plan set. GCG's review comments are based on the Federal and State of Massachusetts requirements with waiver determination by the ZBA. GCG latest comments are shown in "**Black Bold**".

This 5th revision layout consists of two (2), nine-unit row buildings and four (4), two-unit (lower level accessible) buildings. (Previous layout was with two (2), twelve-unit buildings and two (2), two-unit buildings). The drainage design has been revised to utilize subsurface pipe detention system and detention basin/pond. Please see GCG's Review Summary below.

REVIEW SUMMARY:

Existing Conditions Plan (C-101)

1. Notes #5 stated that the Topography's vertical datum shown is the North American Vertical Datum of 1988 (NAVD88). Though the plan's contour elevation as shown appears to be based on an assumed elevation, which is acceptable for an individual site development. However, the revised grading plan (sheet C-103) did not show any proposed contours beyond the proposed retaining wall, which is blocking the off-site (west of Bridge Street) drainage runoff and potentially diverting the flow path to the abutting properties. GCG recommends converting the existing contours to NAVD88 datum and extending the contours to merge with available off-site topography to analysis the drainage patterns and development impacts. ***The plan has been converted to NAVD88, the existing contours as shown indicate the western off-site watershed runoff from Bridge Street to project site drains southward to #31 Blanche Street and into the Blanche Street catch basin system. Resolved.***
2. The Locus Plan does not represent the correct property and should be updated on sheets C-101, C-102, and C-103. ***Locus plan removed. Resolved.***

Layout and Utilities Plan (C-102)

3. The proposed twelve-unit row buildings are scaled 240 feet length and 39.5+/- feet tall, (scaled from Architectural Elevations plan, average height from finish ground level to the tip of roof line) and are set on top of approximately 7-feet of fill at the center of the site. Based on the massive retaining wall and building structures, GCG recommends providing an additional study of the site layout in three dimensions to assess the impacts of this development (see additional grading comments below). ***The revised Elevation Presentation Plans dated 04-29-2024 appear not to drawn to scale, based on the Typical Unit Building and Accessible Dwelling Unit Elevations plans dated 28 September 2023, prepared by Philippe Thibault Architect, LLC. (1st revision submittal). The multi-unit building should be approximately 9' higher (1/4 in proportion) than the accessible building in height, which did not seem to reflect on***

the eastern and western elevations plan. In comparison, the existing abutters 2-story building is much taller than the proposed 40 feet height three-story building. GCG recommends providing elevation plans with the buildings (existing abutters and proposed buildings) at the same scale. (Not addressed). This latest plan set has lowered the site by approximately a foot. However, the two proposed Water Quality Units (WQU) top of concrete is above the driveway finish grade. The proposed retaining wall enclosed wetland forebay has created an accessibility issue for maintenance. This wetland forebay should be cleaned once per year per MSH requirements. The sole maintenance access path would be through the 10 feet wide path along the eastern property line. The applicant should demonstrate a valid accessible path to the southeasterly lot corner and turnaround area without encroaching to the abutting properties.

4. The minimum front yard setback in R-1 Zoning district is 30 feet. The proposed two (2) accessible building structures are 18 feet from the Greenmont Avenue right-of-way. A waiver is required. Most of the dwellings along the south side of Greenmont Avenue meet the 30 feet front yard setback. ***Waiver with 18 feet Greenmont Avenue front yard setback requested. Board approval required. Waiver requested.***
5. There are 10 proposed visitor parking spaces that are common use/public use spaces per 521 CMR 5.00 - Definitions. An ADA/AAB compliance accessible (Van) parking space should be required. ***9 standard and 1 ADA accessible van parking spaces proposed, 1 visitor parking space per 2.6 units. The total number of proposed visitor parking spaces requires Board approval. Board approval required. Waiver requested.***
6. The applicant should clarify the finish material for the “concrete hatched” walkway/patio/landing blocks shown on the plan. Details Plan (Sheet C-107) show a Porous Paver Detail, with notes called out that the driveway surface shall be porous pavers). The applicant should clarify and specify where porous pavers shall be used on the plan. ***The Porous Paver rear patios should be called out on the Layout plan or specify the hatch description on the Legend. Porous Paver details should be provided. (The detail drawing has been removed in this revision of plan sheet C-107). As presented the proposed patio/walkway/landing and roof covered landing should be considered as impervious area. C-107 shows Concrete Sidewalk and Bituminous/Pavement Sidewalk details only. All patios and walkways were proposed to be impervious surface drainage treatment accordingly. Resolved.***
7. The proposed sidewalk finish material and curb type along the site frontage should be specified, (Details Plan C-107 shows a Concrete Sidewalk (with curb, vertical granite curb?). Town of Dracut’s Subdivision Rules and Regulations, (SRR), Section 7.9.2 – requires “All sidewalks shall be concrete cement and a minimum of five feet in width. The area between the curbing and sidewalk should be loamed and seeded. In more rural section of Dracut, the sidewalk material may be bituminous asphalt, as permitted by the DPW.” The plan called out vertical granite curbing at the driveway entrance curb returns with no indication of curbing along the new sidewalk. Sidewalk design shall meet ADA/AAB standards, like the MassDOT sidewalk through driveways details and equipped with wheelchair ramps. ***The Layout plan has specified concrete sidewalk with vertical granite curbing within the Right of Way and entrance drive. Resolved.***
8. SRR Section 7.8 – Driveway Aprons and Curb Cuts. The driveway apron should be placed with concrete when sidewalks are installed. The sidewalk is proposed within the Greenmont Avenue right-of-way and requires Dracut DPW approval. Concrete apron material should be called out on the plan. ***A transition granite curb at the westerly end of the proposed vertical granite curb should be provided. The easterly end of the concrete sidewalk wheelchair ramp should be equipped with a level landing with the warning panel toward Greenmont Avenue. Proposed work within the Right-of-Way is under the Dracut DPW’s jurisdiction. However, the permit plan should show design in compliance with the ADA/AAB requirements. A pair of wheelchair ramps are shown at the driveway entrance. The proposed sidewalk through driveway crossing is within the Greenmont Avenue right-of-***

way. An ADA/AAB compliant crossing will be required by the Dracut DPW through their Street Opening Permit. GCG recommends incorporating into the approval conditions.

9. The proposed driveway intersection's sight distance should be provided. The proposed driveway intersection's steep grade, tree filter box, plantings at the sight line setback should be considered in the intersection layout. **GCG concurs with the safety sight distance assessment as stated in the response letter. The finding should be shown on the plan as part of the certification. However, the applicant should verify the proposed red maple trees and site sign locations at the driveway intersection do not interfere with the driver's sight line exiting the site. No updated planting plan submitted. No landscape plan update provided. GCG recommends incorporating the wetland forebay and basin maintenance access path in the landscape design.**
10. The proposed sewer line is approximately 10 feet below finish grade and 5+/- feet from the face of the proposed retaining wall. GCG recommends providing a minimum 10 feet setback between the face of the retaining wall to the proposed center line of sewer pipe, to allow construction and safety equipment maneuvering and access. **Resolved.**
11. The proposed 6" diameter water service main is being proposed 5 feet from the face of the building stairs along the back side of the two larger buildings. GCG recommends increasing the separation between the water service main and stair structures to 10 feet minimum. (There is not enough room for the construction equipment's swing radius, same situation with the sewer line to the retaining wall separation). Flow tests for water supply and fire protection capacity should be performed to ensure there is sufficient capacity to support this project. The system should be reviewed and approved by the Water District. **The proposed water services remain too close to the accessible building (6') and the multi-unit building rear stairways (5'). GCG recommends providing 10 feet separation between the proposed 6" water services to any permanent structures to allow construction equipment maneuverability. Not addressed. GCG recommends incorporating the Flow Tests to satisfy Fire Department and Dracut Water Supply District/Water Department requirements as part of the approval conditions.**
12. The proposed water line at the southerly end of the building should be relocated further southward to provide 10 feet separation to the sewer services for units 14 and 15. **Resolved. The southern end of the proposed water line does not meet the minimum 10 feet setback to the newly proposed Units 13 and 14's subsurface roof drain chamber system. GCG recommends centering the water line next to Units 13 and 14 building corners to provide a minimum of 10 feet clearance from any structures.**
13. Show proposed buildings fire sprinkler system connection, an additional hydrant is most likely required at the southerly end of the buildings to provide fire service connection. **The existing nearby hydrant is approximately 380 feet from units 13 and 14. The water department or fire department may require an additional hydrant to be installed on-site. Not addressed. GCG recommends incorporating the fire protection system to satisfy Fire Department and Dracut Water Departments requirements as part of the approval conditions.**
14. Proposed sewer connection core invert at the existing sewer manhole on Greenmont Avenue should be specified. **Resolved. This latest plan has lowered the sewer connection core invert at the same elevation as the existing live sewer invert. Which would most likely interrupting the live sewer line during construction. The installation should comply with the Dracut DPW's sewer connection permit requirements.**
15. The proposed sewer main and services pipe sizes, pipe length and slope should be called out on the plan. Sewer service inverts at each building should be provided. The proposed finish floor elevations indicated stepped foundations for the two larger buildings. **Resolved. P-SMH#3 INVin and INVout elevations were transposed.**
16. The proposed tandem parking layout requires Board approval, as garage and tandem parking were not specified in the Zoning Section 3.10.00. However, tandem parking layout for row house building layouts is widely utilized in the community. There are 10 visitor parking spaces (reduced from 16 in the original plan set) proposed on site. The results in 1 visitor space per 2.8

dwelling units. A handicap accessible space should be provided in the visitor parking lot. GCG recommends providing additional visitor parking spaces to offset the tandem parking layout deficiency. **Handicap van parking space provided. The total number of visitor parking spaces proposed requires Board approval. Board approval required. Waiver requested.**

17. A zoning table would be helpful for the Board to determine the waivers requested. **The applicant stated that the list of waivers was included in the Comprehensive Permit Application package. The applicant should provide an updated waivers request (with regulation section and item details), Board decisions for each waiver should be individually listed on the Comprehensive Permit approval.**
18. The plan should show the available snow storage areas. The landscape islands between building units are proposed rain gardens/Bioretenion areas. MSH, Vol.2, Ch.2, Page 28, states that "Never store snow in bioretention areas." The layout as presented seems impossible to avoid snow removal encroaching the rain gardens. GCG recommends installing barriers to protect the rain gardens from snow storage. **The rain garden features have been removed and replaced with landscape islands. The plan has called out a snow storage area at the end of the visitor parking spaces. Additional snow storage could also be stored within the landscape islands between units. Resolved.**
19. The plan should specify the methods of solid waste/trash collection for the site. It appears to be each individual unit curb side pickup. The applicant shall specify and come to an agreement with the Town if this development will utilize a private trash pickup provider or Town trash pickup service. **Plan note #14 should call out curb side pickup in front of each unit, otherwise a dumpster pad would be required. Note #14 updated, resolved.**
20. The applicant shall verify that postal services proposed meet USPS requirements. No mailboxes are proposed. **Unless USPS agreed to deliver mail to individual units, a site mailbox would be required. A site mailbox would affect the number of parking spaces and/or adding an additional impervious surface. This could cause a substantial change in this layout. GCG recommends resolving the mailbox location during the Comprehensive Permit process. Not addressed. If a site mailbox is required, the number of visitor parking spaces would be reduced. Resolved.**
21. Proposed signs with the development's name, if any, should be shown on the plan. **The proposed project sign is at the same location of the proposed red maple tree at approximately 10' setback back from the Greenmont Avenue's edge of travel line. Which also aligns with the exiting vehicle driver's sight line. Sign height and details should be provided. The sign and tree location should be reviewed and situated with the safety sight distance requirements. Not addressed. Final sign and landscape design should meet the Building Department requirements and not to interfere with the safety sight distance.**
22. Details sheet C-107 shows a typical signs detail and called out 'See Site Plan for location of these signs', and a Stop Bar Stripe detail. Plan should show all proposed traffic signs and pavement stripping where applicable. **Resolved.**
23. There appears to be a guard rail proposed along the southern portion of the retaining wall with no description. Plan should identify the line type or label the guard rail. **Resolved.**
24. Proposed fence lines along the top of retaining wall should be identified on the plan. The fence type and height should be specified. The southern portion of the retaining wall appears to be enclosed by a guardrail only. However, due to the height of the retaining wall, this should be equipped with protection fences. **Resolved.**

Grading and Drainage Plan (C-103)

25. The proposed driveway entrance is too steep. The northwesterly intersection corner exceeds 7% slope when scaled. SRR Section 7.6.2.(8) requires maximum 1% slope for 25 feet from the street right-of-way. Furthermore, the driveway entrance with the proposed sidewalk should meet the ADA/AAB sidewalk through driveway's maximum 2% cross slope requirements. **Resolved.**

26. The proposed westerly retaining wall is about 10.5 feet in height, and the proposed 240 feet length row type buildings are 3-story's with a physical height of 39.5+/- feet height (actual roof height should be adjusted with the stepped foundation, GCG is expecting some roof line break with the stepped foundations). The combined retaining wall and building structure will exceed 50 feet in height for 240 feet length at the westerly portion of the site and approximately 46.5 feet height at the easterly portion of the development. GCG recommends having the project Architect provide elevations renderings to demonstrate the visual impacts from the abutting neighbors. Since this is a massive structure (50' x 240' ~ 12,000 square feet) located closely next to the westerly property line (11+/- to 24+/- feet), the Architect should provide impact assessments to the sunlight, wind flow and any other natural impacts affected by this development. **GCG recommends providing elevation plans with the existing abutters buildings and proposed development in same scale. The lowered site with 40+/- feet building remains 48+/- feet higher than the adjacent lots. Shade, sound, and wind impacts to the abutting property analysis should be provided. Not addressed. This latest plan has proposed to lower the finish grade by approximately a foot, which is lower than the two WQU concrete structures concrete tanks and should be addressed. The retaining wall proposed outside the constructed wetland sediment forebay, and wetland basin should be designed to allow BMP's maintenance access without encroaching the abutting properties.**
27. The existing site collects relatively large (3 to 4 acres) off-site surface runoff from west of Bridge Street and flows through the site to the wetland area at the southwesterly lot corner. The proposed retaining wall would block the flow path and divert the drainage flow path southward to the downstream abutter. GCG recommends providing grading outside the retaining wall and within the property to direct the off-site runoff to the original flow pattern. **Based on the additional off-site topography, GCG concurs with the applicant's assessment of the off-site runoff drains southward along the eastern site property line to the Blanche Street catch basin system. GCG recommends adding proposed contour 161 at the east side of the retaining wall and grade the runoff to flow along the retaining wall to the proposed sediment basin. Not addressed. Water puddle is expected at the bottom of the wall, based on the existing contour 161 as shown, and could cause icy conditions in the winter months. However, there is no regulation against water puddle in the open area. The applicant should specify the retaining wall's drain tile (as shown on the Shea Wall System detail drawing) day light locations and should cause any impacts to the abutters.**
28. Tree Box Filter (TBF) #1's curb/gutter inlet is located at a steep slope and subject to by-pass. The driveway grade is too steep to meet the ADA/AAB sidewalk through driveway cross slope requirements and should be addressed. **Tree box filter has been removed. Resolved.**
29. The 102 contours near the southeasterly and southwesterly retaining wall corners as shown pitching the runoff flows to the TBF #4 and TBF #3, respectively. This does not match the post-development watershed's intent. The southern part of these lawn areas (watershed 13S) was not modeled in the drainage calculations to drain through detention pond #1. **Tree box filter removed. Resolved.**
30. MSH, Vol. 2, Ch. 2, Pg. 23 - Rain gardens/bioretention areas, which requires adequate pretreatment to receive 90% TSS removal credit. Pretreatment should be provided to allow scheduled sediment removal prior to flow entering the bioretention cell. As presented, the rain gardens/bioretention areas are acting as a pretreatment BMP. Sediment will enter the bioretention cells directly and fill up the mulch and engineered soil mix layer and require replacement prematurely. In addition, the rain gardens are in the snow plowing/removal path. MSH stated "Never store snow in bioretention area". Rain gardens should be equipped with fences or similar devices to prevent snow being plowed into the rain gardens and cause runoff by-pass. The rain garden abuts the driveway and is a foot lower in grade. The rain garden shall be protected by guard rail or similar devices to prevent vehicle from falling into the rain garden. **Tree box filter and rain garden BMPs were removed. Resolved.**

31. The proposed subsurface infiltration chambers system is classified as Shallow UIC (Underground Injection Control) Class V Injection Well, which should comply with the MassDEP Energy and Environmental Affairs (EEA) Standard Design Requirements for Shallow UIC Class V Injection Wells. The proposed Cultec Recharger R-330XL chamber system (Class V well) requires a 10 feet minimum set back to the rain gardens (open, surface drain). The proposed separation between rain gardens is 24 feet (driveway width), the proposed 25 feet wide chambers infiltration system encroached into the rain gardens. *The subsurface infiltration system has been replaced with a pipe detention system due to the poor draining soil conditions. The proposed detention system consists of 24" HDPE pipe (plan should call out/specify perforated pipe to allow water flow to crushed stone void) embedded in crushed stone bed. However, 2.39' out of the 3' height (elevations 156.0 to 158.0) detention system is below the ESHGW (158.39, TP#6). During the high seasonal groundwater months, the system should be filled with groundwater and deemed useless. GCG recommends raising the bottom of the detention system/crushed stone to one (1) foot minimum above the ESHGW. There were some major discrepancies with the proposed pipe detention system as shown on plan and the HydroCAD calculations, see additional comments under the Stormwater Report Review. The proposed 300 feet length x 6 rows of 30" pipe detention system (approximately 8,836 cubic feet volume) is partially submerged below the ESHGW. Based on the 7 soil test pits performed on site with ESHGW depth between 2.5' to 3.2' below surface. GCG recommends replacing the ADS pipes with either PVC pipe or ductile iron gasketed pipe. (The system should be tested to withhold up to 150 PSI pressure as a watertight system). System buoyancy calculations should be provided. Roof recharge system - 6 of the 7 test pits consisted of very fine sand like Test Pits 1 & 2, which consist of 39.5% and 39.0% high silt and clay content (particle passed the #200 sieve), respectively, per GeoTesting laboratory Particle Size Analysis reports. The soil pits were classified as sandy clay. Permeability tests were performed with reported 0.00031 cm/sec (0.0439in/hr) and 0.000078 cm/sec (0.1106 in/hr), respectively. (MassDEP requires a 50% reduction of the in-situ rate using "Dynamic Field" method, MSH Vol.3, Ch.1, Pg.23). Test Pit #3 test results show lower silt/clay content (21.3%) and a higher permeability rate, 0.00076 cm/sec (1.077 in/hr). However, Test Pit #3 was located within the 50 feet wetland (BVW) buffer and did not meet the infiltration system's minimum 50' setback requirements. Therefore, the two reduced (50%) exfiltration rates (TP-1 - 0.22 in/hr and TP-2 - 0.055 in/hr) should be utilized for the on-site infiltration systems design. Standard engineering practice would utilize the lowest infiltration rate as a conservative/safety approach. In addition, the applicant should analyze the roof recharge system releasing roof runoff next to (3 feet +/-) the pipe detention system over poorly drained soil with proximity to the ESHGW in the buoyancy calculations. Furthermore, the proposed roof drain recharge chambers did not meet the minimum 25 feet setback to other subsurface discharge structures, per MassDEP Energy and Environmental Affairs (EEA), Standard Design Requirements for Shallow UIC Class V Injection Wells (Pg. 2 of 4, footnote #5). The pipe detention system outlet pipe is shown ending at the edge of pavement, which was supposed to discharge to the wet forebay. Drainpipe size and slope should be labeled on the plan. The Technical Note TN5.07 mentioned in the response letter was not included in the latest drainage report. GCG did find the TN5.07 Post Installation Testing for HDPE Pipe through the ADS pipe website dated May 2022. The document stated that "Allowable Leakage – The allowable leakage rate for HDPE is 200 gallons/in-dia/mi-pipe/day for both infiltration and exfiltration when tested in accordance with ASTM F2487" and the Conclusion stated that "HDPE pipes is intended for gravity flow drainage applications and may be tested for deflection and joint tightness as discussed in this technical document. It is important to note that the testing procedures are no different than for other gravity flow drainage products currently being used in the market." Based on the ADS pipe's allowable leakage standards, the proposed 1,800 feet (0.34 miles) 30" diameter pipe would allow 2,040 gallons of water infiltration*

and exfiltration through the system per day, when it is fully submerged. This proposed pipe system invert is approximately 1.5 feet below the ESHGW. GCG estimated over a 1,100 gallon of groundwater infiltration entering the storage per day during high groundwater conditions. This water would continuously discharge downstream through the outlet control structure during wet months. In comparison, a standard sewer pipe system leakage allowance is not to exceed 100 gallons/in-dia/mi-pipe/day for both infiltration and exfiltration with a positive head of 2 feet, approximately half of the HPDE pipe standard. Therefore, the HDPE pipes are not suitable for a watertight drainage storage system use. The HDPE pipe system should either installed above the ESHGW or to be watertight. The TN 5.05 Pipe Flotation Technical Note Table 2 dated May 2022, GCG downloaded from the ADS pipe website, stated that the 30" diameter HDPE pipe would require 22" minimum cover to prevent flotation of the pipe. The applicant should show the buoyancy calculations and certify the proposed pipe detention system meets the requirements.

32. Drainpipes from PDMH #2 to PDMH #5, RG#6 and RG#12 to PDMH #4 are back pitched. **GCG recommends connecting a single outlet pipe from the Pipe Detention System to the OCS (outlet control structure) and installing a baffle wall with the specified cored outlet orifices inside the OCS to control the outflow rates, as modeled in the HydroCAD calculations. Roof drain chambers should be equipped with cleanout/inspection port for inspection and maintenance. Calculations utilized 4" outlet pipe connecting the roof chambers to the pipe detention system, plan should show the 4" pipe connection between roof recharge chambers and pipe detention system. Please provide connection details. The roof drain connections have been eliminated. Roofs runoff will be discharged onto the pavement or lawn area and overland flow to the catch basins. The applicant should verify the catch basins #3 and #4 grate flow capacity and considering installing double grate inlet at these locations.**
33. The plan should show buildings front roof drain connection to subsurface chamber infiltration system. **Roof drain detail should be provided to collect and discharge the front and rear building roofs runoff to the pipe detention system. Additional roof drainpipes and leaders should be provided for the two 9-unit buildings. The two side yards are almost level (proposed contours show less than 0.5% slope along the longitudinal lawn surface. The proposed retaining wall should be equipped with a cap to channel the surface runoff to catch basins. High point/ridge spot grades should be provided between buildings to match the sub-catchment divide. Retaining wall capstone should be shown on all wall section views to avoid confusion during construction. The wall capstone provides the function to trap surface runoff and direct the flow to the designated drainage inlet. The architectural plan shows a roof ridge along the length of the two 9 units buildings. Plan needs to show how to connect the rear roof drain to the roof chambers system in the front of the building. The roofs runoff has been revised to drain onto the lawn surface, due to the relatively flat lawn slope (0.5% slope). Water ponding over the lawn area would be expected with the poorly draining HSG 'D' soil and shallow groundwater conditions. The retaining wall drain tile day-light locations should be specified.**
34. Approximately half of the subsurface infiltration system is located on top of Hydrologic Soil Group 'D' soil, which is not suitable for infiltration per MSH. Based on the soil test log TP#1 and TP#4, the northern portion of the chamber system does not meet the 2 feet separation between the bottom of system stone to ESHGW requirements. **Based on the soil test pits performed onsite, GCG concurs that the soil material is not suitable for infiltration function. However, GCG does not agree with the applicant's Stormwater Report, Section 4.3: Recharge volume requirements statement, which stated that, "Due to the existing soil types and analysis on site, it has been determined that recharge is not required per the Massachusetts Stormwater Handbook regulations." Based on the MSH Vol. 1, Ch.1, Pg. 6 Standard 3, which states that "For sites comprised solely of C and D soils and bedrock at the land surface, proponents are required to infiltration the required recharge volume**

only to the maximum extent practicable.” The handbook further states that: “For the purposes of Standard 3, “to the maximum extent practicable (MEP)” means that: (1) The applicant has made all reasonable efforts to meet the Standard; (2) The applicant has made a complete evaluation of all possible applicable infiltration measures, including environmentally sensitive site design that minimizes land disturbance and impervious surfaces, low impact development techniques, and structural stormwater best management practices; and (3) If the post-development recharge does not at least approximate the annual recharge from pre-development conditions, the applicant has demonstrated that s/he is implementing the highest practicable method for infiltrating stormwater.” Since all 7 soil test pits were relatively consistent with shallow seasonal high groundwater and silty sand material, infiltration practices are not feasible, (maximum extent practicable (MEP) requirement #1). Hence, the applicant should seek reduction of the impervious area as required under the MEP requirement #2. Furthermore, the site development without infiltration would not be able to control the post-development increased runoff volume and potentially cause downstream flooding. **Additional clarifications are required, see Stormwater Report Comments below.** GCG has found some discrepancies in the off-site drainage calculations, which should be addressed, see Stormwater Report comments below.

35. The drainage chart stated Cultec Chamber System with 2 - 6” header outlet at elevation 100.00 to OCS#1, but HydroCAD calculations used an additional 2” vertical orifice outlet at elevation 98.00. The discrepancy is significant and must be addressed. **The latest drainage chart called for a 4” and a 12” outlets from the ADS Pipe Retention System. However, the HydroCAD report was based on a 4”, a 6”, and a 12” orifices outlets. There were also discrepancies with the bottom of stone elevation, the plan called for stone base at 156.0, but calculations used stone bed invert at 156.5, both elevations were below the ESHGW at 158.39 (TP#6). The lowest outlet pipe/orifice (4” diameter) invert elevation was set at 157.00, where the stone void storage volume below the outlet pipe invert would be filled with groundwater and/or runoff. Therefore, the storage volumes are invalid. The pipe detention system should be raised to a minimum of a foot above the ESHGW, (with no exfiltration due to the HSG ‘D’ silty soil, stormwater storage volume below the ESHGW is not acceptable). Furthermore, the proposed pipe detention system does not match the pipe length used in the HydroCAD report. See additional comments under Stormwater Report. The proposed pipe detention system (without stone bed) is partially submerged below ESHGW, the system must be watertight to function, see pressure testing requirements stated in comment #31 above. See comment #31 above. The HDPE pipe system is not suitable for watertight drainage storage system submerged partially in ESHGW. Provide buoyancy calculations with professional engineer certification.**
36. The proposed detention basin Pond #1 earth berm is constructed in fill, not recommended. GCG recommends utilizing lowering the detention basin with impervious liner or utilizing a wet basin or construction wetland to provide the detention storage. If the applicant insisted to construct the earth berm in fill, the earth berm should be widened with a properly designed impervious core, the 4” or 6” outlet pipe (Drainage Chart called for 4” Low Flow Drain, plan called for 6” Pipe Outlet, need clarification.) should be constructed with an anti-seep collar. The 4” or 6” outlet pipe should be included in the drainage calculations. **The outlet pond and the sediment basin/forebay bottoms are below ESHGW. Outlet Pond #1 bottom elevation at 154.0 is below the ESHGW at 154.47 (TP#3); the entire sediment basin, bottom elevation at 156.0 and spillway weir invert at 156.50 (per calculations) are both below the ESHGW at 157.34 (TP#2). The applicant should clarify the intension and function of the sediment basin. The plan should call out the basin outlet weir invert elevation, (156.5 was used in the calculations). The sediment basin is below ESHGW and does not provide any stormwater storage volume. If the sediment basin is intended to collect sedimentation, it should be designed and sized as a wetland forebay according to the MSH Table CSW.1 (Constructed Stormwater Wetland), Vol. 2, Ch. 2, Pg. 43, requirements. Pond #1 has a**

proposed outlet broad crested weir invert at 155.50, the bottom of the basin is below ESHGW and with little to no exfiltration available, once the basin filled with surface runoff, it would not be able to drawdown within 72 hours for back-to-back or multiple storm events. Therefore, storage volume should not be accounted below the weir invert at 155.50. The stormwater storage within the forebay and construction wetland basin should not be credited. There is no other outlet other than the spillway weir, there would be no drawdown of the basin water other than evaporation, which is not reliable for the storage volume available for the next storm event. See additional comments in the stormwater report below. Maintenance access path should be provided. The proposed retaining wall outside the wet sediment forebay has blocked the maintenance access. This now requires passing through 100 feet of the constructed wetland to provide maintenance and should be addressed. See additional Stormwater Report comments below.

37. The applicant should clarify the detention basin bottom finish material, bottom should be loamed (loam and sand mixed soil) and seeded with water tolerant wet seed mix. *The outlet pond basin bottom is proposed below the ESHGW, the basin should be raised to a minimum of one foot above the ESHGW. The basin could also be designed as a Constructed Stormwater Wetland according to the MSH Table CSW.1 requirements. The detention basin has been replaced by an extended detention constructed stormwater wetland with forebay pretreatment. However, GCG does not agree with the proposed stormwater storage volume. See additional comments in the stormwater report below. See Stormwater Report comments below.*
38. The retaining wall at the peak is approximately 10.5' above existing ground and the wall is approximately 18 feet from the property line. *The top of retaining walls should be raised with a cap to contain and channel the side yard runoff toward the catch basins. As presented the side yard runoff would spill over the retaining wall and onto the abutter's property and bypass the detention system. The northwesterly corner of the retaining wall should be pulled back to allow mowers to mow along the property line without encroaching onto the adjacent property. The top capstone was added to the retaining wall details on plan sheet C-108. However, multiple wall section details (retaining wall, guard rail, and fence section details) were still showing finish grade flush with top of stonewall. GCG recommends to specify top of wall and bottom of wall spot grades on the grading plan, so that it will clarify the proposed wall height, and revise all details to show top of retaining wall/capstone above the adjacent finish grade. Resolved.*

Erosion Control Plan (C-104)

39. The proposed hay-bale erosion control along the eastern property line would block the off-site surface runoff and divert it most likely onto #31 Blanche Street abutter. GCG recommends analyzing the topography around the property boundary and redirecting the runoff away from the abutters. *GCG concurs with the updated topography that the existing off-site runoff drains southward to Blanche Street. GCG recommends installing additional erosion control along the Greenmont Avenue frontage. A silt sack should be installed at the Greenmont Avenue downstream catch basin during the sidewalk construction. Not addressed. Resolved.*

Landscape and Lighting Plan (C-105)

40. Additional lighting specifications should be provided. The applicant should clarify the discrepancy shown on the Site Lighting Fixture. The detail shows the total fixture height to be 18 feet above finish grade. But the leader stated LED Light Engine at 20 feet height. *The proposed site lighting fixture has been updated to 18 feet above the finish grade. There is no restriction for outdoor lighting fixtures height in the Singal Family Residential R-1 Zoning District. For reference, the Dracut Zoning By Laws Section 4.12.30. A.7. requires*

outdoor lighting fixtures not higher than 15 feet for multifamily development special permit. The proposed lighting fixture and pole meets the 15 feet high requirements. However, the proposed light pole fixture is being proposed on top of a concrete footing 3 feet above the finish grade. The proposed lighting fixture height has been reduced to 15' above finish grade. The applicant should clarify how the lowered lighting fixtures has no effects on the photometric/luminaire boundaries. No updated landscape plan provided.

41. There are two lighting fixtures proposed in front of Units 7 and 8 and in front of Units 21 and 22, without the Candle Watt boundaries shown. Three lights are proposed inside the rain gardens where soil media and planting require replacement as part of the maintenance schedule, especially without pretreatments. There are no luminaires provided in front of Unit 3 and 26's garages. **Resolved, subject to item #40 approval. See comment #40 above. Resolved.**
42. Landscape screening should be provided along the property lines outside of the retaining wall to soften the visual impacts. Additional grading is expected along the southeast portion of the site to address the off-site drainage path. Tree and vegetation removed due to the grading should be replaced with landscape features to provide screening. **No additional landscape screening proposed outside the retaining walls, subject to Board approval. The proposed red maple tree at the northwest site entrance intersection is at the same location as the site sign. The trees and site sign appear to be interfering with the exiting vehicle's driver sight line. Not addressed. No updated landscape plan provided.**

Details Plan (C-106)

43. Retaining wall detail should show fence on top of the wall. **The retaining wall details drawing has been moved to Plan Sheet C-108. The wall should be equipped with a wall cap set above the side yard lawn finish grade. The side yard areas consist of flat longitudinal slope at less than 0.5%. The wall cap is necessary to contain the surface runoff and channel it to flow toward the catch basin system. See comment #38 above. Resolved.**

Details Plan (C-107)

44. Typical signs detail shows Do Not Enter (S4) and One Way (S5) signs, which appears not applicable on this site plan. The applicant should call out the Stop (S3) sign and Stop Bar Strip on the Site Plan. The Handicap and Handicap Van signs should be installed in front of a handicap parking space, which should be added in the visitor parking area. All traffic signs should comply with the latest MUTCD standards. Stop sign should meet R1-1 sign standard, Handicap Accessible Parking sign and Van Accessible should meet R7-8 and R7-8P standards, respectively. **Resolved.**
45. Porous Pavers Detail, Driveway Notes, note #1 calls out "Driveway surface shall be porous interlocking concrete 'Aqua-Bric' pavers by Ideal Concrete Block Co., Inc. All materials and installation shall be as specified by the manufacturer. The applicant should call out porous paver driveways on the site plan. **The response letter item #6 stated that "The Porous Pavement will be utilized in the rear patio area." Therefore, the Porous Pavement details should be provided, which have been removed from this revision. Since this site consists of high silt/clay content soil base, HSG 'D' soil, the porous paver may not be feasible as the runoff is unable to drawdown with the 72 hours period. GCG recommends treating the proposed walkway, landing, and patio surface as impervious surface. Resolved.**
46. Guard rail dimensions should comply with MassDOT standards. The top of rail should be 2'-7" above finish grade, see MassDOT Construction Standard Details drawing 400.1.6. **The 2'-7" height should be at the top of the rail, not the post, as shown on the MassDOT drawing 400.1.6. Timber guardrail does not meet the required Federal and/or State safety standards and is not accepted by MassDOT. However, steel-backed timber guardrail is permissible by the U.S. Department of Transportation Federal Highway Administration (FHWA). GCG recommends calling out the guardrail to meet the MassDOT requirements.**

Since this is a Comprehensive Permit plan based on preliminary nature, the guardrail details should be addressed in the building permit/construction plan set. The plan should specify the guardrail to meet MassDOT standards. The southern end of the site driveway and visitor parking space is on top of an eight feet +/- high retaining wall and safety protection would be critical. The applicant has claimed the Guard Rail is a residential guardrail sufficient for safety within the parking area. GCG recommends adding the statement on the Guardrail Detail drawing.

Details Plan (C-108 and C-109)

47. Provide "Terraflume curb inlet detail sheet" as referenced on the Tree Box Filter detail Section B-B. *Tree Box Filter (TBF) BMP removed. Resolved.*
48. The bottom of Rain Garden should have a minimum of two feet separation to the ESHGW or be lined with impervious barriers to avoid infiltration. (Rain Gardens #1, #2, #7, and #8 are most likely affected by the ESHGW). *Rain Garden design removed. Resolved.*
49. Pretreatment is required for Rain Garden/Bioretention Area BMP's. Pretreatment should be provided to allow sediment removal maintenance. *Rain Garden design removed. Resolved.*
50. Rain gardens should be set back from the Cultec infiltration system, as presented the rain gardens overlapped with the Cultec chambers system. (Rain gardens are separated by the 24' wide driveway, but the proposed Cultec system is 25' wide.) *Rain Garden design removed. Resolved.*
51. Rain gardens abuts driveway with an abrupt grade drop, GCG recommends providing a mild slope setback to resolve the grade drop and avoid snow being plowed into the rain gardens. *Rain Garden design removed. Resolved.*
52. Provide an Outlet Control Structure detail drawing. The structure should be designed to fit two (2) – 6" diameter orifice outlets (per plan C-103) and/or additional 2" outlet orifice, which is modeled in the HydroCAD calculations but not mentioned on the plan. *The HydroCAD calculations called for three outlet pipes (4", 6", and 12") from the pipe detention system to the Outlet Control Structure (OCS). The calculations have also modeled the outlet pipes as vertical orifices. (Pipe outlet should be modeled as culvert, which has a different flow entrance coefficient). GCG recommends installing the outlet control orifices inside the OCS with a baffle wall and cored openings. The Outlet Control Structure detail's 12" core invert is a foot lower than the invert used on the calculations. Vortechs model should be specified to the associated WQU unit and provide support sizing calculations. The two WQU units top of concrete is 4.67' above the pipe inverts, and above the proposed pavement finish grade and should be addressed.*

Emergency Access Plan (C-110)

53. This plan shows the Fire Truck access path through the main driveway and access to the front of (one side) of the building only. However, the proposed two, 12-unit buildings are 240 feet long and up to 50 feet above the property boundary. Access to the rear side of the buildings is limited and should be reviewed and approved by the Fire Department. *Subject to Fire Department approval.*

Stormwater Report

The stormwater report does not meet the MassDEP MSH requirements as listed below:

1. The site soil data as presented (NRCS Web Soil Survey, Site Soil Particle Size Analysis, and Soil Permeability Testing) did not prove the site soil suitable for the proposed infiltration facilities. The NRCS soil map shows the westerly half of the site consists of Hydrologic Soil Group (HSG) "D" soil and the easterly half of the site consists of HSG "C/D" soil. The soil samples TP#1 and TP#2 (2 of the 3 samples) tested approximately 39.5% and 39% of silt and

clay contents, respectively and not suitable for an infiltration system. The On-Site Soils Evaluation Report from the original Stormwater Report dated May 18, 2023, also estimated the seasonal high groundwater at 24" below the surface for all 3 test pits (DH301, DH302, and DH303). **The applicant should provide the location of the original soil test pits DH301, DH302, and DH303 for reference.** This revised Stormwater Report, (revised November 29, 2023), page 21 of 326 shows deep hole soil test TP#1, TP#2, TP#3, and TP#4 and the Particle Size Analysis for and Permeability of Granular Soils (Constant Head) reports prepared by GeoTesting Express dated September 9/27/22, for TP#1, TP#2, and TP#3. The northerly end of proposed Cultec chamber infiltration system is near TP#1, where deep hole test shown ESHGW at 97.73, the proposed bottom of system at elevation 96.5 does not meet the 2 feet separation from the bottom of system to ESHGW. TP#1's Particle Size Analysis report also showed 40% finer passage of #200 Sieve (Silty clay material), not suitable for infiltration. The southerly end of the Cultec system is at TP#4, but TP#4 was not included in the laboratory analysis. The TP#4 deep hole test showed ESHGW at 94.94, which does not meet the 2 feet separation to ESHGW requirements. Permeability tests for TP#1, TP#2, and TP#3, showed exfiltration rates of 0.44 in/hr, 0.22 in/hr, and 1.08 in/hr, for the test pits, respectively. MSH recommends performing multiple test pits per system for "Dynamic Field" method and must use the lowest of the values recorded for sizing the stormwater recharge BMP, and not an average. (MSH, Vol.3, Ch.1, Pg.12). Furthermore, for "Dynamic Field" method, should use 50% of the in-situ saturated hydraulic conductivity value. (MSH, Vol.3, Ch.1, Pg.25). Based on the lowest permeability rate of 0.11 in/hr (TP#2) with 50% reduction at 0.055 in/hr. The system should not be used as an infiltration BMP. GCG considers the soil tests to be too far apart and inconclusive. Additional tests should be performed within the proposed Cultec system location. The applicant shall perform the minimum number of test pits as required by MSH per system. MSH also states that "Infiltration system must be installed in soils capable of absorbing the recharge volume (i.e. not D soils). (MSH, Vol.1, Ch. 1, Pg.7). All infiltration systems must meet the minimum 2 feet separation from the bottom of the system to ESHGW requirements. The permeability rates are meaningless below the ESHGW. **GCG concurs with the site soil conditions that infiltration is most likely not feasible on this site. The applicant should process with the MSH the maximum extent practicable (MEP), item 2 to evaluate of all possible applicable infiltration measures, including environmentally sensitive site design that minimizes land disturbance and impervious surfaces, low impact development techniques, and structural stormwater best management practices. The MSH's intent is to reduce the impervious area to minimize lost groundwater recharge. The proposed roof recharge chambers infiltration rate should be based on the lowest permeability rate of the three tests. Test pit #3 was too close to the BVW wetland and the permeability rate should be ignored. Test pit #2 has an exfiltration rate of HSG 'C' soil, since the site was agreed to consist of HSD 'D' soil, so as used in the HydroCAD calculation's CN values. Therefore, TP-2's permeability rate should be utilized in the calculations. Furthermore, MSH also requires using the recharge system bottom as maximum infiltration surface area. "Do not use sidewalks." Also, a 50% reduction for the in-situ permeability rate is required (Vol. 3, Ch. 1, Pg. 23. Items d and f). Infiltration system removed. Resolved.**

2. System drawdown time calculations should be provided. Based on the exfiltration rate use in the HydroCAD calculations, the system would not meet the maximum 72 hours drawdown requirements. **Runoff storage volume below outlet orifice or weir invert elevation would not drain with no infiltration. Hence, stormwater storage volume below outlet invert and ESHGW should be considered invalid. Based on the TP-2 permeability rate (50% of 0.1106 in/hr = 0.055 in/hr), the proposed recharge system would not be able to drawdown within 72 hours, Vol. 3, Ch. 1, Pg. 23. Item i. MSH does not recommend infiltration system proposed within HSG 'D' soil. Minimum infiltration rate should be 0.17 inches per hour. (MSH Vol. 1, Ch. 1, Pg. 8). Infiltration system removed. Resolved.**
3. Since the system does not have the 4 feet separation between the bottom of system to the ESHGW. A water mounting analysis should be provided. (MSH, Vol.3, Ch. 1, Pg.28). **The**

proposed pipe detention system should be raised to a minimum of one-foot above ESHGW, with no infiltration due to the HSG 'D' soil. The pipe detention system should consist of rigid material (PVC or Ductile Iron) with gasket joints and the system should be tested to withstand a minimum of 150 psi pressure to be considered watertight. Roof infiltration system over HSG 'D' soil is not recommended. Furthermore, the proposed systems do not meet the minimum 25 feet separation. The systems do not have the 4 feet separation to the ESHGW. Water Mounding calculations should be provided. Infiltration system removed. Resolved.

4. Sub-catchments (17S, 18S, 20S, 25S, 26S, 27S, 42S, 43S, 45S, 48S, 50S, and 52S) runoff flow to rain gardens did not account for the impervious roof and walkway in front of each unit. This should be modeled as an impervious surface with 98 CN value. *The post-development watershed plan should be updated, the watershed plan no longer matching the sub-catchment areas label and square footage. A revised post-development watershed plan should be submitted for review. GCG was unable to verify the sub-catchments watershed area without an updated watershed plan. Sub-catchment watershed maps should be clarified. The pre-development watershed map should identify the HSG boundaries. The pre-development calculations consisted of HSG 'D' for the entire site in the first two stormwater reports. The report from 4-19-2024 and the latest calculations show a 2,107 square feet HSG 'C' grass surface. However, the post-development calculations were based on HSG 'D' for the entire site. The latest pre-development HydroCAD calculations added time of concentration (Tc) in the component, which is acceptable as general engineering practices. The pre-development flow path should be shown on the plan. However, the Sub-catchment 2S's 12,242 square feet of Woods, Good, HSG D (CN=77), was revised to Woods, Poor, HSG D (CN=83) was questionable. There is no indication of poor woods coverage on site per aerial images. In addition, the Dracut Stormwater Management Rules and Regulations, Section 7G.(7) stated 'For purpose of computing runoff, all pervious lands in the site are assumed prior to Development to be in "good hydrologic condition" regardless of the conditions existing at the time of computation'. Even though the weight average CN numbers may not have any significant changes on the computation in this case, GCG recommends following the rules and regulations requirements. See HydroCAD report comments below.*
5. Rain garden's stormwater storage volume should not include the voids within the engineered soil mix media and stone layers, which would be displaced by the sediment and compost material breakdown over time. Only the ponding volume on top of the mulch layer should be used for storage. *Rain Garden design removed. Resolved.*
6. Cultec Basin is modeled with a 2" vertical orifice /gate outlet at elevation 98.00. Only the two (2) 6" diameter (vertical orifice outlet) header to OSC#1 are shown on the plan set. *Cultec Basin design removed. Resolved.*
7. Outlet Det. Pond did not include the 4" low flow drain (applicant to clarify the size of the outlet pipe, plan drainage chart called 4" pipe, but plan label specified 6" pipe) in the calculations. *The proposed Sediment Basin is below ESHGW, storage volume credit is invalid. Outlet Pond #1 bottom is below ESHGW, hence, no infiltration credit. The storage volume below the outlet weir invert without infiltration should not be counted, as it would not meet the 72-hour drawdown requirements. The HydroCAD calculations should ignore the stormwater storage volume below the spillway for the wet forebay and constructed wetland, since both sumps do not have any drawdown capacity. (The bottom of constructed wetland and wet forebay are designed to set below ESHGW). The wetland basin outlet pipe invert at 155.00 is below the existing wetland boundary grade (above 155 contour). The wet basin is within the 25-feet no disturbance buffer, which requires Conservation Commission approval. Furthermore, no stormwater storage credit should be taken below the board crest weir elevation 155.50.*
8. The southern portion of Sub-catchment 13S drains to the tree box filters TBF#3 & TBF#4 per grading plan. *The retaining wall should be equipped with a cap, set higher than the lawn*

finish, to retain the side yard runoff and channel the flow to the catch basins and pipe detention system. The applicant should clarify the reduce impervious area in this set of post-development calculations, since there were no changes to the proposed site layout based on the post-development watershed (Prop-WS) plan. The width of the hot mix asphalt berm and curbing base, walkway, landing (including building front entrance landings covered by roof overhang), patio surface should be counted as impervious area and modeled as such in the HydroCAD sub-catchments 1S, 3S, 4S, 5S, 7S, and 8S. See HydroCAD report comments below.

9. Treatment BMP's – rain garden stated TSS removal credit – 90% if pretreatment provided. However, no pretreatment was provided. The calculations also used exfiltration rate (K) to calculate drawdown time. (MSH, Vol.2, Ch. 2, Pg.26) stated that, "When the bioretention area is designed to exfiltration, the design must ensure vertical separation of a least 2 feet from the seasonal high groundwater table to the bottom of the bioretention cell." The northern rain gardens do not meet the 2 feet separation to ESHGW requirements. In addition, the proposed underdrain pipe will release the filter water to the Cultec System. Only water stored below the pipe invert will be qualified for infiltration. *Additional rating approval documents should be submitted for the ADS Barracuda Hydrodynamic Separator. GCG was unable to find any MassDEP approved documents for the Barracuda unit. Unit sizing calculations should be provided. Based on the Barracuda installation instructions. GCG recommends utilizing the factory pre-installed Barracuda unit only to ensure proper installation and workmanship. The sizing calculations for the two Vortechs units should be provided. The Vortechs model should be referenced on the plan. The two Vortechs units are different in sizes and should be designated to the specific treatment chain. Approved TSS removal rates should be provided, other than the manufacturer's own claim. The top of the two WQU units are above the pavement finish grade and should be addressed.*
10. Provide detention Pond emergency spillway sizing calculations, at brimful conditions. *Spillway sizing calculations with brimfull conditions should be provided. The calculations are necessary to ensure the emergency overflow would contain within the erosion protected armor channel and would not overtop and washout the earth berm. Construction Wetland and wet forebay surface area should be modeled as water surface (CN=98) in sub-catchments 5S and 36S. Emergency spillway sizing calculations should be provided, with brimful conditions. The spillway shall be sized to avoid any overtopping through the top of berm.*
11. Operation and Maintenance (O&M) plan (during construction period and long-term) should be included in the stormwater report. O&M plan should identify the responsible party of the O&M plan, with estimated annual operation budget and sample O&M log. *A new O&M plan for the revised system should be provided. A new O&M plan should be updated for the revised system. No new O&M plan provided.*
12. *The HydroCAD ADS Pipe Detention Basin calculations were based on six (6) rows of 240' - 24" diameter round pipe storage embedded within a 22.00'W x 203.00'L x 3.00'H stone bed. The calculations were based on the bottom of stone at elevation 156.50, with the 4" outlet orifice at elevation 157.00. Since the system does not provide exfiltration, the storage below the 4" outlet would be filled with water and not available for any future storm. In addition, most of the system is below the ESHGW. The revised pipe detention system should be pressure tested to prove watertight. There is insufficient data to support the proposed roof recharge systems are not in the HSG 'D' soil. The NRCS Webb Soil Survey identified the western portion the site consists of 71B Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony, HSG 'D' soil. And the eastern portion of the site consists of 310A Woodbridge fine sandy loam, 0 to 3 percent slopes, HSG "C/D" soil. The soil test pit logs indicated consistent soil material as identified in TPs-1 and -2. The laboratory tests reported high (39% - 39.5%) silt/clay contends and classified as HSG 'D' soils. (TP-3 was the only test hole, which found sand in the C-layer.) Based on the soil tests data available, there is not sufficient evidence that the proposed roof*

recharge/infiltration systems would function as designed. Furthermore, the roof recharge systems as shown do not meet the minimum 25' setback to each system. The revised HDPE pipe detention system does not meet the watertight requirements. See TN5.07 technical Note comment #31 above.

13. The Grading and Drainage plan showed a 203' length bed only, which was 40-foot short of the 6 rows of 240' -24" diameter pipes storage used in the calculations. The plan also called for the bottom of stone at 156.00 with the 24" pipes invert at 157.00, where the ESHGW is at 158.39 (TP#6). The detention system must be set above the ESHGW. See comment #12 above. The revised HDPE pipe detention system does not meet the watertight requirements. See TN 5.07 technical Note comment #31 above. TN5.05's 22" minimum cover appeared to be valid. However, calculations should be certified and provided to show this site design meets the requirements for liability purpose.
14. HydroCAD report Pond 11P – Sediment Forebay, there should not be any valid stormwater storage volume available in the Forebay. The bottom of the forebay at 156.00 with the spillway weir at 156.50 are both below the ESHGW elevation at 157.34 (TP#2). The whole volume would be submerged under seasonal high groundwater during the wet months. The wet forebay does not provide any stormwater storage volume. The ponding water eventually would be replaced by sedimentation, which should be cleaned once a year under an Operation and Maintenance plan. The constructed wet sediment forebay should be designed as a forebay pretreatment to receive the constructed wetland's 80% TSS removal credit. The proposed 6" culvert allows sediment discharged out of the forebay and should be removed. The forebay volume should be reserved for sediment storage only. No stormwater storage volume below the spillway weir (157.50) should be credited.
15. HydroCAD report Pond 12P – Outlet Detention Pond's bottom at elevation 154.00 are also below the ESHGW at 154.47 (TP#3). The storage volume below the outlet weir at 155.50 would be filled with water with no exfiltration function. Hence, the storage volume is invalid. The proposed extended detention stormwater wetland does not provide any stormwater storage volume without a drawdown/outlet device. Wetland basin is within the "25-feet No Disturb" zone, which requires Conservation Commission approval. The proposed 6" outlet culvert invert at 155.00, which is below the existing ground along the wetland boundary and requires grading within the resource area. This will require Conservation Commission approval. No stormwater storage volume should be allowed below the Test Pit #3's ESHGW at 154.5. The applicant needs to revise the outlet culvert invert and adjust the storage volume accordingly.
16. There appeared to be two errors on the Post-Development (Proposed Conditions) summary of Flow to Rear Wetlands (DP#2), the 25-yr event peak flow rate should be 5.11 cfs with volume at 0.605 acre-ft. (see HydroCAD Prop-Conditions Revised 041024 page 47); and the 100-yr event peak flow rate should be 10.05 cfs with volume at 0.828 acre-ft. (see HydroCAD Prop-Conditions Revised 041024 page 62); Therefore, the calculations shown increased runoff volumes flow to the rear wetlands during the 25-yr and 100-yr storm events, net increases of 0.043 acre-ft and 0.091 acre-ft, respectively. Since the existing wetland is surrounded by Greenmont Avenue and Spring Park Avenue. The increased runoff volume would most likely create some adverse impacts to the downstream properties. GCG recommends recalculating the post-development runoff peak and volume with the above comments and re-compare the pre-and post-development conditions for the 4 study storm events. The applicant has provided an off-site pre-development and post-development HydroCAD report to analyze the downstream flooding impacts imposed by this development. GCG has the following comments for the off-site analysis report:
 - a) GCG found a major discrepancy in the stormwater report which causes the analysis results invalid. The pre-development HydroCAD modeled approximately 7.9+/- acres (combined project site and off-site) of single-family developed area

with ½ acre lots, with 25% impervious surface, with Hydrologic Soil Group (HSG) 'D', CN value = 85 in sub-catchment 1S. However, the post-development HydroCAD sub-catchment 4S (the remaining off-site watershed, 5.7+/- acres) was modeled with ½ acre lots, with 25% impervious surface, with HSG 'C', CN value = 80, which has a lower runoff rate than the pre-development conditions. Hence, the calculations are invalid. Furthermore, the project site's 2.24+/- acres (pre-development sub-catchment 1S minus post-development sub-catchment 4S) was included as ½ acre lots, with 25% impervious surface, with HSG 'D', CN=85. This is the site area with surveyed details and appeared to have an impervious percentage of 5.7+/-%. GCG recommends utilizing the exact calculated project site impervious area (CN valid) in the pre-development modeling.

- b) Based on the EX-WS map contours as shown, there appeared to be a road crown along Greenmont Avenue and Spring Park Avenue. Additional stormwater runoff drains into the existing wetland area. The applicant should verify the off-site watershed boundary, there appeared to be additional drainage structures on Greenmont Avenue, which should be shown on the watershed plan. The existing drainage network and outfall may also clarify the watershed boundary.
- c) The pre-development Pond 2P's 12" outlet culvert's pipe slope 2.78% should be verified. The model should utilize the 12" pipe (L=35'+/-, S=0.4+/-%) between the two existing catch basins on Spring Park Avenue, as the restricted point with the stormwater runoff surcharging out of the Ex-CB (rim=153.07) at the northern side of Spring Park Avenue.
- d) Based on the calculations as presented, the wetland's water ponding elevation would encroach the northern side of the existing house at #67 Spring Park Avenue during the 100-year storm event. GCG recommends using the same Time Span period with the pre- and post- development HydroCAD calculations and extending the time span (more than 24 hours) to cover the full volume of the rainfall events. Due to the sensitive flood situations, the Time increment/Hydrograph points (dt) should be reduced to 0.1 or 0.2 to increase the calculations points to show the detail peak water ponding elevations.

17. **Extended Detention Wetland Basin Specifications as shown on plan sheet C-103 were based on the contributing watershed area of 58,470 square feet (s.f.). The watershed area for the entire site consists of 106,730 square feet. Based on the Prop-WS plan, only post sub-catchments 4S and 6S do not flow through the settlement forebay and constructed wetland. Hence, the wet forebay and constructed wetland sizing should be based on the (total site area minus sub-catchments 4S and 6S) 95,000+/- s.f. of watershed area. WQV volume calculations and percent distribution calculations to the extended wetland component according to Table CSW.1 should be provided. There are grading issues (proposed culvert invert below existing grade), storage volume issues (volume below ESGW), and maintenance access issues to be address as stated above.**

CONCLUSIONS:

There are major errors in the off-site drainage calculations need to be addressed. As presented GCG was unable to determine the off-site downstream impacts due to this development. The applicant should address the water tightness of the subsurface pipe detention system. The calculations are showing the downstream property is flooded during the 100-year storm existing conditions. And the post-development calculations were unable to prove the impacts imposed by this development. Portion of the proposed construction wetland is within the Dracut Conservation Commission's 25-foot No Disturb zone. GCG recommends the applicant to provide the calculations with NRCC Extreme Precipitation Rainfall Data to show the impacts to the downstream properties as part of the waiver request.

If you have any questions regarding this matter, please contact our office.

Respectfully Submitted,
GCG Associates

Michael J. Carter

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President