



CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS

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March 28, 2024

Ms. Breeka Li Goodlander, Conservation Agent
Town of Franklin Conservation Commission
355 East Central Street
Franklin, MA 02038

Regarding: Grove Street Residences – 121 Grove Street
MassDEP File No. 159-1286
Notice of Intent Peer Review

Dear Ms. Goodlander:

RJ O’Connell & Associates (RJOC) and Lucas Environmental (LE) have reviewed the comments issued by BETA Group, Inc. (BETA) dated February 20, 2024, and have prepared responses in this letter and included attachments, as necessary.

Enclosed are the following documents that have been included with this letter to address these comments:

1. Revised Notice of Intent Plan Set dated 10/30/23, revised through 03/28/24
2. Stormwater Management Report dated 12/18/23, revised through 03/28/24
3. The following attachments:
 - Attachment 1: Notice of Intent – Response Letter #1, prepared by LE, dated 03/28/24;
 - Attachment 2: WPA Form 3, prepared by LE;
 - Attachment 3: Wetland & Buffer Zone Impact Exhibit, prepared by RJOC, dated 12/18/23, revised through 03/28/24;
 - Attachment 4: Bankfull Determination Exhibits, prepared by RJOC, dated 03/28/24;
 - Attachment 5: Stream Crossing Hydrologic/Hydraulic Calculation, prepared by RJOC, dated 03/28/24.

The comments from BETA’s review are listed below in *italics* with the corresponding numbering from their letter, and our responses follow in **bold**.

Administrative and Plan Comments

The plan set (as identified above) is missing information and requires additional information for clarity.

Table 1. NOI Plan

NOI Plan Requirements	Yes	No
North Arrow	✓	
Registered PLS Stamp (Existing Condition Plans Only)	✓	
Assessors' Reference		(See Comment A2)
Abutting Property Assessors' Reference		(See Comment A2)
Survey Benchmark	✓	
Existing Conditions Topography (with source and date of survey)		(See Comment A4)
Accurate Plan Scale	✓	
Plan Scale 1" = 40' or smaller	✓	

Plan and General Comments

A1. The Massachusetts Department of Environmental Protection (MassDEP) has issued a DEP file number (159-1286) with the following technical comments:

a. "The Commission may want to consider a third-party review due to the complexity of this project, including but not limited to the review of the proposed stormwater system and the intermittent streams not confirmed in the ORAD process".

Response: Third party peer reviews are being completed.

b. "It is recommended that phased erosion controls are provided in addition to the construction sequence. Temporary swales and basins shall be shown on (phased) erosion control plans".

Response: Phased erosion control plans have been completed and included in the revised plan set. These include temporary swales and basins. (See Sheets C-1A through C-1D).

c. "The site of the future infiltration basins should not be used as temporary sediment traps for construction activities, see V2, Ch2, p91 of the SW Handbook".

Response: The plans have been revised to provide notes on the Erosion Control Plans that the bottom of the temporary sediment basin at the location of the infiltration basin (stormwater basin-1) shall be set one foot above the bottom of the proposed infiltration basin to ensure the underlying soil is not adversely impacted. Excavation of the bottom one foot to final grade and the installation of the crushed stone shall not be completed until after final stabilization. This last foot of excavation after site stabilization will remove all sediment and protect the underlying soil.

d. "The Commission may want to include the Operation and Maintenance of the proposed stormwater system as a perpetual conditions".

Response: Comment acknowledged. The applicant has no issue with the condition.

e. "Given the steep slopes and their proximity to wetlands, MassDEP recommends the Commission include a condition that requires an inspection of erosion controls prior to and following any storm events greater than 1".

Response: Comment acknowledged. The applicant has no issue with the condition.

- A2. *Depict Assessors' references for both the Site and the abutting properties on all plan sheets.*
Response: The Assessors references for the site and abutting properties have been added to the Overall Site Plan.
- A3. *The proposed tree line is currently only depicted on the Landscape Plan sheets. Depict the proposed tree line on all plan sheets.*
Response: The proposed tree line has been added to all applicable site plan sheets.
- A4. *Provide survey dates/methods for all on-the-ground topographic and boundary survey efforts in the plan notes.*
Response: The Existing Conditions Site Plan has been revised to include plan notes for the survey dates/methods for all on-the-ground topographic and boundary survey efforts.
- A5. *The narrative references filing under two (2) limited project provisions (310 CMR 10.53(3)(e) and (3)(j)) but the WPA Form 3 references only one. Provide a revised WPA Form 3 referencing both limited project provisions for the record.*
Response: The WPA Form 3 has been revised as requested. See Attachment #2.
- A6. *Provide a revised WPA Form 3 that includes temporary and permanent impacts proposed to LUW and includes both temporary and permanent impacts to BVW. Only permanent impacts are currently listed on the WPA form.*
Response: The WPA Form 3 has been revised as requested. See Attachment #2. Additionally, the impact numbers have been updated to show the temporary and permanent impact numbers (presented in the narrative of the original NOI), see LE Response Letter #1 within Attachment 1 of this letter.

Resource Area Boundary Comments

- W1. *The ORAD approved the Bank boundary of 3 onsite intermittent streams (BF1, BF2, and BF3); however, there are 6 additional Bank series shown on the existing conditions plan and described in the NOI narrative per the Commission's request (BF4, BF5, BF6, BF7, BF8, and BF9). Of these Bank series, the Applicant asserts that only BF9 meets the definition of a stream under the Act.*

BETA reviewed all additional intermittent stream Banks flagged as part of this Project and concurs with the delineated boundaries. It is recommended that the Commission consider these features jurisdictional intermittent streams.

Response: BETA's response is noted and furthermore, the impacts have been calculated very conservatively, assuming the referenced streams are jurisdictional to address BETA's following comments.

- W2. *BETA did not review the FRW Series BVW in the field due to its location on private property. Based on the Project plans, work is not proposed within its associated Buffer Zone. The Commission could consider including a finding in an Order of Conditions (OOC) stating that these boundaries are not approved as part of this filing.*
Response: The Applicant agrees with this finding.

Construction Comments

W3. *Provide information supporting the location of the sewer line below the streambed at both stream crossings instead of within or along the roadway above the stream. Should the proposed location be required due to design/Site constraints, provide details on how construction will occur as it relates to the nature of the Resource Area impacts (i.e., open trench excavation versus directional drilling, and construction sequencing).*

Response: To allow for gravity sewer connection to the town sewer system and crossing of other utilities and drainage the proposed sewer line needs to be below the streambed at both stream crossings. The sewer lines are proposed below the streambeds, and above the footings of the culverts. The installation of the sewer lines will occur using trench excavation at the same time as the construction of the culverts, while the streams are temporarily diverted, and the surrounding resource area protected. See response to W5 for details on construction which will occur at the same time as the culverts. The existing streambed soils will be removed and stockpiled separately for reuse in reestablishing the streambed. The sewer lines are to be bedded as noted on the detail on Sheet C-10 and then backfilled with the existing channel bed material up to the final channel elevation within the culverts.

W4. *Clearly label all Resource Area impacts (both permanent and temporary) on the Project plans. It is recommended that this information be included on the Grading and Drainage plans to supplement the callouts that are already present. Although a separate Resource Area impact exhibit is provided, it is at a larger scale and does not depict proposed grades.*

Response: Additional Resource Area Impact Plans have been developed and added to the plan set as Sheet C-2D & C-2E. The plans clearly labels all MassDEP Resource Area impacts (both permanent and temporary) and depicts the proposed grades.

W5. *Erosion controls should be depicted on all sheets to demonstrate Project constructability. BETA offers the following comments on the proposed erosion controls:*

a. *Erosion controls consisting of siltation fencing and compost filter tubes are proposed to be installed across the stream at both intermittent stream crossings as shown on the Demolition and Erosion Control Plan (Sheets C-1A and C-1B). These erosion controls are not a typical method of in-water erosion, sedimentation, and/or turbidity control. Clarify what time of year the crossing work will occur, what erosion controls will be used for in-water work (i.e., cofferdams), and how water will be controlled during construction of the crossing. To comply with the Section 404 Massachusetts General Permit, in-water controls should only be in place while required to complete the crossing work. At a minimum, the Applicant should provide location-specific water control and dewatering details for the proposed culvert work.*

Response: Phasing plans (C-1A through C-1D) have been developed to depict erosion control measures to be implemented during construction of the proposed project. The in-water erosion, sedimentation and/or turbidity controls have been revised at the proposed stream crossings to include sandbag cofferdams, pumps and water filter bags. These will be used to control the water flows within the intermittent streams during the construction of the culverts and to pump the water to the downstream side of the culverts to a filter bag. Details reflecting these controls have

been provided on Sheet C-6. The crossing work will occur during forecasted dry periods and periods of low flow, where feasible. A note has been added to the plans that in-water controls will be removed as soon as possible once the work is completed and that area is stabilized.

- b. *No erosion controls are shown at the location of either of the proposed boardwalks. Depict erosion controls proposed for boardwalk construction, describe the anticipated method of construction, and quantify any additional temporary BVW impact associated with installation of erosion controls, anti-compaction measures (i.e., swamp mats), and access for construction.*

Response: Erosion controls have been added adjacent to the proposed boardwalks within the existing wetlands and ground protection (construction) mats have been proposed at the intermittent stream crossings. The impact areas associated with the additional erosion controls have been revised and are reflected in the revised Wetland & Buffer Zone Impact Exhibit in Attachment 3 of this letter.

The applicant is anticipating constructing the boardwalks using a handheld helical pile installer for the screwpile bases. This will involve the use of chainsaws to clear the area and then using a walk behind skid steer to transport the building material through the proposed boardwalk corridor. However, if screwpiles cannot be installed in some areas, due to shallow ledge, the contractor may need to install 12-inch concrete footings. Although helical piles are the preferred method of installation to minimize impact, the calculations of impact areas were conservatively calculated assuming the need for the 12-inch concrete footings.

The limits of work have been revised, as necessary, and the temporary/permanent BVW impact calculations have been updated as depicted on the Wetland & Buffer Zone Impact Exhibit in Attachment #3 of this response letter.

- c. *Erosion controls are depicted directly adjacent to the proposed retaining upgradient of the BVW near the proposed pool and clubhouse, and within Buffer Zone north of Building #3. Considering that over excavation is required to set the footings for segmented block walls, additional temporary BVW/Buffer Zone impacts are likely to be required at these locations and the limits of work do not appear to represent a constructable Project. The Applicant should revise the limits of work and disclose all impacts accordingly.*

Response: The erosion controls in these areas have been reviewed and revised as necessary, the limits of work have been revised to ensure constructability. A cross-section detail showing the proposed wall, erosion control measures and wetland limits has been provided on Sheet C-16. This depicts areas where the proposed wall is at the closest proximity to the wetland and illustrates there is sufficient area for construction without impacting the wetland.

- d. *Erosion control placement is directly over areas of proposed grade tie-ins along several locations around the Project perimeter (e.g., northeast of Building #2). Provide locations for erosion controls that support constructability and disclose any additional temporary/permanent BVW impacts that may be required.*

Response: The line type width depicted on the plans is not representative of the actual thickness of the erosion control in the field. The plans have been revised to depict a different line type that illustrates the true size of the erosion control measures. The limits of work have been revised, as necessary, and the temporary/permanent BVW impact calculations have been updated as reflected in Attachment #3 of this response letter.

- W6. *The Project will require significant clearing and grubbing. Provide a phasing plan to supplement the erosion control plan that limits the total area of disturbance at the Site at one time. This plan should also include timing on environmentally sensitive activities including stream/BVW crossings (roadways and boardwalks), the wetland replication area, and the stream restoration area. In addition, all staging/stockpile areas should be staked in the field prior to advancing phases. The Commission could consider a Special Condition in the OOC requiring the Applicant achieve stabilization to the satisfaction of the Commission or their Agent prior to advancing phases.*

Response: Erosion and Sediment Control Plans (C-1C & C-1D) have been prepared to illustrate the construction phasing of the proposed site work. Additionally, a Construction Phasing Plan (C-1E) has been prepared, and is included within the revised Plan Set, depicting the anticipated construction zones and sequences for the project.

- W7. *In addition to a phasing plan for the entire Project, a construction sequence and plan specific to the proposed intermittent stream crossings should also be provided. This plan should include the following:*

a. *Installation of erosion and sedimentation controls, and in water controls as appropriate;*
Response: Phased erosion control plans for construction have been prepared on Sheets C-1A through C-1D and are included in the revised plan set. These plans provide sequencing for erosion control and construction.

b. *Points of access by machinery to construct the crossings; and*
Response: The demolition and erosion control plans (C-1A and C-1B) have been revised to depict the use of construction swamp mats to be used at the crossings for access for clearing/grubbing of the site; Erosion and sediment control phase II plans (C-1C and C-1D) have been prepared depicting the details of the construction of the culverts at the crossings with cofferdams, pumps and filter bags (details have been provided on Sheets C-5 and C-6).

c. *Restoration of temporarily impacted LUW and Bank.*
Response: Impacted areas of Bank will be restored to pre-existing conditions, i.e., the existing substrate will be restored to a natural state that are present prior to construction. The land between the Banks will also be restored to pre-existing conditions, which BETA is generally referring to as LUW.

- W8. *It is recommended that all chain link fencing provide a minimum of a 4-inch bottom gap to facilitate wildlife movement for small species.*

Response: The Chain link fence detail on Sheet C-12 has been revised to include a note to provide a minimum of a 4-inch bottom gap under fencing to facilitate wildlife movement for small species.

W9. *To apprise the Conservation Commission of federal permitting requirements, the Project will be required to obtain U.S. Army Corps of Engineers (USACE) approval under the Section 404 Massachusetts General Permit prior to commencing construction.*

Response: The Applicant is aware of this requirement and will be submitting the appropriate documents to the USACE.

MITIGATION COMMENTS

W10. *The “Existing Wetland Disturbance Exhibit” depicts areas of existing disturbed wetlands (12,485 sf) resulting from active mowing that will be restored as a part of the Project. A portion of the proposed restoration (as depicted by the Applicant) will be permanently impacted through construction of the clubhouse pool. Similarly, a portion of the proposed Boardwalk #2 is also within proposed BVW restoration area. Revise the Exhibit and restoration totals accordingly or adjust the limits of work.*

Response: The proposed retaining wall adjacent to the clubhouse pool has been revised to avoid both temporary and permanent impacts to the wetland. The existing, disturbed wetland areas will be restored via tilling and seeding, and immediately covered with a straw mat for erosion and sediment control. The disturbed wetland areas to be restored at Boardwalk #2 will be seeded below the boardwalk for restoration, however there will be footings installed within this area that will have an overall impact of approximately 5 sf. Therefore, there will be an overall wetland restoration area of 12,480 sf.

W11. *BETA offers the following comments with regards to the wetland replication area and associated stream daylighting efforts:*

a. *Provide a note on the Wetland Replication Plan (Sheet C-2C) stating that the Wetland Scientist will review the proposed wetland replication area for existing, native woody plants to retain and mark them in the field for preservation.*

Response: The suggested note has been added to Sheet C-2C as Note #1 under General Wetland Replication Notes.

b. *Provide a note requiring the Wetland Scientist to contact the Commission for review and approval of final grades and proposed planting stock prior to planting. This could be included as a Special Condition in the OOC.*

Response: The suggested note has been added to Sheet C-2C as Note #2 under General Wetland Replication Notes.

c. *BETA recommends that the wetland replication area and associated stream daylighting efforts be established and temporarily stabilized, at a minimum, prior to constructing the adjacent roadway crossing over the intermittent stream. Construction of the roadway and adjacent temporary drainage swale will severely limit access to the wetland replication area. This could be included as a Special Condition in the OOC.*

Response: Construction phasing proposed for the project calls for the area of the wetland replication area to be used as a temporary sediment basin. Upon stabilization of the site, the temporary sediment basin will be removed and at that time the wetland replication and associated stream daylighting efforts will occur. Performing the work

for the wetland replication and associated stream daylighting efforts at this time would also limit the risks of any damage to these areas during overall site construction.

- d. *As part of the proposed wetland replication area, the Applicant proposes to daylight 180 linear feet (920 sf) of culverted stream; however, minimal details on sequencing and approach are provided. Provide information including the proposed profile of the streambed and the proposed bankfull width (and how these were determined), the proposed gradient of the stream, how the restored stream will tie into the existing BF2 Series streambed and Bank elevations, how the streambed and Banks will be stabilized (temporarily and permanently), and what type of substrate is proposed/how it was determined based on existing fluvial processes. Additional erosion controls will also be required to prevent sedimentation of the stream while the wetland replication area is being stabilized.*

Response: Construction sequencing for the existing drain pipe removal and intermittent stream construction has been provided on Sheet C-1C. Additionally, Sheet C-2C has been revised to include a profile of the stream bed, depicting the slope and tie in elevations to the adjacent wetlands and proposed culvert. The plan view on Sheet C-2C has been revised to depict compost sock erosion and sedimentation barriers be installed on either side of the proposed intermittent stream until the wetland replication area is stabilized. Bankfull Determination Exhibits have been prepared and are included in Attachment #4 of this response letter depicting how the bankfull widths were determined for the stream crossings. Notes have been added to the intermittent stream details on Sheet C-9 stating that the existing streambed soils will be removed and stockpiled separately for reuse in reestablishing the streambed.

- W12. *Provide a method for restoring temporary Bank and LUW impact areas and describe how Banks under the crossing will be graded and permanently stabilized and include notes pertaining to Resource Area restoration on the plan set.*

Response: The Banks and land between the Banks (LUW per BETA), will be graded per the revised plans, dressed with an appropriate substrate to match the existing substrate, and stabilized. The Banks will be stabilized via loaming and seeding, along with installation of an erosion control blanket and compost socks on the slopes if necessary (Details on Sheet C-6 and C-9).

- W13. *Discussion of alternatives to the southern stream crossing to access Building 1 references only one alternate location to the crossing as shown in the exhibit titled "Alternative Driveway Layout". This alternative does not take into consideration other configurations for Building 1 and associated amenities that would make a driveway to this Building from Grove Street feasible.*

Response: The applicant has consulted with the Project Traffic Engineer, Vanasse & Associates, Inc., and they have noted there are traffic-related concerns with adding a secondary driveway for Building 1. The concerns include:

- **Access management guidelines indicate that if one driveway adequately services the Project demand, a second driveway should not be considered. Access principles dictate that conflicts at intersections and driveways should be separated and the number reduced as much as possible.**

- There is a potential for conflict due to differentials in speeds of vehicles entering and exiting the site. Vehicles exiting a secondary driveway for Building 1 would need to accelerate to get up to speed on Grove Street while vehicles intending to enter the Main Driveway would need to decelerate. Given the distance that would be proposed between the two driveways, there are likely to be conflicts which will cause a safety concern.
- Good practice for site development is to avoid a scenario that can be confusing for emergency response. Without central connectivity throughout the project, emergency response personnel and vehicles could inadvertently use the wrong driveway requiring them to exit to Grove Street and then re-enter the second driveway.

W14. BETA offers the following comments on the Landscape Plans:

- a. The proposed area of wetland fill north of the clubhouse is not depicted as being planted or stabilized on the Landscape Plans. Provide plantings within this area, unless fill is avoided.

Response: The plans have been revised accordingly.

- b. Areas of proposed lawn that do not appear to be necessary for public use/access (i.e., south of Building #2 along the parking area) should be vegetated with native, herbaceous species and mowed only once per year during late fall. BETA recommends a Special Condition requiring this mowing schedule for all areas where native, herbaceous species are established.

Response: These areas are proposed as lawn by the Landscape Architect to allow for vehicle overhang over the curbing without resulting in degradation of higher growing ground species.

- c. The proposed Russian sage (*Perovskia a.* “Little Spire”) should be replaced with a native species.

Response: The Russian sage has been removed and the plans have been revised accordingly.

- d. The Applicant proposes several cultivars in the planting plan. Cultivars alter the natural fruiting and flowering processes of plant species and oftentimes diminish their value to native wildlife. It is recommended that cultivars be removed from the plan and replaced with true native counterparts.

Response: The cultivars have been removed and the plans have been revised accordingly.

W15. The Applicant proposes restoration of Buffer Zone and disturbed BVW within several areas across the Site. The narrative notes that seed should be applied to “clean bare soil” in Buffer Zone restoration areas and does not specify any details regarding the preparation of the BVW restoration areas. It is recommended that the Applicant clarify if full tillage is proposed in all restoration areas; if so, additional erosion controls should be provided at the downgradient limits of disturbance.

Response: The applicant is proposing to till and seed the existing disturbed wetland areas. The areas will be covered with straw matting immediately after seeding for erosion and sediment control until stabilization occurs.

WPA Performance Standards Comments

Bank (310 CMR 10.54)

W16. *Provide a narrative to demonstrate compliance with the Performance Standards at 310 CMR 10.54(4). Although the roadway crossings meeting the Stream Crossing Standards are presumed to meet the Bank Performance Standards, an assessment must be provided for the boardwalks regardless of potential Limited Project status.*

Response: A narrative has been provided to demonstrate the project's compliance with the performance standards under Section 310 CMR 10.54(4) of the WPA. The narrative includes a description of the construction of the proposed boardwalks and compliance with the performance standards for Inland Bank. See LE Response Letter #1 in Attachment 1 of this letter.

W17. *The Applicant should provide further justification for the southern intermittent stream crossing as part of its review under the Limited Project provisions. The alternatives analysis does not consider the establishment of a secondary entrance/egress off Grove Street that avoids a steep roadway slope by redesigning the layout of this portion of the Site so that the proposed roadway could be located where Stormwater Basin 1 is currently proposed.*

Response: The applicant has consulted with the Project Traffic Engineer, Vanasse & Associates, Inc., and they have noted there are traffic-related concerns with adding a secondary driveway for Building 1. See Response to Comment W13.

Bordering Vegetated Wetland (310 CMR 10.55)

W18. *Provide depth to groundwater within the replication area to demonstrate that the proposed grading will result in Estimated Seasonal High Ground Water (ESHGW) levels occurring within 12 inches of the final surface elevation.*

Response: It is expected that the proposed elevations will result in ESHGW to be within 12 inches of final grade based upon existing grades and observations of the adjacent wetlands. The applicant suggests that soil testing to verify ESHGW elevation be performed at the time of the installation of the temporary sediment basin in this area. If testing reveals that the ESHGW will not be within 12" of the final surface elevation, but only minor elevation modifications are necessary, then field adjustments will occur at the time of construction under the supervision of the Wetland Scientist and/or Civil Engineer (with notification to the Conservation Agent). If significant modifications are necessary, the area shall be redesigned by the Wetland Scientist and/or Civil Engineer and submitted to the Conservation Department for review.

W19. *The section view for the boardwalk on Sheet L301 references finished grade that will vary dependent on location. The Applicant should clarify that no grading will occur within BVW; if grading is proposed, quantify permanent impacts that are not only associated with shading. As previously noted, all temporary impacts associated with the construction of the boardwalk should also be quantified.*

Response: A note has been added to Sheet C-4B and to the boardwalk detail on Sheet L301 stating that "No grading within the Bordering Vegetated Wetland shall occur in association with the construction of the boardwalks."

W20. *The Applicant should provide justification for the permanent wetland impacts adjacent to the pool and clubhouse. The NOI narrative does not discuss the feasibility of adding angle points to the retaining wall and shifting stormwater infrastructure to avoid wetland impacts at this location.*

Response: The retaining wall layout in this area has been revised to avoid both temporary and permanent wetland impacts.

Land Under Water (310 CMR 10.56)

W21. *Disclose all temporary and permanent LUW impacts associated with the construction of the crossing. Based on BETA's knowledge of the Site, the intermittent streams at the locations of the proposed crossings flow for a significant portion of the year; accordingly, the mean low water level is above the thread of the stream and the streams have associated LUW.*

Response: LE disagrees with BETA's assessment that LUWW is present on the site and has prepared a narrative detailing our position. However, assuming LUWW were present at the site, the narrative includes a summary of temporary and permanent impacts to LUWW. See LE Response Letter #1 in Attachment 1.

W22. *Provide a narrative demonstrating compliance with 310 CMR 10.56(4).*

Response: Assuming LUWW were present at the site, a narrative has been provided to demonstrate the project's compliance with the performance standards under Section 310 CMR 10.56(4) of the WPA. See LE Response Letter #1 in Attachment 1.

Stormwater Management Review

SW1. *The base of the proposed retaining walls along western extent of each building will be far below existing grade and it is anticipated that blasting will be required to achieve this depth based on test pits logs within 25 feet of the BVW. As a result, significant groundwater inputs from the adjacent BVW are anticipated. There are no construction details provided for these walls; however, they are shown on the detail sheets as being segmented block walls.*

Since the walls will allow free passage of water throughout a majority of the blocks, groundwater flow will impact the capability of the downgradient subsurface infiltration systems from functioning in accordance with the Standards. In addition, the Applicant should disclose the limits of work and potential BVW and groundwater associated with the blasting (fracturing of bedrock).

Response: Cross-section details of the walls in the earth cut areas have been provided on Sheet C-15. The grading at the rear of Building 1 has been revised to raise the parking area and reduce the cut in that area. The excavation for the installation of the wall will include a geosynthetic clay liner on the face of the cut slope prior to backfilling with the existing soil. The clay liner will extend below proposed finish grade a nominal distance as a means to restrict the flow of water through the wall. The earth cuts in these areas will be 8 to 10 feet maximum. Based on the available soil test pits the shallowest rock appears to be at or about the same depth or deeper. No significant blasting will be required that will fracture bedrock, and we do not anticipate any adverse impacts to groundwater.

SW2. *Several subsurface infiltration systems are within the 50-foot minimum setback from BVW per the Massachusetts Stormwater Handbook (the Handbook) including PSIS 4, 5, 7 & 8. These infiltration systems must be relocated to comply with the design requirements of the Handbook.*

Response: The infiltration systems have been relocated to provide a 50-foot minimum setback from BVW. (Note: the infiltration system adjacent to the clubhouse (PSIS-7) has been removed from the design).

SW3. *In accordance with Volume 2, Chapter 2 of the Handbook, all subsurface structures must have an appropriate number of observation wells to monitor the water surface elevation and serve as a sampling port. In addition, each must have an entry port to allow worker access for maintenance. Provide the required observation wells and entry ports.*

Response: Notes have been added to each of the subsurface chamber systems (infiltration and detention) details, on Sheets C-8 and C-9, stating that a minimum of 4 inspection ports shall be installed per system (to be set at 4 corners of each system). Additionally, a note has been added to each of the subsurface corrugated metal pipe infiltration system details, on Sheet C-8, stating to “provide observation manholes with 24-inch covers at all corners and inlet/outlet pipes”. These observation ports and manholes will provide access for monitoring and cleaning of the systems. Details have been provided, on the detail sheets of the revised plan set, for both the observation ports and access manholes.

SW4. *Subsurface infiltration systems 1, 2, & 6 are located 5 to 15 feet upgradient of a stormwater basin. In each case, the water surface elevation in the basin during a rainfall event will be above the bottom of the subsurface infiltration system. This standing water is likely to raise groundwater levels above the bottom of the infiltration systems and restrict the ability of the systems to infiltrate. The Applicant should revise the design accordingly.*

Response: Stormwater basins downgrade of subsurface infiltration systems 2 and 6 have been eliminated and the stormwater calculations have been revised accordingly. Stormwater Basin-1 (SWB-1) has been reviewed and the peak stormwater elevation is below the nearby infiltration system. The peak elevation within SWB-1 is 289.85 in the 100-year design storm and the bottom of stone elevation of subsurface infiltration system-1 (PSIS-1) is 295.70, therefore a 5.85’ separation is provided from peak SWB-1 elevation to bottom of stone elevation of PSIS-1. Therefore, the SWB-1 is still being proposed as part of the drainage design.

SW5. *Subsurface infiltration systems 1, 2, 3, 4, 5, & 8 are all located approximately 5 feet from a proposed retaining wall. In each case, the grade at the base of the wall is either at or below the bottom of the proposed infiltration system. The proposed impervious barrier along the walls near the infiltration systems must, at a minimum, extend to the bottom of the walls, down to the lowest elevation at the base of the retaining wall to avoid breakout and circumventing the full infiltration/treatment process.*

Response: The infiltration systems have been relocated to provide greater separation from proposed retaining walls. Additionally, cross-section details have been provided on Sheet C-14 depicting that the impervious barriers shall extend to one-foot below the bottom of wall.

SW6. *Provide monitoring wells and emergency low level outlets within all stormwater basins per the Handbook.*

Response: An emergency low level outlet has been provided in the surface stormwater basin (SWB-1), and a note has been added to the detail on Sheet C-7 stating that a monitoring well shall be installed. The proposed location of the monitoring well has been provided on Sheet C-2A.

SW7. *Based on the ESHGW elevation established by test pit 40, Stormwater Basin 1 is only 0.5 feet above groundwater, where a minimum of 2 feet is required. In addition, it has been designed as an Infiltration Basin and does not meet the minimum setback of 50 feet from BVW per the Handbook. The design should be revised accordingly.*

Response: The bottom elevation of Stormwater Basin-1 (SWB-1) has been revised to be at 287.5 to provide 2 feet of separation from ESHGW. SWB-1 is no longer being designed as an infiltration basin and exfiltration has not been included in the HydroCAD model. As noted above, SWB-1 is located within 50' of a bordering vegetated wetland and cannot be included in the required recharge volume calculations for the project. Therefore, SWB-1 is designed to only provide water quality.

SW8. *The discharges from PSDS 1 & 2 use a proprietary separator as terminal treatment for these treatment trains. In accordance with Volume 1, Chapter 1 of the Handbook, they cannot be used as terminal treatment and will require an alternative design.*

Response: The drainage system layouts have been revised such that a proprietary separator is not used as terminal treatment. Terminal treatment for all captured stormwater runoff is provided via infiltration. The required TSS removal is achieved.

SW9. *The designer is assuming a total suspended solids (TSS) Removal Rate of 80% for all proprietary separators being used. According to Environmental Protection Agency (EPA) studies, these separators are only 40-45% effective. Generally, these systems proposed in Franklin have only been allowed for use as a final treatment in redevelopment situations where the existing stormwater collection system is being maintained. The TSS removal rate should only be 44% for all proprietary separators in the TSS removal calculations in the report.*

Response: The TSS calculations have been revised to use a removal rate of 44% for all proprietary separators and the resulting calculations reflect full compliance with the regulations.

SW10. *There are no hydrologic/hydraulic calculations provided for the 2 stream crossings. BETA recommends that this analysis be provided for review to ensure appropriate capacity and avoidance of potential issues related to scour, erosion, and flooding.*

Response: A hydrologic/hydraulic calculation has been provided for the 2 stream crossings and is included in Attachment # 5 of this response letter. The calculations illustrate that the culverts at the stream crossings are more than adequately sized to handle the upstream flows for the 100-year design storm (an exhibit has also been included in Attachment #5 depicting the limits of offsite tributary areas to the intermittent streams).

SW11. *CB-4 should be moved to the low point in the intersection to improve the angle into DMH-6.*

Response: CB-4 has been relocated accordingly.

SW12. *The connection from CB-41 to DMH-29 is an acute angle which is opposite to the flow direction out of the manhole and should be corrected to a more obtuse angle.*

Response: The connection has been revised accordingly.

MASSDEP Stormwater Standards

No Untreated Stormwater (Standard Number 1):

SW13. *The stone sizing calculations for the riprap aprons were not included in Appendix B as noted in the legend.*

Response: Rip-Rap Apron Sizing Calculations have been provided within Appendix B of the revised stormwater report.

SW14. *The impervious surface area tributary to DCB-50 exceeds ¼ of an acre and therefore does not conform with the design requirements in Volume 2, Chapter 2 of the Handbook.*

Response: The proposed grading in this area has been revised and an additional catch basin has been added upgradient to decrease the tributary area to that DCB.

Post-Development Peak Discharge Rates (Standard Number 2):

SW15. *The time of concentration (Tc) calculations for the existing conditions analysis are understated. As correctly noted in the report, Tc should be based upon the longest time of travel, not necessarily the longest distance. BETA recommends that the Applicant reassess flow paths, especially for the initial sheet flow path and slope.*

Response: The Tc calculations for the existing conditions have been reviewed and minor adjustments have been made to the hydrologic analysis model within Appendix B of the revised stormwater report.

SW16. *The use of curve number (CN) values associated with hydrologic soil group (HSG) D within the central portion of the Site should be limited to areas of BVW. Several of the test pits performed in this area indicate that soils are classified as HSG A.*

Response: The limits of designated HSGs used in the stormwater analysis are based upon the National Resources Conservation Services (NRCS) online web soil survey. These HSG designations provide estimates of runoff potential from the upper soils as described in the Massachusetts Stormwater Handbook Volume 3: Chapter 1, Page 13:

“For undisturbed soils in Massachusetts, NRCS has assigned each soil type to a Hydrologic Soil Group. However, that classification is based on the upper and not lower soil horizons.”

The onsite soil testing performed by RJOC, which yielded a Sand or Loamy Sand, HSG A soil, was required to determine the soil texture in the lower soil horizons (parent material) for infiltration system design. This does not represent the runoff potential from the upper soil horizons when calculating site hydrology. Therefore, the NRCS HSG

designations, as depicted on the web soil survey, were used for determining the CN values for the analysis of stormwater runoff.

SW17. *The stormwater basins are all retention basins with only an emergency spillway, however there is no discussion regarding dewatering between events. BETA recommends that a positive means of dewatering be provided for these basins.*

Response: The drainage design has been revised to eliminate all surface stormwater basins, except for Stormwater Basin-1 (SWB-1). Calculations have been provided depicting that SWB-1 will drawdown within 72-hours, additionally an emergency drawdown outlet has been provided.

The locations of the formerly proposed surface stormwater basins are to be used for temporary sediment basins during construction (as depicted on Sheets C-1A through C1-D) but are to be removed/filled and the area revegetated after site stabilization. Final grading on Sheets C-2A and C-2B depict positive slopes away from outlets.

SW18. *There is no opportunity for maintenance for the subsurface detention systems. Since they are lined with no opportunity for infiltration, the storage volume is critical to their success in meeting this Standard. Although the flow into these systems is treated by proprietary separators, their limited capabilities based on the EPA's analyses indicate that the sediment which flows through these systems from the pavement areas will impact overall storage capacity over time. BETA recommends that the Applicant review the design and find alternative above-ground means of providing storage to attenuate peak flow rates, which can be effectively maintained long-term.*

Response: The subsurface detention systems will be maintained in the same manner as the subsurface infiltration systems, as noted in the O&M within Appendix E of the revised stormwater report. Monitoring of the systems for any sediment accumulation will be performed through the observation ports in the systems. As noted above, the flows are treated using deep-sump catchbasins and proprietary separators to remove 58% TSS prior to entering these systems. In the event there is sediment observed within the system of more than 3" of average depth, maintenance will occur through the observation ports. The maintenance is accomplished using a high-pressure water nozzle in an observation port to suspend the sediments and then the vacuuming of the water and sediments through an adjacent observation port to remove the sediments. Sewer and pipe maintenance companies have vacuum/JetVac combination vehicles to perform this maintenance.

Recharge to Groundwater (Standard 3):

SW19. *In accordance with the Handbook, 2 test pits are required within the footprint of each proposed infiltration system. Additional test pits are required within the footprint of 5 of the subsurface infiltration systems to meet this requirement.*

Response: After the reconfiguration of the drainage design noted previously, a minimum of 2 test pits are provided within the footprints or within reasonable proximity of all infiltration systems. For Stormwater Basin-1, PSIS-2 and PSIS-7 there has been extensive soil investigation in the area, as outlined below:

- **PSIS-2:** 1 test pit within the system and 3 additional within 50' of the system.
- **PSIS-7:** 1 test pit within the system and 2 additional within 15' of the system.
- **SWB-1:** 4 test pits within 30' of the bottom of the basin.

RJOC believes the soil testing performed in close proximity to each of these systems provide evidence that the soil types and groundwater elevations used in the design as accurate.

SW20. *There are no calculations provided to verify the static storage volume provided in the subsurface systems. The stage-storage table for each system should be provided to verify the volumes shown in the appendix.*

Response: The stage-storage tables for each system have been provided within Appendix B of the revised stormwater report.

SW21. *The overall impervious surface area at the Site should be developed to ensure that at least 65% of these surface areas are directed to an infiltration structure.*

Response: Calculations illustrating that at least 65% of the impervious surface area is being directed to the infiltration facilities are provided within Section 9.2 of the stormwater report.

Total Suspended Solids (Standard Number 4):

SW22. *The pretreatment cannot be included in the total treatment rate provided by the treatment train and must be isolated. The TSS Removal sheets should be modified appropriately including a separate sheet to identify the pretreatment provided.*

Response: The TSS removal sheets, in Appendix B of the revised stormwater report, have been updated accordingly and illustrate compliance with the removal requirements

Higher Potential Pollutant Loads (Standard Number 5):

The project is not considered a LUHPPL – standard not applicable

Response: Acknowledged.

Critical Areas (Standard Number 6):

A portion of the Project is located within a critical area. These standards will be applicable to the development. – standard met.

Response: Acknowledged.

Redevelopment (Standard Number 7):

The project is not considered a redevelopment – standard not applicable.

Response: Acknowledged.

Erosion and Sediment Controls (Standard Number 8):

SW23. *BETA recommends that a draft SWPPP be submitted to the Commission for their review given the density of the Project, with specific phasing.*

Response: A draft SWPPP has been provided in Appendix D of the revised stormwater report.

SW24. *The design indicates that swales with stone check dams will be used along the edge of the BVW. Based on the existing and proposed grades, the Applicant should depict the proposed grading of swales to ensure that they can be installed and be effective in protecting the BVW during the construction process.*

Response: The plans have been revised to provide proposed spot elevations along the temporary drainage swales on Sheets C-1A and C-1B which shows they can be installed as shown. As noted in the plans the location of erosion and sediment controls within the construction limits will be relocated as necessary during construction to protect the resource areas and surrounding undisturbed areas.

Operations/Maintenance Plan (Standard Number 9):

SW25. *Provide an annual budget for O&M.*

Response: An annual budget of \$15,000-\$20,000 has been provided within the O&M.

SW26. *The O&M Plan should be signed by the Applicant.*

Response: The applicant has signed the O&M Plan.

SW27. *The manufacturer's maintenance requirements for the proprietary separators should be included in the plan.*

Response: The manufacturer's maintenance requirements has been added to the O&M, in Appendix E of the revised stormwater report.

ILLICIT DISCHARGES (STANDARD NUMBER 10):

SW28. *The Illicit Discharge statement should be signed.*

Response: The applicant has signed the illicit discharge statement.

Please call me if you have any questions at 781-279-0180.

Sincerely,

RJO'CONNELL & ASSOCIATES



Brian J. McCarthy
Vice President

cc: MassDEP Central Regional Office
Robb Hewitt - Fairfield Residential Company, LLC
John Shipe - Fairfield Residential Company, LLC
Christopher Lucas – Lucas Environmental, LLC
Bryn Smith – Owner (electronic copy)

ATTACHMENTS:

Table of Contents

Attachment 1: Notice of Intent – Response Letter 1 by Lucas Environmental, LLC

Attachment 2: WPA Form 3

Attachment 3: Wetland & Buffer Zone Impact Exhibit

Attachment 4: Bankfull Determination Exhibits

Attachment 5: Stream Crossing Hydrologic/Hydraulic Calculations

Attachment 1:

Notice of Intent – Response Letter 1 by Lucas Environmental, LLC



March 28, 2024

Town of Franklin
Conservation Commission
355 East Central Street
Franklin, Massachusetts 02038

Re: Notice of Intent – Response Letter #1
121 Grove Street (Map 295, Lot 1 & Map 294, Lot 7)
Franklin, Massachusetts 02038
MassDEP File #159-1286

Members of the Franklin Conservation Commission:

On behalf of the project proponent, Fairfield Grove Street LLC, and in association with RJO'Connell & Associates, Inc. (RJOC), LLC, Lucas Environmental, LLC is pleased to submit this letter in response to the BETA Comment Letter, dated February 20, 2024, and as Attachment 1 to the RJOC Response Letter, dated March 28, 2024. This response is submitted as a supplement to the Notice of Intent (NOI) application for the proposed Grove Street Residences located at 121 Grove Street (Map 295, Lot 1 & Map 294, Lot 7) in Franklin, Massachusetts (MassDEP File #159-1286).

As a supplement to the RJOC Response Letter, LE has provided additional information to address BETA's comments related to 1) the updated impact analysis including Tables from the original NOI (BETA Comment A6), and 2) Inland Bank and Land Under Water Bodies and Waterways (LUWW) performance standards and compliance, and Limited Project discussion (W16, W21, and W22).

1.0 IMPACT ANALYSIS

This section provides the requested impact analysis updates per BETA Comment A6. Tables 5-1, 5-2, and 6-2 of the original NOI have been updated to reflect the revisions to the plans to address BETA's comments. Table 5-1 provides a summary of updated resource area impacts. Table 5-2 provides a summary of the updated Buffer Zone Impacts. Table 6-1 provides an updated summary of the projects compliance with the Stream Crossing Standards for the General requirements and Optimum standards where feasible. The bankfull width has been slightly adjusted for the roadway crossings to reflect the average of the three locations identified on the Bankfull Determination Exhibits for the roadway crossings, included with the RJOC Response Letter as Attachment 4.

Impacts to the wetlands near the Clubhouse Pool have been removed. The project results in the loss of approximately 480 square feet of BVW, reduced from 580 square feet from the original NOI. These impacts will be mitigated by replication of approximately 5,875 square feet of wetlands, which also includes replication for the local IVW loss of 2,015 square feet. This provides a 12.2 to 1 ratio of mitigation to impact for resource areas subject to jurisdiction under the WPA and 2.4 to 1 of mitigation to impact for resource areas subject to local jurisdiction.



TABLE 5-1 RESOURCE AREA IMPACTS – WPA *							
Impact Area	Area of Impact	BVW Alteration		Bank Alteration **		LUWW Alteration ***	
		Temporary (SF)	Permanent (SF)	Temporary (LF)	Permanent (LF)	Temporary (SF)	Permanent (SF)
Northern Access Roadway Crossing	BVW/Bank	185	450	30	125	420	0
Southern Access Roadway Crossing	Bank	0	0	30	110	425	0
Clubhouse Pool	BVW	0	0	0	0	0	0
Northern Boardwalk	BVW/Bank	740	20	25	0	113	0
Southern Boardwalk	BVW/Bank	350	10	20	0	62	0
Total		1,275	480	105	235	1,020	0
Proposed Mitigation		1,155	5,875	105	415	1,020	N/A

* Impact Calculations provided by RJOC. Temporary impacts listed are necessary to complete the proposed work.
 ** Alterations to Inland Bank are listed in the Table; however, there will be no loss of Bank associated with these resource areas at the impact areas. Each impact area is associated with the installation of a three-sided, open-bottom box culvert or boardwalk span.
 *** Per the existing and valid ORAD, there is no LUWW on the site. This column has been presented to show LUWW impacts if the resource area were present.
 **** Note: The construction of Building #4 will permanently impact 2,015 square feet of a non-regulated IVW. Impacts are not included.



TABLE 5-2 BUFFER ZONE IMPACTS*				
Impact Area	Temporary (square feet)	Permanent (square feet)		
		Crossings and IVW	Buildings & Infrastructure	Total Permanent
25-Foot Buffer Zone**	43,780	12,480	10,070	22,550
100-Foot Buffer Zone	112,920	352,080		

* Impact Calculations provided by RJOC. Temporary impacts listed are necessary to complete the proposed work.

** The Applicant is requesting a waiver to the 25-Foot Buffer Zone local requirements.

**TABLE 6-1
SUMMARY OF STREAM CROSSING STANDARD COMPLIANCE**

Parameter	General Standard	Provided for Access Roadways	Provided for Boardwalks
Spans	Bridges, 3-sided box culverts, open-bottom culverts, or arches	3-sided open-bottom box culvert (General)	Bridge span (Optimum Standard)
Embedment	Culverts should be embedded a minimum of 2 feet and at least 25% for round pipes.	N/A – 3-sided box culvert will have an open-bottom and span the streambed and banks.	N/A – Boardwalks will have an open-bottom and span the streambed and banks.
Crossing Span	General and Optimum Standard: Minimum: 1.2 x bankfull width	<p>Road Crossing #1: Required: 8.2 feet (1.2 x 6.8 feet) Proposed: 10 Feet</p> <p>Road Crossing #2: Required: 8.8 feet (1.2 x 7.3 feet) Proposed: 10 Feet</p>	<p>Boardwalk Crossing #1 North: Required: 7.5 feet (1.2 x 5.0 feet) Proposed: Minimum 7.5 Feet</p> <p>Boardwalk Crossing #1 South: Required: 10.2 feet (1.2 x 8.5 feet) Proposed: Minimum 10.2 Feet</p> <p>Boardwalk Crossing #2: Required: 8.4 feet (1.2 x 7.0 feet) Proposed: Minimum 8.4 Feet</p> <p>The footings will be installed to meet the minimum requirements above.</p>

**TABLE 6-1
SUMMARY OF STREAM CROSSING STANDARD COMPLIANCE**

Parameter	General Standard	Provided for Access Roadways	Provided for Boardwalks
Openness Ratio & Height	<p>Openness Ration (OR) = cross sectional area divided by length of culvert</p> <p>> 0.82 feet (0.25 meters)</p>	<p>Road Crossing #1: 4.3 feet (h) x 10 feet (w) = 43 square feet OR = 43 sq. ft./ 51.5 feet (l) = 0.835 ft (0.254 m)</p> <p>Road Crossing #2: 4 feet (h) x 10 feet (w) = 40 square feet OR = 40 sq. ft./ 45.9 feet (l) = 0.871 ft (0.266 m)</p>	<p>Boardwalk Crossing #1 North: 3.5 feet (h) x 5.0 feet (w) = 17.5 sq. feet OR = 17.5 sq. ft./ 5.0 feet (l) = 3.5 ft (1.07 m)</p> <p>Boardwalk Crossing #1 North: 3.5 feet (h) x 8.5 feet (w) = 29.75 sq. ft. OR = 29.75 sq. ft./ 5 feet (l) = 5.95 ft (1.81 m)</p> <p>Boardwalk Crossing #2: 3.5 feet (h) x 7 feet (w) = 24.5 sq. feet OR = 24.5 sq. ft./ 5 feet (l) = 4.9 ft (1.49 m)</p>
Substrate	<p>General and Optimum Standard: Match pre-construction substrate</p>	<p>The existing stream bed material will be removed and placed in the new crossings.</p>	<p>The existing stream bed will temporarily impacted to cross the stream and install the decking.</p>

**TABLE 6-1
SUMMARY OF STREAM CROSSING STANDARD COMPLIANCE**

Parameter	General Standard	Provided for Access Roadways	Provided for Boardwalks
Water Depth & Velocity	General and Optimum Standard: Match water depth & velocity in natural stream	Stream bed will be designed to match existing depth & velocity characteristics. Following installation of the box culverts, the streambed will be visually inspected to ensure there were no impacts to the upstream and downstream conditions (i.e., hydraulic gradient, substrate, and topography).	The stream beds will not be permanently altered and will match pre-existing conditions.
Banks	Optimum Standard: Match horizontal profile of stream and banks on both sides of stream. Constructed so as not to hinder use by riverine wildlife. Reduce hindrance to riverine wildlife.	The horizontal profile of the existing channel and banks will be designed to match existing characteristics. The Bank will be inspected by a qualified wetland professional to ensure that bank morphology, topography, and soil structure have not been impacted up or down gradient of the crossing. The box culverts will continue to allow wildlife movement.	The stream beds will not be permanently altered and will match pre-existing conditions. The boardwalks will continue to allow wildlife movement.

2.0 WPA PERFORMANCE STANDARDS COMMENTS

This section has been prepared to address BETA's comments (primarily W16, W21, and W22) as related to the project's compliance with the performance standards related to Inland Bank and LUWW. Under the Limited Project provisions, LE notes a fine distinction here in which the Commission does not have discretion as to whether or not the project meets the Limited Project provisions (it either does or does not); however, the Commission has discretion to approve the crossings as part of the overall project. LE has documented that the roadway crossings and boardwalk meet the Limited Project provisions.

2.1 Bank – 310 CMR 10.54

This section responds to BETA's Comment W16 as related to the projects compliance with the performance standards for Bank. LE notes that Section 6.3 of the original NOI included the project compliance with the performance standards for Inland Bank under Section 310 CMR 10.54(a) of the WPA for both roadway crossings and the three stream crossings associated with the boardwalks. As previously noted, the proposed roadway crossings meet the Stream Crossing Standards, and therefore are presumed to meet the performance standards for Inland Bank per the WPA Regulations. The boardwalk crossings, although they are not a typical roadway or driveway crossing, also meet the Stream Crossing Standards since the boardwalk structure was designed to meet the openness ratio and bankfull width requirements as documented in Table 6-1. Regardless, a narrative describing how the construction of the proposed boardwalks meet the performance standards for Inland Bank has been provided below.

Approximately 25 linear feet of Inland Bank associated with two streams channels will be altered for the construction of the northern boardwalk, and approximately 20 linear feet of Bank associated with an intermittent stream will be altered for the construction of the southern boardwalk.

Section 310 CMR 10.54(4) of the WPA describes the performance standards for Bank. The performance standard is listed in *italics* and the compliance statement is listed in standard format.

a) *Where the presumption set forth in 310 CMR 10.54(3) is not overcome, any proposed work on a Bank shall not impair the following:*

1. *the physical stability of the Bank;*

This standard is met. This work will not undermine the physical stability of the Banks and is temporary in nature as construction swamp mats will be used to cross the stream channels for construction of the boardwalks (See Plans). Minor work for the sewer installation includes trenching which will be restored upon completion (see RJOC Response Letter).

2. *the water carrying capacity of the existing channel within the Bank;*

This standard has been met. Both of the proposed boardwalks will be constructed in a manner that will not result in reduction in the width of the stream channel at either of the crossing locations. The footings will not be located within the stream channels and the boardwalk is elevated above the stream channels. Therefore, there will not be any change or alteration to the carrying capacity of the respective stream channels.

3. *ground water and surface water quality;*

This standard is met. Erosion control barriers will be implemented in order to protect wetland resource areas from sedimentation and turbidity. Therefore, the project will not result in the degradation of groundwater and surface water quality.

4. *the capacity of the Bank to provide breeding habitat, escape cover and food for fisheries;*

Not applicable – the intermittent streams on this site do not provide breeding habitat for fisheries.

5. *the capacity of the Bank to provide important wildlife habitat functions. A project or projects on a single lot, for which Notice(s) of Intent is filed on or after November 1, 1987, that (cumulatively) alter(s) up to 10% or 50 feet (whichever is less) of the length of the bank found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. In the case of a bank of a river or an intermittent stream, the impact shall be measured on each side of the stream or river. Additional alterations beyond the above threshold may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures contained in 310 CMR 10.60.*

This standard is met. The proposed boardwalks will alter less than 50 linear feet of Inland Bank as noted in Table 5-1.

6. *Work on a stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.54(4)(a) provided the work is performed in compliance with the Massachusetts Stream Crossing Standards by consisting of a span or embedded culvert in which, at a minimum, the bottom of a span structure or the upper surface of an embedded culvert is above the elevation of the top of the bank, and the structure spans the channel width by a minimum of 1.2 times the bankfull width. This presumption is rebuttable and may be overcome by the submittal of credible evidence from a competent source. Notwithstanding the requirement of 310 CMR 10.54(4)(a)5., the impact on bank caused by the installation of a stream crossing is exempt from the requirement to perform a habitat evaluation in accordance with the procedures contained in 310 CMR 10.60.*

This standard has been met. The proposed boardwalk structures have been designed to meet the Massachusetts Stream Crossing Standards by consisting of a bridge structure which meets the required bankfull width and openness ratio. See Table 6-1.

c) *Notwithstanding the provisions of 310 CMR 10.54(4)(a) or (b), no project may be permitted which will have any adverse effect on specified habitat sites of Rare Species, as identified by procedures established under 310 CMR 10.59*

Not applicable – the project is not located within habitat of rare species.

2.2 Land Under Water Bodies and Waterways – 310 CMR 10.56

LE disagrees with BETA’s assessment that LUWW is present on the site for the following two reasons:

1. Wetland resource areas were reviewed under an Abbreviated Notice of Resource Area Delineation (ANRAD) application submitted in December 2022. The ANRAD underwent peer review, and an Order of Resource Area Delineation (ORAD) was subsequently issued on April 6, 2023 (MassDEP File #CE159-1261). See Appendix A – Order of Resource Area Delineation of the original NOI. As part of the ANRAD application, the Applicant specifically requested confirmation that no other resource areas were present on the site. The ORAD confirmed all resource areas present, which only excluded the Inland Bank to the six streams noted by BETA, which have subsequently been reviewed and confirmed as accurately delineated under this NOI (Streams BF4 to BF9). The Commission cannot revise or modify the ORAD to include additional resource areas on the site while the ORAD is still valid.
2. LUWW is not present within intermittent streams, and it is not directly measurable. Per Section 310 CMR 10.56(4) of the WPA, “*the boundary of Land under Water Bodies and Waterways is the mean annual low water level.*” There is no direct way to measure the mean annual low water level of the intermittent streams on this site, and one could presume it is zero when the streams run dry. If you cannot measure the limit of LUWW, it cannot be quantified. LE’s opinion is that LUWW does not exist on this site and therefore does not require an impact analysis or further discussion; however, LE has provided the following narrative to discuss the project’s compliance with the performance standards of LUWW for the roadway crossings and boardwalks, as if LUWW were present.

Assuming LUWW were present on the site, the project complies with the WPA performance standards for the resource area LUWW. Section 310 CMR 10.56(4) of the WPA describes the performance standards for LUWW. The performance standard is listed in *italics* and the compliance statement is listed in standard format.

Approximately 420 square feet of LUWW at the northern stream (BF2) will be temporarily altered to construct the stream crossing for the access roadway to the north, and approximately 425 square feet of the southern stream (BF1) will be temporarily altered to construct the stream crossing for the access roadway to the south. Additionally, approximately 113 square feet of LUWW associated with stream BF2 and BF8 will be temporarily altered for the construction of the northern boardwalk and approximately 62 square feet of LUWW associated with stream BF1 will be temporarily altered for the construction of the southern boardwalk.

Refer to Table 5-1 for an updated impact analysis quantifying impacts to LUWW. Note that the impacts for LUWW were conservatively assumed to be the land between the limit of the delineated Bank on each side of the channel for the purposes of this discussion.

Section 310 CMR 10.56(4)(a)(5) of the WPA addresses stream crossings as it pertains to the performance standards for LUWW at each of the roadway crossings, as follows:

5. *Work on a stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.54(4)(a) provided the work is performed in compliance with the Massachusetts Stream Crossing Standards by consisting of a span or embedded culvert in which, at a minimum, the bottom of a span structure or the upper surface of an embedded culvert is above the elevation of the top of the bank, and the structure spans the channel width by a minimum of 1.2 times the bankfull width...Notwithstanding the requirements 310 CMR 10.54(4)(a)5., the impact on bank caused by the installation of a stream crossing is exempt from the requirement to perform a habitat evaluation in accordance with the procedures contained in 310 CMR 10.60.*

The proposed roadway crossings consist of open-bottom box culverts designed to meet the Massachusetts Stream Crossing Standards; therefore, the proposed roadway crossings comply with the performance standard for LUWW. LE presumes this also applies to the three stream crossings associated with the two boardwalks; however, although not required, LE has provided further discussion below documenting the boardwalks for Section 310 CMR 10.56(4)(a)1. to 4.

- (a) *Where the presumption set forth in 310 CMR 10.56(3) is not overcome, any proposed work within Land under Water Bodies and Waterways shall not impair the following:*

1. *The water carrying capacity within the defined channel, which is provided by said land in conjunction with the banks;*

This standard has been met. Both of the proposed boardwalks will be constructed in a manner that will not result in permanent disturbance to the LUWW at either of the crossing locations. Minor work for the sewer installation includes trenching which will be restored upon completion (see RJOC Response Letter), resulting in approximately 16.7 cubic yards of material to be stockpiled and replaced. Therefore, there will not be any change or alteration to the carrying capacity of the respective stream channels. All temporary impacts to LUWW for the roadway crossings and boardwalks consist of construction swamp mats to cross the stream channels for construction of the boardwalks (See Plans).

2. *Ground and surface water quality;*

This standard is met. Erosion control barriers will be implemented in order to protect wetland resource areas from sedimentation and turbidity. Therefore, the project will not result in the degradation of groundwater and surface water quality.

3. *The capacity of said land to provide breeding habitat, escape cover and food for fisheries; and*

Not applicable – the intermittent streams do not provide breeding habitat for fisheries.

4. *The capacity of said land to provide important wildlife habitat functions. A project or projects on a single lot, for which Notice(s) of intent is filed on or after November 1, 1987, that (cumulatively) alter(s) up to 10% or 5,000 square feet (whichever is less) of land in this resource area found to be significant to the protection of wildlife habitat, shall not be deemed to impair its capacity to provide important wildlife habitat functions. Additional alterations beyond the above threshold may be permitted if they will have no adverse effects on wildlife habitat, as determined by procedures established under 310 CMR 10.60.*



This standard is met. The crossing will temporarily impact approximately 1,020 square feet of LUWW, significantly less than 5,000 square feet.

5. *Work on a stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.56(4)(a) provided the work is performed in compliance with the Massachusetts Stream Crossing Standards by consisting of a span or embedded culvert in which, at a minimum, the bottom of a span structure or the upper surface of an embedded culvert is above the elevation of the top of the bank, and the structure spans the channel width by a minimum of 1.2 times the bankfull width. This presumption is rebuttable and may be overcome by the submittal of credible evidence from a competent source. Notwithstanding the requirements of 310 CMR 10.56(4)(a)4., the impact on Land under Water Bodies and Waterways caused by the installation of a stream crossing is exempt from the requirement to perform a habitat evaluation in accordance with the procedures established under 310 CMR 10.60.*

This standard has been met. The proposed boardwalk structures have been designed to meet the Massachusetts Stream Crossing Standards by consisting of a bridge structure which meets the required bankfull width and openness ratio. See Table 6-1 above.

- (c) *Notwithstanding the provisions of 310 CMR 10.56(4)(a) or (b), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.*

Not applicable – the project is not located within habitat of rare species.

It is LE's opinion, based on our professional education, training, and familiarity with the project site, that the proposed work will not have any permanent adverse effect on any interests identified in the Wetlands Protection Act and are designed to minimize adverse effects on the local ecosystem, and fully complies with the performance standards for work within Inland Bank, BVW, and LUWW (if it were present).

If you have any questions, please do not hesitate to contact me at 617.405.4140 or cml@lucasenviro.com. Thank you for your consideration in this matter.

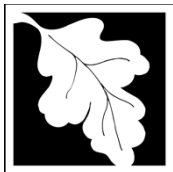
Sincerely,
LUCAS ENVIRONMENTAL, LLC

A handwritten signature in blue ink that reads 'Christopher M. Lucas'.

Christopher M. Lucas, PWS, CWS, RPSS
Environmental Consultant/Wetland & Soil Scientist

cc: See RJOC Letter

Attachment 2:
WPA Form 3



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Franklin
City/Town

Important:

When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Note:
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

<u>121 Grove Street</u>	<u>Franklin</u>	<u>02038</u>
a. Street Address	b. City/Town	c. Zip Code
Latitude and Longitude:		
<u>42° 4' 36.5" N</u>	<u>71° 25' 21.55" W</u>	
d. Latitude	e. Longitude	
<u>Map 294 & 295</u>	<u>Lots 7 & 1</u>	
f. Assessors Map/Plat Number	g. Parcel /Lot Number	

2. Applicant:

<u>Robert</u>	<u>Hewitt</u>	
a. First Name	b. Last Name	
<u>Fairfield Grove Street LLC</u>		
c. Organization		
<u>30 Braintree Hill Office Park, Suite 105</u>		
d. Street Address		
<u>Braintree</u>	<u>MA</u>	<u>02184</u>
e. City/Town	f. State	g. Zip Code
<u>781.881.2303</u>	<u>rhewitt@ffres.com</u>	
h. Phone Number	i. Fax Number	j. Email Address

3. Property owner (required if different from applicant): Check if more than one owner

<u>Bryn</u>	<u>Smith</u>	
a. First Name	b. Last Name	
c. Organization		
<u>106 Mendon Street</u>		
d. Street Address		
<u>Bellingham</u>	<u>MA</u>	<u>02019</u>
e. City/Town	f. State	g. Zip Code
<u>508.523.3492</u>	<u>brun@thenicecompany.com</u>	
h. Phone Number	i. Fax Number	j. Email address

4. Representative (if any):

<u>Christopher</u>	<u>Lucas</u>	
a. First Name	b. Last Name	
<u>Lucas Environmental, LLC</u>		
c. Company		
<u>500A Washington Street</u>		
d. Street Address		
<u>Quincy</u>	<u>MA</u>	<u>02169</u>
e. City/Town	f. State	g. Zip Code
<u>617.405.4140</u>	<u>617.405.4465</u>	<u>cml@lucasenviro.com</u>
h. Phone Number	i. Fax Number	j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

<u>\$9,150.00</u>	<u>\$4,562.50</u>	<u>\$4,587.50</u>
a. Total Fee Paid	b. State Fee Paid	c. City/Town Fee Paid



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:	
MassDEP File Number	
Document Transaction Number	
Franklin	
City/Town	

A. General Information (continued)

6. General Project Description:

The proposed project involves the construction of a multi-building residential development. Portions of the proposed project will be located within Bordering Vegetated Wetlands, Inland Bank, and the associated 100-Foot Buffer Zone.

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

- 1. Single Family Home
- 2. Residential Subdivision
- 3. Commercial/Industrial
- 4. Dock/Pier
- 5. Utilities
- 6. Coastal engineering Structure
- 7. Agriculture (e.g., cranberries, forestry)
- 8. Transportation
- 9. Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

- 1. Yes No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)
310 CMR 10.53(3)(e) - construction and maintenance of a new roadway or driveway and
310 CMR 10.53(3)(j) for the proposed boardwalks

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

Middlesex	
a. County	b. Certificate # (if registered land)
39702	310
c. Book	d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

- 1. Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
- 2. Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Franklin
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. <input checked="" type="checkbox"/> Bank	105 Temp.; 235 Perm. 1. linear feet	520 2. linear feet
b. <input checked="" type="checkbox"/> Bordering Vegetated Wetland	1,275 Temp.; 480 Perm. 1. square feet	7,150 2. square feet
c. <input checked="" type="checkbox"/> Land Under Waterbodies and Waterways*	1,020 Temp.; 0 Perm. 1. square feet 16.7 3. cubic yards dredged	1,020 2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. <input type="checkbox"/> Bordering Land Subject to Flooding	1. square feet	2. square feet
	3. cubic feet of flood storage lost	4. cubic feet replaced
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet	
	2. cubic feet of flood storage lost	3. cubic feet replaced
f. <input type="checkbox"/> Riverfront Area	1. Name of Waterway (if available) - specify coastal or inland	

2. Width of Riverfront Area (check one):

- 25 ft. - Designated Densely Developed Areas only
- 100 ft. - New agricultural projects only
- 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: _____ square feet

4. Proposed alteration of the Riverfront Area:

_____	_____	_____
a. total square feet	b. square feet within 100 ft.	c. square feet between 100 ft. and 200 ft.

5. Has an alternatives analysis been done and is it attached to this NOI? Yes No

6. Was the lot where the activity is proposed created prior to August 1, 1996? Yes No

3. Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f.** above.

***ORAD (MassDEP File #CE159-1261) issued on April 6, 2023 confirmed no LUWW on-site. BETA has since incorrectly contested that it is present and should be quantified. The Applicant is showing the impacts herein assuming it is present, which we contend it is not.**



WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Franklin
 City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users:
 Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. <input type="checkbox"/> Land Under the Ocean	_____	
	1. square feet	

	2. cubic yards dredged	
c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. <input type="checkbox"/> Coastal Beaches	_____	_____
	1. square feet	2. cubic yards beach nourishment
e. <input type="checkbox"/> Coastal Dunes	_____	_____
	1. square feet	2. cubic yards dune nourishment
	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
f. <input type="checkbox"/> Coastal Banks	_____	
	1. linear feet	
g. <input type="checkbox"/> Rocky Intertidal Shores	_____	
	1. square feet	
h. <input type="checkbox"/> Salt Marshes	_____	_____
	1. square feet	2. sq ft restoration, rehab., creation
i. <input type="checkbox"/> Land Under Salt Ponds	_____	
	1. square feet	

	2. cubic yards dredged	
j. <input type="checkbox"/> Land Containing Shellfish	_____	
	1. square feet	
k. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above	

	1. cubic yards dredged	
l. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	_____	
	1. square feet	
4. <input type="checkbox"/> Restoration/Enhancement	If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.	
	_____	_____
	a. square feet of BVW	b. square feet of Salt Marsh
5. <input checked="" type="checkbox"/> Project Involves Stream Crossings		
	1 - Road Crossing; 3 - Boardwalks	1 - Road Crossing
	a. number of new stream crossings	b. number of replacement stream crossings



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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MassDEP File Number

Document Transaction Number

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C. Other Applicable Standards and Requirements

- This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

- a. Yes No **If yes, include proof of mailing or hand delivery of NOI to:**

**Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581**

August 1, 2021
b. Date of map

If yes, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); OR complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

- c. Submit Supplemental Information for Endangered Species Review*

1. Percentage/acreage of property to be altered:
 - (a) within wetland Resource Area _____ percentage/acreage
 - (b) outside Resource Area _____ percentage/acreage
2. Assessor's Map or right-of-way plan of site

2. Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **
 - (a) Project description (including description of impacts outside of wetland resource area & buffer zone)
 - (b) Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see <https://www.mass.gov/endangered-species-act-mesa-regulatory-review>).

Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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MassDEP File Number

Document Transaction Number

Franklin

City/Town

C. Other Applicable Standards and Requirements (cont'd)

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?
- a. Yes No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.
- b. ACEC
5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?
- a. Yes No
6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?
- a. Yes No
7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?
- a. Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:
1. Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)
 2. A portion of the site constitutes redevelopment
 3. Proprietary BMPs are included in the Stormwater Management System.
- b. No. Check why the project is exempt:
1. Single-family house
 2. Emergency road repair
 3. Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

- This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
2. Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

Online Users:
Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:	
MassDEP File Number	
Document Transaction Number	
Franklin	
City/Town	

D. Additional Information (cont'd)

3. Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. List the titles and dates for all plans and other materials submitted with this NOI.

Grove Street Residences, 121 Grove Street - Franklin, MA

a. Plan Title

RJO'Connell & Associates, Inc.

Brian P. Dundon, P.E.

b. Prepared By

c. Signed and Stamped by

March 20, 2024

1" = 40'

d. Final Revision Date

e. Scale

Stormwater Management Report

March 20, 2024

f. Additional Plan or Document Title

g. Date

5. If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. Attach NOI Wetland Fee Transmittal Form

9. Attach Stormwater Report, if needed.

E. Fees

1. Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

702984

December 13, 2023

2. Municipal Check Number

3. Check date

702983

December 13, 2023

4. State Check Number

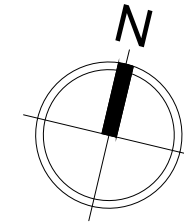
5. Check date

FRH Realty LLC

6. Payor name on check: First Name

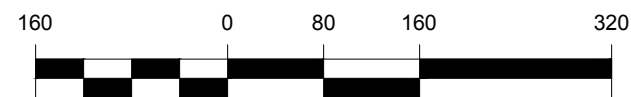
7. Payor name on check: Last Name

Attachment 3:
Wetland & Buffer Zone Impact Exhibit



WETLAND & BUFFER ZONE IMPACT CHART		
RESOURCE	HATCH COLORING	AREA IMPACTED
BORDERING VEGETATED WETLAND		480 S.F. (PERMANENT)
BORDERING VEGETATED WETLAND		1,275 S.F. (TEMPORARY)
ISOLATED VEGETATED WETLAND		2,015 S.F. (PERMANENT)
INTERMITTENT STREAM BANK		235 L.F. (PERMANENT)
INTERMITTENT STREAM BANK		105 L.F. (TEMPORARY)
LAND UNDER WATER		1,020 S.F. (TEMPORARY)
25' WETLAND BUFFER ZONE		22,550 S.F. (PERMANENT)
25' WETLAND BUFFER ZONE		43,780 S.F. (TEMPORARY)
100' WETLAND BUFFER ZONE		465,000 S.F.

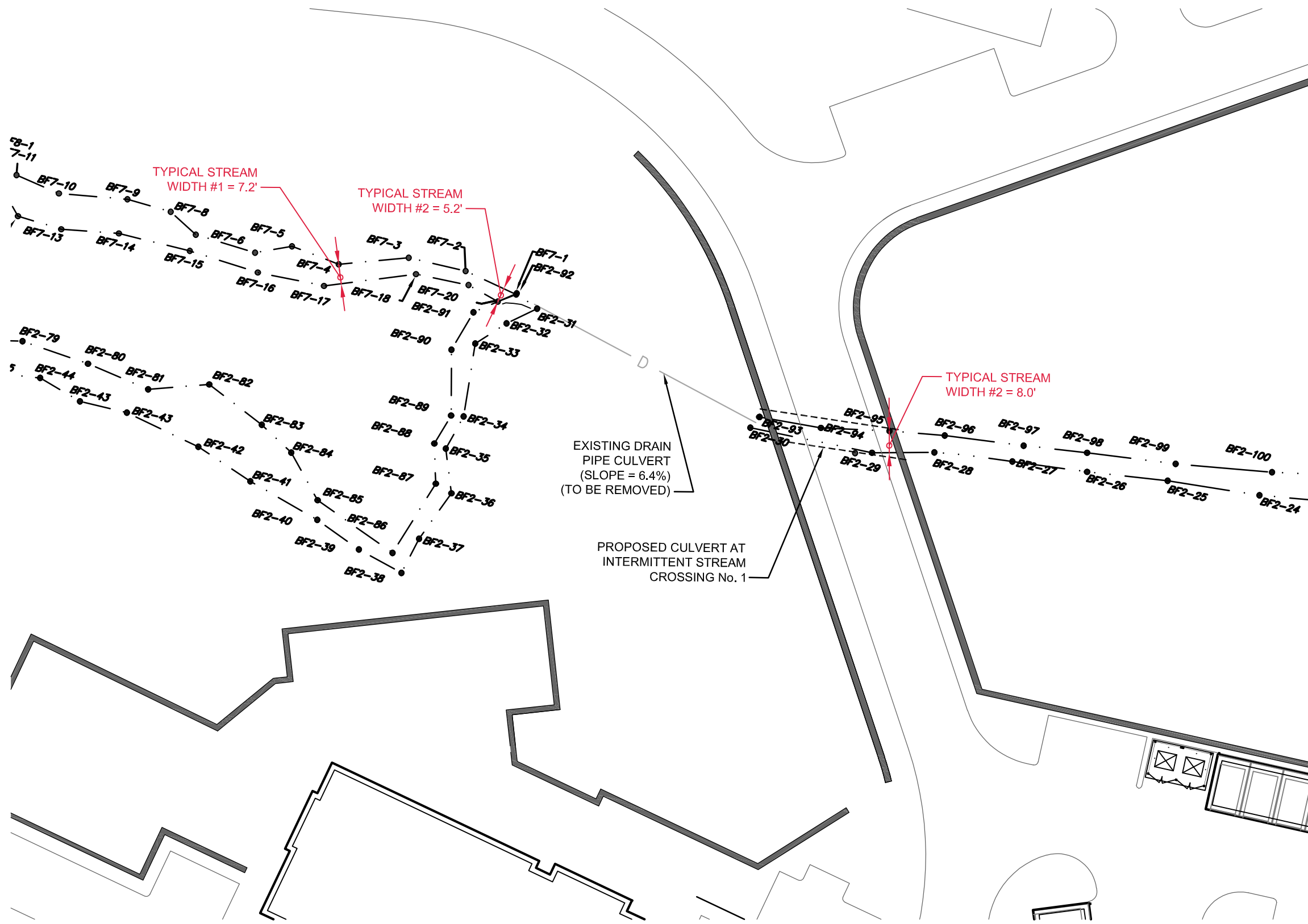
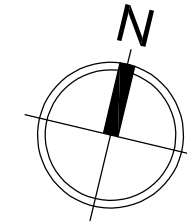
TOTAL BVW & IVW PERMANENT WETLAND IMPACTS = 2,495 S.F.



GRAPHIC SCALE IN FEET

RJO'CONNELL & ASSOCIATES, INC.
 CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
 DATE: 12/18/2023 SCALE: 1"=160'
 REVISED: 03/28/2024
 GROVE STREET RESIDENCES
WETLAND & BUFFER ZONE IMPACT EXHIBIT
 121 GROVE STREET
 FRANKLIN, MA

Attachment 4:
Bankfull Determination Exhibits



BANKFULL WIDTH CALCULATIONS

AVERAGE EXISTING BANKFULL WIDTH CALCULATION:

- TYPICAL STREAM WIDTH #1 = 7.2'
- TYPICAL STREAM WIDTH #2 = 5.2'
- TYPICAL STREAM WIDTH #3 = 8.0'

$(7.2 + 5.2 + 8.0) / 3 = 6.8'$

AVERAGE EXISTING BACKFULL WIDTH = 6.8'

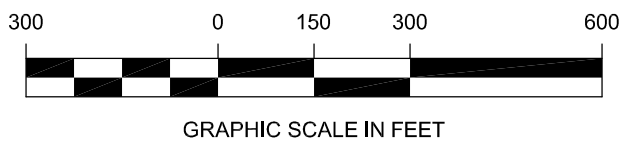
MINIMUM ALLOWABLE BANKFULL WIDTH CALCULATION:

- $(6.8')(1.2) = 8.2'$

MINIMUM ALLOWABLE BANKFULL WIDTH = 8.2'

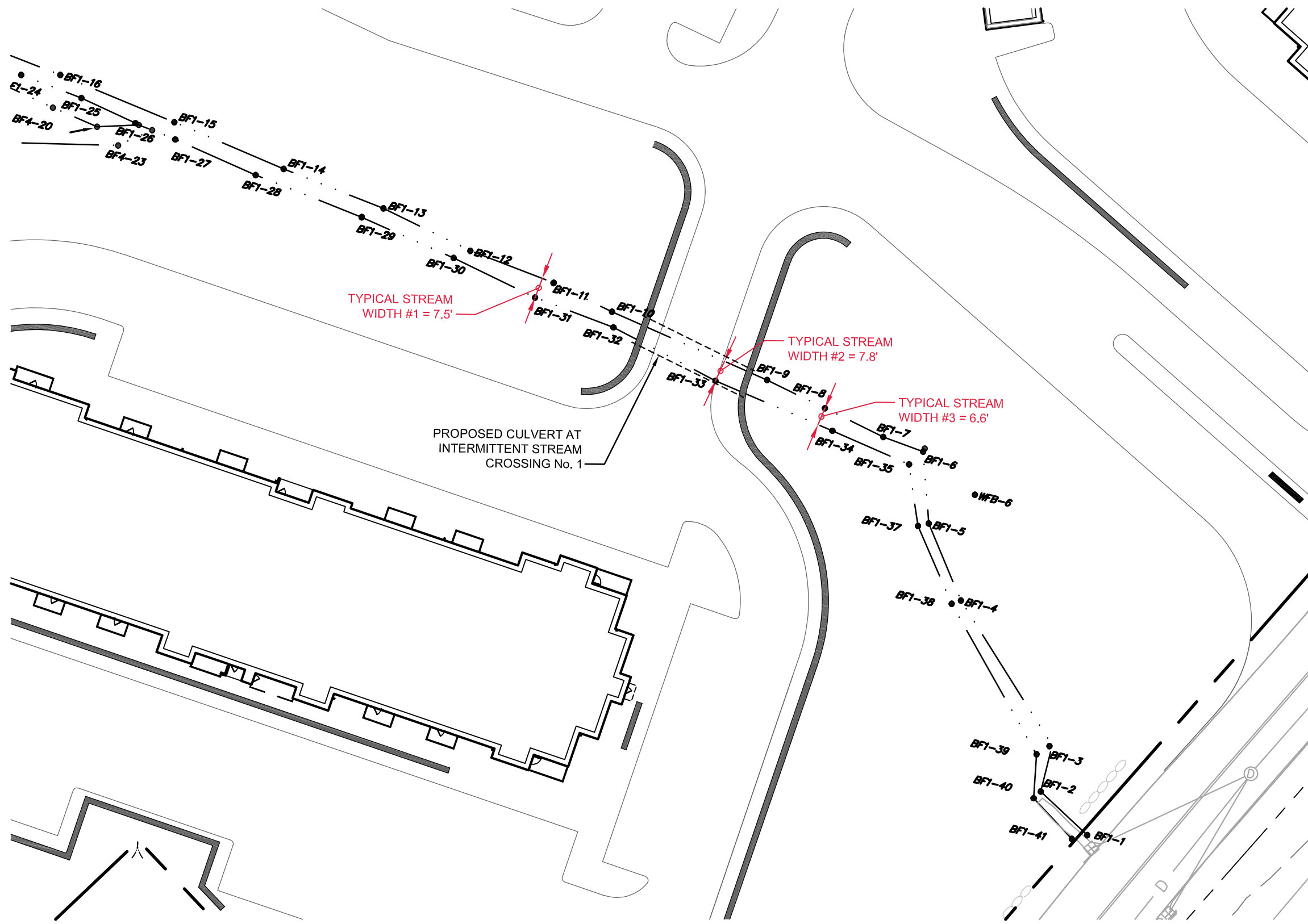
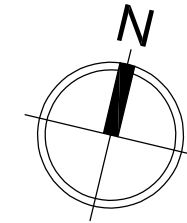
PROPOSED BANKFULL WIDTH = 10.0'

(CALCULATIONS PER MASSACHUSETTS RIVER AND STREAM CROSSING STANDARDS)



RJO'CONNELL & ASSOCIATES, INC.
 CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
 DATE: 03/28/2024 SCALE: 1"=40'
BANKFULL DETERMINATION AT STREAM CROSSING #1
 121 GROVE STREET
 FRANKLIN, MA 02038

Drawing name: G:\MA\Franklin\Fairfield Residential\121 Grove Street\Engineer\Inter. Stream Crossing Calcs\22016_Bank Full Width Exhibit.dwg
 Mar 25, 2024 - 12:16pm



PROPOSED CULVERT AT
INTERMITTENT STREAM
CROSSING No. 1

BANKFULL WIDTH CALCULATIONS

AVERAGE EXISTING BANKFULL WIDTH CALCULATION:

- TYPICAL STREAM WIDTH #1 = 7.5'
- TYPICAL STREAM WIDTH #2 = 7.8'
- TYPICAL STREAM WIDTH #3 = 6.6'

$(7.5 + 7.8 + 6.6) / 3 = 7.3'$

AVERAGE EXISTING BACKFULL WIDTH = 7.3'

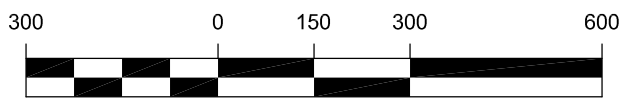
MINIMUM ALLOWABLE BANKFULL WIDTH CALCULATION:

- $(7.3')(1.2) = 8.8'$

MINIMUM ALLOWABLE BANKFULL WIDTH = 8.8'

PROPOSED BANKFULL WIDTH = 10.0'

(CALCULATIONS PER MASSACHUSETTS RIVER AND STREAM CROSSING STANDARDS)

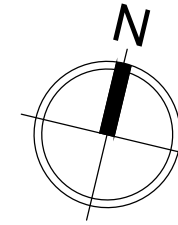
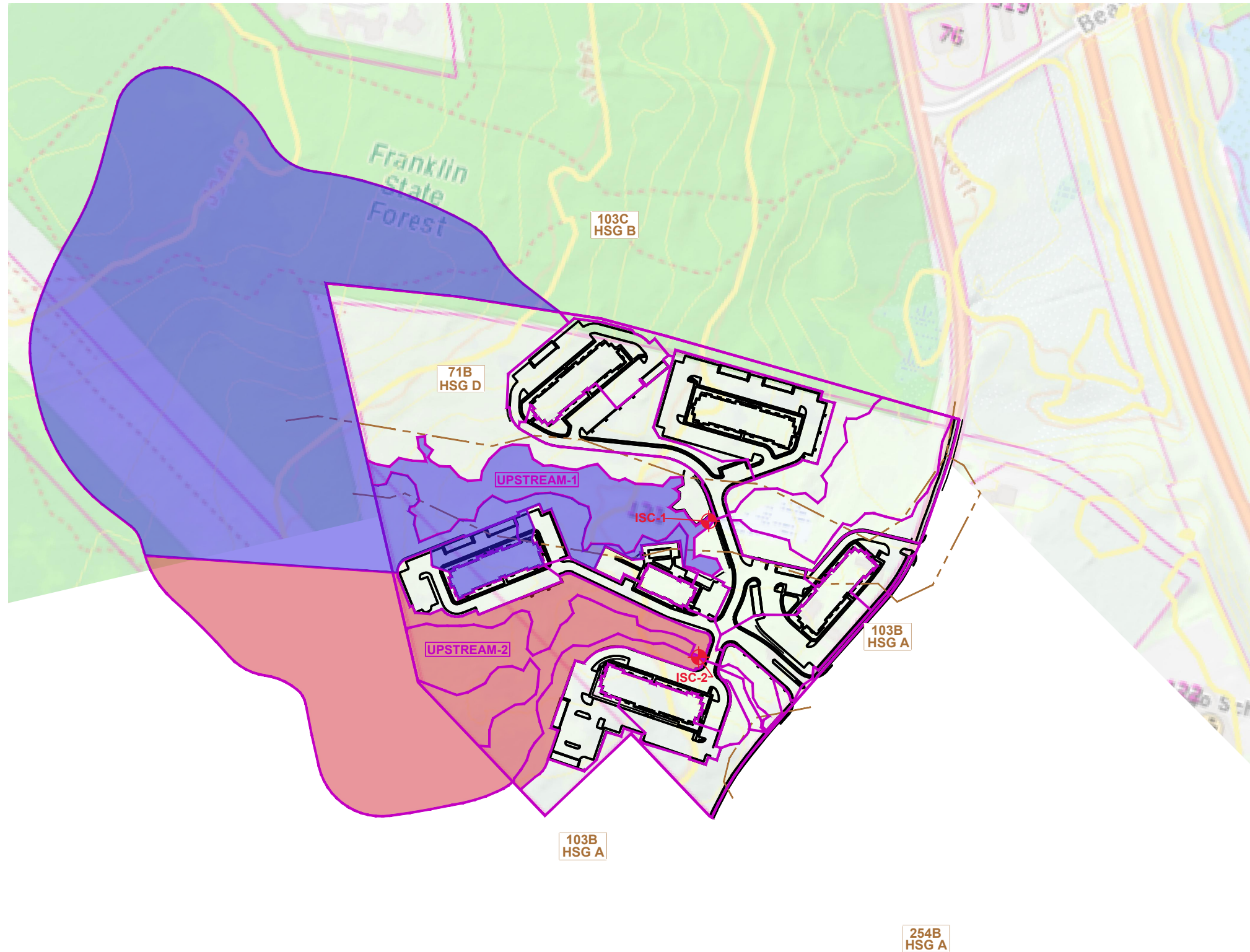


GRAPHIC SCALE IN FEET

RJO'CONNELL & ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
DATE: 03/28/2024 SCALE: 1"=40'
**BANKFULL DETERMINATION AT
STREAM CROSSING #2**
121 GROVE STREET
FRANKLIN, MA 02038

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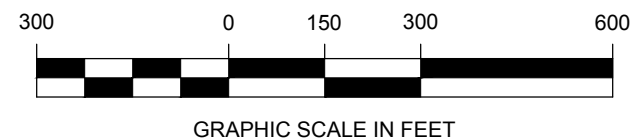
Attachment 5:
Stream Crossing Hydrologic/Hydraulic Calculations



- SUBCATCHMENT UPSTREAM FROM PROPOSED INTERMITTENT STREAM CROSSING #1
- SUBCATCHMENT UPSTREAM FROM PROPOSED INTERMITTENT STREAM CROSSING #2
- + ISC-1 INTERMITTENT STREAM CROSSING
- UPSTREAM-1 SUBCATCHMENT LABEL
- 103B SOIL TYPE
- HSG HYDROLOGIC SOIL GROUP
- SOIL BOUNDARY

NOTES:

1. LOCATIONS AND TYPES OF SOIL DESIGNATIONS SHOWN HEREON HAVE BEEN DELINEATED BY USDA NATURAL RESOURCES CONSERVATION SERVICE (NRCS) AND COMPILED BY MA GIS
2. ONSITE WATERSHED AREAS BASED UPON ANALYSIS PREPARED WITHIN STORMWATER REPORT FOR THIS PROJECT. (SEE POST WATERSHED PLAN (FIGURE-5))
3. OFFSITE WATERSHED AREAS DETERMINED VIA MASSGIS ONLINE CONTOUR MAPPING.

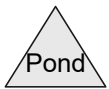
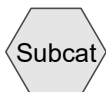
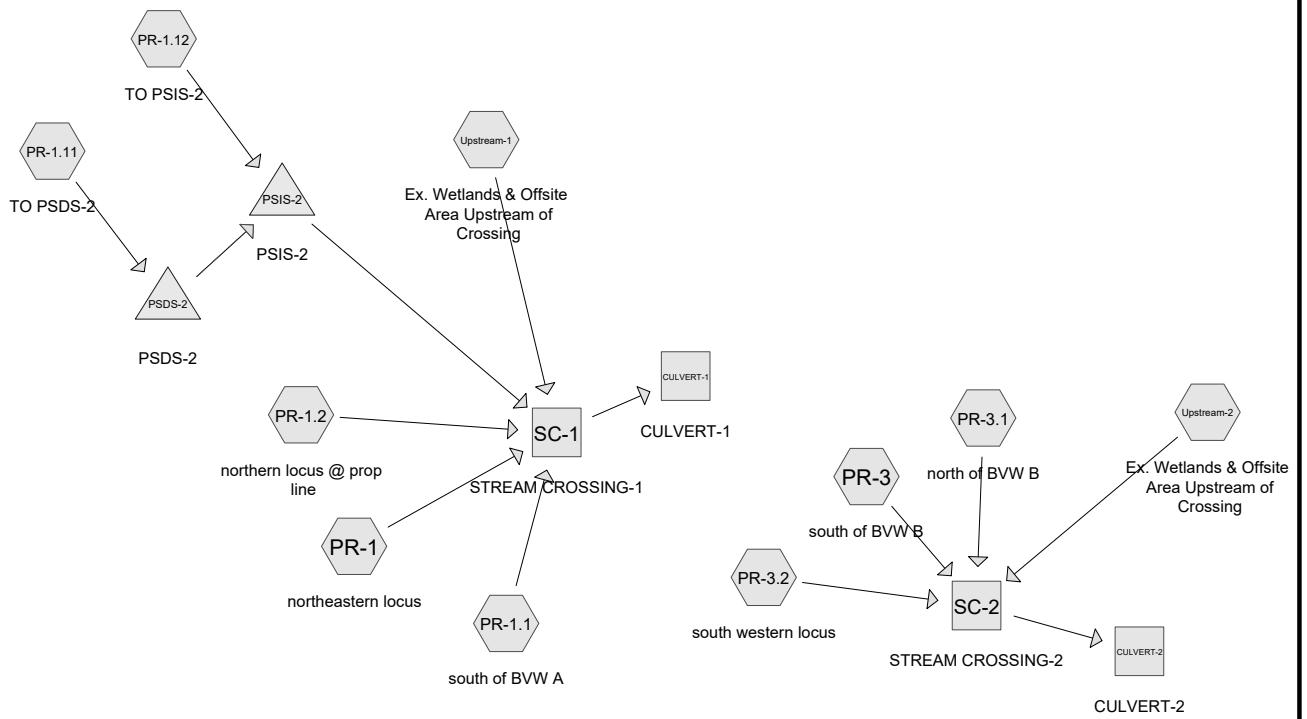


RJO'CONNELL & ASSOCIATES, INC.
 CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS

DATE: 03/28/2024 SCALE: 1"=300'
 REVISED:

FIGURE 8
STREAM CROSSING WATERSHED PLAN

121 GROVE STREET
 FRANKLIN, MA



Routing Diagram for 22016-POST_STREAM CROSSING
 Prepared by RJOC, Printed 2/27/2024
 HydroCAD® 10.10-6a s/n 04881 © 2020 HydroCAD Software Solutions LLC

22016-POST_STREAM CROSSING

Prepared by RJOC

HydroCAD® 10.10-6a s/n 04881 © 2020 HydroCAD Software Solutions LLC

Culvert Flow Calcs

Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Printed 2/27/2024

Page 2

Summary for Subcatchment PR-1: northeastern locus

Runoff = 16.8 cfs @ 12.18 hrs, Volume= 65,336 cf, Depth> 3.57"
Routed to Reach SC-1 : STREAM CROSSING-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
51,817	77	Woods, Good, HSG D
813	80	>75% Grass cover, Good, HSG D
162,557	55	Woods, Good, HSG B
* 4,295	72	Dirt Path
219,482	61	Weighted Average
219,482		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0800	0.1		Sheet Flow, overland (woods) Woods: Light underbrush n= 0.400 P2= 3.32"
1.8	165	0.0940	1.5		Shallow Concentrated Flow, overland (woods) Woodland Kv= 5.0 fps
0.0	9	0.1000	5.1		Shallow Concentrated Flow, overland (path) Unpaved Kv= 16.1 fps
2.6	256	0.1110	1.7		Shallow Concentrated Flow, overland (woods) Woodland Kv= 5.0 fps
0.0	10	0.1000	5.1		Shallow Concentrated Flow, overland (path) Unpaved Kv= 16.1 fps
1.2	113	0.0970	1.6		Shallow Concentrated Flow, overland (woods) Woodland Kv= 5.0 fps
12.6	603	Total			

Summary for Subcatchment PR-1.1: south of BVW A

Runoff = 4.4 cfs @ 12.09 hrs, Volume= 13,805 cf, Depth> 3.24"
Routed to Reach SC-1 : STREAM CROSSING-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
21,801	77	Woods, Good, HSG D
603	39	>75% Grass cover, Good, HSG A
8,166	80	>75% Grass cover, Good, HSG D
20,582	30	Woods, Good, HSG A
51,152	58	Weighted Average
51,152		100.00% Pervious Area

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Culvert Flow Calcs

Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

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Page 3

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment PR-1.11: TO PSDS-2

Runoff = 2.5 cfs @ 12.08 hrs, Volume= 8,105 cf, Depth> 6.74"
Routed to Pond PSDS-2 : PSDS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	11,889	98	Impervious Area
	2,546	39	>75% Grass cover, Good, HSG A
	14,435	88	Weighted Average
	2,546		17.64% Pervious Area
	11,889		82.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, min. eng pract

Summary for Subcatchment PR-1.12: TO PSIS-2

Runoff = 3.5 cfs @ 12.08 hrs, Volume= 12,420 cf, Depth> 7.81"
Routed to Pond PSIS-2 : PSIS-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

	Area (sf)	CN	Description
*	16,369	98	Roof Area
*	1,892	98	Impervious Area
	812	80	>75% Grass cover, Good, HSG D
	19,073	97	Weighted Average
	812		4.26% Pervious Area
	18,261		95.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, min. eng pract

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Culvert Flow Calcs

Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

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Page 4

Summary for Subcatchment PR-1.2: northern locus @ prop line

Runoff = 4.3 cfs @ 12.10 hrs, Volume= 13,652 cf, Depth> 3.69"
Routed to Reach SC-1 : STREAM CROSSING-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
37,239	61	>75% Grass cover, Good, HSG B
3,652	55	Woods, Good, HSG B
3,492	80	>75% Grass cover, Good, HSG D
44,383	62	Weighted Average
44,383		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.8	50	0.0500	0.2		Sheet Flow, Grass: Short n= 0.150 P2= 3.32"
2.6	769	0.0930	4.9		Shallow Concentrated Flow, overland (grass) Unpaved Kv= 16.1 fps
6.4	819	Total			

Summary for Subcatchment PR-3: south of BVW B

Runoff = 0.1 cfs @ 12.34 hrs, Volume= 1,334 cf, Depth> 0.61"
Routed to Reach SC-2 : STREAM CROSSING-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
19,666	30	Woods, Good, HSG A
6,445	39	>75% Grass cover, Good, HSG A
* 64	98	Impervious Area
26,175	32	Weighted Average
26,111		99.76% Pervious Area
64		0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

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Culvert Flow Calcs

Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

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Page 5

Summary for Subcatchment PR-3.1: north of BVW B

Runoff = 0.4 cfs @ 12.15 hrs, Volume= 3,066 cf, Depth> 0.86"
Routed to Reach SC-2 : STREAM CROSSING-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
17,728	30	Woods, Good, HSG A
24,872	39	>75% Grass cover, Good, HSG A
42,600	35	Weighted Average
42,600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Summary for Subcatchment PR-3.2: south western locus

Runoff = 0.1 cfs @ 12.51 hrs, Volume= 1,000 cf, Depth> 0.46"
Routed to Reach SC-2 : STREAM CROSSING-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
26,302	30	Woods, Good, HSG A
26,302		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.32"
0.9	53	0.0350	0.9		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
13.0	103	Total			

Summary for Subcatchment Upstream-1: Ex. Wetlands & Offsite Area Upstream of Crossing

Runoff = 93.4 cfs @ 12.30 hrs, Volume= 451,805 cf, Depth> 5.42"
Routed to Reach SC-1 : STREAM CROSSING-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

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Culvert Flow Calcs

Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

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Page 6

Area (sf)	CN	Description
* 101,282	77	Onsite Wetland Area
* 899,543	77	Offsite Area (Franklin State Forest)
1,000,825	77	Weighted Average
1,000,825		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0700	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.32"
15.2	877	0.0370	1.0		Shallow Concentrated Flow, overland Woodland Kv= 5.0 fps
22.5	927	Total			

Summary for Subcatchment Upstream-2: Ex. Wetlands & Offsite Area Upstream of Crossing

Runoff = 33.4 cfs @ 12.33 hrs, Volume= 166,826 cf, Depth> 5.42"
Routed to Reach SC-2 : STREAM CROSSING-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

Area (sf)	CN	Description
* 88,691	77	Onsite Wetland Area
* 281,000	77	Offsite Area (Franklin State Forest)
369,691	77	Weighted Average
369,691		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.1	50	0.0200	0.1		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.32"
12.4	698	0.0350	0.9		Shallow Concentrated Flow, overland Woodland Kv= 5.0 fps
24.5	748	Total			

Summary for Reach CULVERT-1: CULVERT-1

Inflow Area = 1,349,350 sf, 2.23% Impervious, Inflow Depth > 4.91" for 100-Yr 24 Hr event
Inflow = 113.9 cfs @ 12.28 hrs, Volume= 552,524 cf
Outflow = 113.9 cfs @ 12.28 hrs, Volume= 552,468 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.3 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.6 fps, Avg. Travel Time= 0.3 min

Peak Storage= 708 cf @ 12.28 hrs
Average Depth at Peak Storage= 1.38' , Surface Width= 10.00'
Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 536.4 cfs

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Culvert Flow Calcs

Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

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Page 7

10.00' x 4.00' deep channel, n= 0.022 Earth, clean & straight

Length= 51.5' Slope= 0.0136 '/'

Inlet Invert= 279.70', Outlet Invert= 279.00'



Summary for Reach CULVERT-2: CULVERT-2

Inflow Area = 464,768 sf, 0.01% Impervious, Inflow Depth > 4.45" for 100-Yr 24 Hr event

Inflow = 34.0 cfs @ 12.33 hrs, Volume= 172,226 cf

Outflow = 34.0 cfs @ 12.33 hrs, Volume= 172,207 cf, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Max. Velocity= 7.2 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.3 fps, Avg. Travel Time= 0.3 min

Peak Storage= 216 cf @ 12.33 hrs

Average Depth at Peak Storage= 0.47' , Surface Width= 10.00'

Bank-Full Depth= 4.00' Flow Area= 40.0 sf, Capacity= 859.0 cfs

10.00' x 4.00' deep channel, n= 0.022 Earth, clean & straight

Length= 45.9' Slope= 0.0349 '/'

Inlet Invert= 289.10', Outlet Invert= 287.50'



Summary for Reach SC-1: STREAM CROSSING-1

Inflow Area = 1,349,350 sf, 2.23% Impervious, Inflow Depth > 4.91" for 100-Yr 24 Hr event

Inflow = 113.9 cfs @ 12.28 hrs, Volume= 552,524 cf

Outflow = 113.9 cfs @ 12.28 hrs, Volume= 552,524 cf, Atten= 0%, Lag= 0.0 min

Routed to Reach CULVERT-1 : CULVERT-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

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Culvert Flow Calcs

Type III 24-hr 100-Yr 24 Hr Rainfall=8.18"

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Page 8

Summary for Reach SC-2: STREAM CROSSING-2

Inflow Area = 464,768 sf, 0.01% Impervious, Inflow Depth > 4.45" for 100-Yr 24 Hr event
 Inflow = 34.0 cfs @ 12.33 hrs, Volume= 172,226 cf
 Outflow = 34.0 cfs @ 12.33 hrs, Volume= 172,226 cf, Atten= 0%, Lag= 0.0 min
 Routed to Reach CULVERT-2 : CULVERT-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Pond PSDS-2: PSDS-2

Inflow Area = 14,435 sf, 82.36% Impervious, Inflow Depth > 6.74" for 100-Yr 24 Hr event
 Inflow = 2.5 cfs @ 12.08 hrs, Volume= 8,105 cf
 Outflow = 2.2 cfs @ 12.13 hrs, Volume= 8,003 cf, Atten= 12%, Lag= 2.6 min
 Primary = 2.0 cfs @ 12.13 hrs, Volume= 2,322 cf
 Routed to Pond PSIS-2 : PSIS-2
 Secondary = 0.2 cfs @ 12.13 hrs, Volume= 5,680 cf
 Routed to Pond PSIS-2 : PSIS-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 311.79' @ 12.13 hrs Surf.Area= 1,066 sf Storage= 2,146 cf

Plug-Flow detention time= 105.2 min calculated for 7,999 cf (99% of inflow)
 Center-of-Mass det. time= 97.2 min (878.0 - 780.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	308.50'	997 cf	15.75'W x 67.70'L x 3.50'H Field A 3,732 cf Overall - 1,240 cf Embedded = 2,491 cf x 40.0% Voids
#2A	309.00'	1,240 cf	ADS_StormTech SC-740 +Cap x 27 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 27 Chambers in 3 Rows
		2,237 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Device 2	311.00'	6.0" Vert. Orifice/Grate X 3.00 C= 0.600 Limited to weir flow at low heads
#2	Primary	311.00'	18.0" Round Culvert L= 4.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 311.00' / 310.90' S= 0.0250 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 4	308.50'	2.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Secondary	308.50'	2.0" Round Culvert L= 8.5' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 308.50' / 307.00' S= 0.1765 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.02 sf

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Page 9

Primary OutFlow Max=2.0 cfs @ 12.13 hrs HW=311.79' TW=307.78' (Dynamic Tailwater)

↳ **2=Culvert** (Barrel Controls 2.0 cfs @ 3.1 fps)

↳ **1=Orifice/Grate** (Passes 2.0 cfs of 2.1 cfs potential flow)

Secondary OutFlow Max=0.2 cfs @ 12.13 hrs HW=311.79' TW=307.78' (Dynamic Tailwater)

↳ **4=Culvert** (Inlet Controls 0.2 cfs @ 7.6 fps)

↳ **3=Orifice/Grate** (Passes 0.2 cfs of 0.2 cfs potential flow)

Summary for Pond PSIS-2: PSIS-2

Inflow Area = 33,508 sf, 89.98% Impervious, Inflow Depth > 7.31" for 100-Yr 24 Hr event

Inflow = 5.4 cfs @ 12.11 hrs, Volume= 20,422 cf

Outflow = 4.5 cfs @ 12.16 hrs, Volume= 18,806 cf, Atten= 17%, Lag= 3.1 min

Discarded = 0.2 cfs @ 9.75 hrs, Volume= 10,879 cf

Primary = 4.4 cfs @ 12.16 hrs, Volume= 7,926 cf

Routed to Reach SC-1 : STREAM CROSSING-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 307.83' @ 12.16 hrs Surf.Area= 3,058 sf Storage= 3,825 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 50.3 min (848.2 - 797.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	305.50'	2,205 cf	76.83'W x 39.80'L x 2.33'H Field A 7,135 cf Overall - 1,622 cf Embedded = 5,514 cf x 40.0% Voids
#2A	306.00'	1,622 cf	ADS_StormTech SC-310 +Cap x 110 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 110 Chambers in 22 Rows
		3,827 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	305.50'	2.410 in/hr Exfiltration over Surface area
#2	Device 3	306.95'	4.0" Vert. Orifice/Grate X 22.00 C= 0.600 Limited to weir flow at low heads
#3	Primary	306.95'	36.0" Round Culvert L= 13.5' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 306.95' / 306.50' S= 0.0333 1/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 7.07 sf

Discarded OutFlow Max=0.2 cfs @ 9.75 hrs HW=305.55' (Free Discharge)

↳ **1=Exfiltration** (Exfiltration Controls 0.2 cfs)

Primary OutFlow Max=4.4 cfs @ 12.16 hrs HW=307.83' TW=0.00' (Dynamic Tailwater)

↳ **3=Culvert** (Inlet Controls 4.4 cfs @ 2.5 fps)

↳ **2=Orifice/Grate** (Passes 4.4 cfs of 7.8 cfs potential flow)