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December 7, 2022

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

Re: Franklin Heights – 0 Lincoln Street
MassDEP File No. 159-1260 Notice of Intent Peer Review

Dear Ms. Goodlander:

Creative Land & Water Engineering, LLC (CLAWE) has received and reviewed the peer review comments by BETA dated November 2, 2022 for the referenced project. This letter is provided to response to BETA's comments and recommendations item by item with respect to wetland and stream crossing design and site construction phasing and fill operation and slope stabilization. Issues related to stormwater management and site plan design will be addressed by G&H in a separate letter. We will quote the comments first and be followed with our response in red.

BASIS OF REVIEW

- Site Visit on October 25, 2022
- ***Massachusetts Wetlands Protection Act 310 CMR 10.00*** effective October 24, 2014
- ***Massachusetts Stormwater Handbook*** effective January 2, 2008 by MassDEP
- ***Stormwater Management Chapter 153 From the Code of the Town of Franklin,*** Adopted May 2, 2007
- ***Wetlands Protection Chapter 181 From the Code of the Town of Franklin,*** dated August 20, 1997
- ***Town of Franklin Best Development Practices Guidebook***, dated September 2016

Response: The project is a 40B project, only MA WPA and its regulations shall apply to this project though we tried to make the project in compliance as much as possible with the Town byalws.

SITE AND PROJECT DESCRIPTION

The Site includes two (2) parcels located at 0 Lincoln Street in Franklin, Massachusetts, further identified by the Franklin Assessor's Office as Assessor's Parcel 219-178-001-005 ("Parcel A") and Assessor's Parcel 219-178-002-000 ("Parcel B"). The Site is bounded on all sides by residential development and to the west by Lincoln Street. Parcel A consists of the existing Franklin Heights apartment and condominium complex and is improved by paved private roadways (Trooper Paul Barry Way, Shayne Road, and Leanne Way), maintained landscape areas, stormwater management infrastructure, and utilities. Parcel B is an undeveloped, wooded parcel featuring a centrally located area of upland vegetated by species including sugar maple (*Acer saccharum*), Eastern white pine (*Pinus strobus*), and roundleaf greenbrier (*Smilax rotundifolia*). Gentle topographic relief from the central upland area is present on all sides.

Several Resource Areas Subject to Protection under the Massachusetts Wetlands Protection Act (M.G.L. ch.131 s.40) and its implementing regulations at 310 CMR 10.00 (collectively "the Act"), as well as the Town of Franklin Wetlands Protection Bylaw (Chapter 181) and its associated regulations (collectively "the Bylaw") are present at the Site and include the following:

- Inland Bank (to intermittent stream);
- Bordering Vegetated Wetland (BVW);
- Land Under Water (LUW); and
- Isolated Vegetated Wetland (IVW).

The boundaries of BVW and IVW were previously confirmed by an Order of Resource Area Delineation (ORAD) issued under MassDEP File No. 159-1249 on May 17, 2022 and recorded at the Norfolk County Registry of Deeds in Land Court Book 7224, Page 356. The ORAD does not indicate that Bank boundaries were approved; however, the potential presence of Vernal Pools are incorporated by reference.

The Site is not located within any Wellhead Protections Areas (Zone I, Zone II, & Interim) or Surface Water Protection Areas (Zone A, B, or C). There are also no Outstanding Resource Waters (ORWs) or Areas of Critical Environmental Concern (ACEC) present, and the most recent Natural Heritage and Endangered Species Program (NHESP) mapping does not depict any Priority Habitat of Rare Species or Estimated Habitat of Rare Wildlife at the Site. There are no NHESP-mapped Certified or Potential Vernal Pools located within 100 feet of the Site.

Natural Resource Conservation Service (NRCS) soil maps indicate the presence various soil groups at the Site including Woodbridge Fine Sandy Loam with a Hydrologic Soil Group (HSG) rating of C/D, Paxton Fine Sandy Loam with a HSG rating of C, and Whitman Fine Sandy Loam with a HSG rating of D.

Proposed work is associated with a residential development pursuant to M.G.L. Chapter 40B (40B) and includes the following activities (collectively referred to as "the Project"):

- Construction of a looped bituminous concrete roadway with a single entrance/egress off Trooper Paul Barry Way;
- Construction of a wetland and intermittent stream crossing consisting of an open-bottom culvert and retaining walls;
- Construction of 60 residential units, 19 of which are within Buffer Zone;
- Construction of a sidewalk with a grass buffer along one (1) side of the new roadway;
- Construction of driveways and parking areas for each unit;
- Construction of a closed drainage system that directs runoff to two (2) infiltration basins, one (1) of which is within Buffer Zone;
- Installation of new water and sewer utilities with service off of Trooper Paul Barry Way;
- Re-grading of Parcel B, including backfill at the western portion of the Site, with increases in elevation of up to twelve (12) feet; and
- Planting of various trees and shrubs.

The Project will result in direct impacts to Bank, BVW, and LUW. As a 40B development, it is assumed that the Bylaw has been or will be waived by the Franklin Zoning Board of Appeals (ZBA); therefore, the Project is being reviewed only under the Act.

Response: No response needed.

ADMINISTRATIVE AND PLAN COMMENTS

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

Table 1. NOI Plan **G&H addressed separately**

NOI Plan Requirements	Yes	No
North Arrow	✓	
Registered PLS Stamp (Existing Condition Plans Only)	✓	
Assessors' Reference		✓
Abutting Property Assessors' Reference		✓
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 AND RECOMMENDATIONS

A1. No file number or technical comments have been issued by the Massachusetts Department of Environmental Protection (MassDEP) as of 10/31/2022.

Response: DEP has issued a file number -159-1260

A2. Depict Assessors' references for both the Site and the abutting properties on the plans.

Response: G&H to add

A3. Include at least one (1) survey benchmark on the plans.

Response: Get it from G&H

A4. Include the date(s) and method(s) of the topographic survey in the plan notes.

Response: Get it from G&H

A5. Depict the proposed tree line on the Site development plans.

Response: See G&H plans.

A6. Provide a detail of the proposed retaining wall at the stream/BVW crossing.

Response: The wall will be Shea Concrete block wall and will be provided for construction.

A7. Revise the WPA Form 3 to detail all temporary and permanent impacts to BVW, Bank, and LUW.

Response: The WPA Form 3 is updated as requested.

A8. Depict the limit of erosion controls on all plan sheets.

Response: Provided all erosion control lines on all applied plans.

WETLAND RESOURCE AREAS AND REGULATORY REVIEW

BETA conducted a site visit and regulatory review of the submitted revised documents and plans, focusing on compliance with Resource Area definitions and Performance Standards set forth in the Act.

As noted above, Resource Area boundaries at the Site were previously approved under an ORAD; however, the ORAD appears to only have explicitly approved the boundaries of BVW and IVW and stated the potential for presence of Vernal Pools. Therefore, BETA only assessed Resource Area flagging in the field associated with the intermittent stream southwest of 52 Leanne Way.

The NOI application does not include any narrative information documenting compliance with the applicable

Performance Standards and does not disclose all permanent and temporary Resource Area impacts that will result from the Project. In addition, the wetland replication area requires further detail on construction and sequencing to ensure a high likelihood of successful implementation per the

Massachusetts Inland Wetland Replication Guidelines. While Conservation Commissions generally do not dictate construction means and methods, ensuring the likelihood of replication area success is crucial in demonstrating compliance with the BVW Performance Standards.

Although the Applicant has indicated that the proposed stream/BVW crossing will fully adhere to the Massachusetts Stream Crossing Standards, **insufficient information and conflicting calculations were provided. BETA also observed hydrologic/hydraulic conditions associated with the stream that may warrant modifications to the design in order to maintain upstream hydrology and comply with the Water Depth and Velocity Standard (Stream Crossing Standard 6).** Further information from the Applicant will also be required to demonstrate that the proposed design reflects a minimization of impacts associated with the stream/BVW crossing.

At this time, the Applicant has not provided sufficient information to describe the Site, the work, or the effects of the work on the interests of the Act.

Resource Area Boundary Comments and Recommendations

BETA conducted a Site visit on October 25, 2022 to assess existing conditions, particularly with regards to the proposed stream crossing and adjacent BVW replication area. BETA observed numerous wetland flags in the field and considered their location when reviewing the proposed BVW replication area.

W1. BVW boundaries were previously approved under the ORAD; however, it is unclear whether the boundaries of Bank and the intermittent status of the associated stream were approved. BETA generally observed the Bank flagging in the field to accurately delineate the top of Bank where flags were present, i.e., the first observable break in slope/mean annual flood level. Based on information accessed through the Massachusetts Geographic Information Systems (MassGIS) website and the United States Geologic Survey (USGS) StreamStats tool, the stream does not appear on USGS topographic maps and is not associated with a drainage area greater than 0.50 square miles; therefore, the stream qualifies as intermittent.

Response: All wetland and streambank delineation has been approved by the ORAD at the crossing.

W2. Provide additional Bank delineation of the BKN series to depict the location of the stream channel along the BVW replication area.

Response: Additional bank delineation are provided and surveyed as shown on the plan.

W3. Provide calculations to demonstrate whether the IVWs at the Site have the water holding capacity to qualify as ILSF and be afforded protection under the Act.

Response: The ILSF calculations had been provided during the ANRAD review. The two IVWs have area of 2520 Sf and 7887 Sf with less than 1 ft depth, respectively. So, the total volume is less than 0.25 ac-ft, which disqualify them as ILSF according to 310 CMR 10.57 (2) (b) 1. The only issue remain with IVW is the potential VP concern, which should not be an issue as no alteration is proposed to the IVW. Based on the depth of the IVW, it is our professional opinion that these two IVW is unlikely a vernal pool.

Construction Comments and Recommendations

W4. The Project will result in approximately 9.6 acres of clearing and grubbing. Provide a phasing plan to supplement the erosion control plan that limits the total area of disturbance at the Site at a one time. The proposed single line of perimeter erosion controls is anticipated to be insufficient for the large area of clearing where soils are associated with high runoff volumes.

Response: We will phase the project in five phases. See Plan sheet 3 for details. It will require a temporary

crossing as we did with soil testing for erosion control installation.

W5. The Erosion Control Plan indicates that the Site will be cleared following construction of the construction entrance and installation of erosion controls. Clarify whether the construction entrance will include full construction of the stream/BVW crossing, or if a temporary crossing is required. Should a temporary crossing be required, provide construction details.

Response: A temporary crossing for soil testing has been granted. We would request that the same or similar method of temporary crossing can be used for clearing and Erosion Control installation without soil disturbance.

W6. The Applicant should confirm whether additional test pits will be conducted for this Project. Test pit data provided on the Plans is dated 2005 and should be reconfirmed as discussed in Comment SW18. Conducting test pits at the Site would require approval from the Conservation Commission

and would not qualify for the exemption at 310 CMR 10.02(2)(b)2.g. if Resource Area crossings are required.

Response: The applicant has DA from the Commission to conduct soil testing, which is provided in the attached soil testing plan. Soil logs has been submitted to the Conservation Agent.

W7. Revise the Erosion Control Plan to include a note stating clearing of the BVW and BVW replication area is prohibited until the Wetland Scientist reviews the area for woody plants to potentially transplant, as indicated on the Stream crossing and Wetland Replication Plan.

Response: The note has been incorporated to the plan special note for wetland and stream crossing as follows:

1. Clearing of the BVW and BVW replication area is prohibited until the Wetland Scientist reviews the area for woody plants to potentially transplant, as indicated on the Stream crossing and Wetland Replication Plan.

W8. The proposed 2V:1H slope at the west side of the site will be stabilized as "designed by others". Provide the method(s) and timing of both temporary and permanent slope stabilization to prevent sedimentation of the downgradient BVW. The Applicant should consider use of native seed mixes with wildlife habitat / pollinator habitat value for permanent stabilization where within Buffer Zone.

Response: The 2V:1H slope at the west side of the site will be constructed and stabilized as spelled out on sheet 3 of the plan entitled "Construction phasing and slope stabilization plan" by CLAWE.

W9. Provide a plan that depicts all Resource Area impacts associated with the Project, as the Stream Crossing and Wetland Replication Plan does not accurately disclose all impacts. It appears that temporary impacts are anticipated to be required for the following:

a. Stream water control (if applicable);
b. Construction of the stream/BVW crossing and retaining walls;
c. Construction of the BVW replication area; and
d. Installation of erosion controls along/over the BVW boundary between flags B30A/B34AN and B40AN/B44A.

Response: a. Crossing work will be preferably done during dry season if time allows to avoid dewater issue. If it needs to work during flowing season, we have devised a dewater plan for Conservation Commission to review and approval. b. The retaining wall will be provided by Shea Concrete for the crossing c. Compost tube should be adequate for the replication area given fairly flat area with little contribution watershed. D. A line of boulders can be used to shore up the bottom slope in area upgradient of flags B30A to B34AN and B40AN to B44A. The updated plan showed all resource area alteration associated with the wetland and

stream crossing.

W10. Erosion controls consisting of siltation fencing and compost filter tubes are proposed to be installed across the stream as depicted on the Wetland Replication & Stream Crossing Plan, which is 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, 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. Based on BETA's experience with the Franklin Conservation Commission, the Commission may wish to clarify if they would prefer the use of alternative erosion controls.

Response: See response to W9. If time allows, we prefer to do the work during now flow summer and fall. If dewater is required, a dewater plan is provided on the plan detail sheet to assure no flowing water will coming through the construction section of the crossing.

W11. 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: We agree and will start with USACE permitting when we reached a definitive consensus with the Commission review.

MITIGATION COMMENTS AND RECOMMENDATIONS

The mitigation comments and recommendations for the Project are primarily related to the proposed BVW replication area. BVW replication area comments consider the Massachusetts Inland Wetland Replication Guidelines and generally accepted wetland science/construction procedures.

W12. If available, the BVW replication area should be backfilled initially with native hydric soils, with creating a soil blend having high organic content as a way to supplement native soils. The Applicant should estimate the volume of hydric soils that can be reused from the permanent BVW impact area associated with the crossing. Based on hand auger soil sampling conducted during BETA's Site visit, soils within the proposed replication area consist of shallow refusal and gravelly A- and B-layers. Onsite soils used for a supplemental hydric soil blend should be assessed for appropriate composition, and compost used for the supplemental hydric soil blend should consist of clean leaf mulch. It is recommended that the contractor target 50% organic matter by volume when creating supplemental hydric soils; therefore, additional compost will be required beyond the 1/3 composition indicated on the plans. BETA recommends revising the Wetland Replication & Stream Crossing plan notes to reference the items above.

Response: There 2140 SF of wetland replication, which contains about 8" good high organic loam. With the additional transferring of about 12" wetland soil from the filled 947 SF wetland, we estimated about 20 Cu. yard of compost organic materials will be needed to achieve the 50% organic matter content soil for wetland plants as specified in the note.

W13. A note should be added to the Wetland Replication & Stream Crossing Plan indicating that the subgrade of the BVW replication area should be loosened prior to placing hydric soil backfill to provide sufficient vegetation rooting depth. If a heavily compacted C-layer is encountered, it is recommended that additional excavation/aeration occur to provide greater than 12 inches of hydric soils in the replication area.

Response: The following note is added as part of Wetland Replication Special notes:

2. The subgrade of the BVW replication area should be loosened prior to placing hydric soil backfill to provide sufficient vegetation rooting depth if a heavily compacted C-layer is encountered. The

design wetland scientist should be contact to inspect the site condition to assure that the C-soil is not heavily compacted prior to the placement of the top 12 inches or more organic hydric soils in the replication area.

W14. Provide the specification sheet for the New England Wetland Plants Wetland Seed Mix for the contractor's reference.

Response: The New England Wetmix spec sheet is added to the replication plan for reference.

W15. Include a note on the Wetland Replication and Stream Crossing Plan requiring the BVW replication area to be overseeded by doubling the recommended application rate and include a note requiring placing clean straw mulch over the seed to promote stability in the replication area until germination occurs.

Response: The recommended note is added to the special note.

3. The BVW replication area to be overseeded by doubling the recommended application rate in the NE Wetmix spec with placing clean straw mulch over the seed to promote stability and germination in the replication area.

W16. Depict supplemental erosion controls directly upgradient of the BVW replication area on the Stream Crossing and Wetland Replication Plan.

Response: Temporary access is demarcated on the plan for replication access. In addition to the compost tube erosion control, other erosion control may be used if needed per the contractor and the wetland scientist, which include but not limited to woodchip/grindings mulch or check dam.

W17. Provide a narrative describing how Buffer Zone temporarily impacted by the Project will be restored following construction. Based on the provided plans, wooded areas will be cleared to access the BVW replication area and conduct grading, but no Buffer Zone replanting is depicted on the plans.

Response: The temporary access is marked on the plan with restoration note. In practice, we will try to find a path without or minimum tree removal. In any case, the access path will be restored with loam and New England Erosion Control seed mix or as approved by FCC.

W18. Provide a method for restoring temporary BVW/Bank/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: Field survey of the stream channel has been conducted and recorded and analyzed. The information of the channel morphology is presented in the plan for reference in case channel restoration is needed. A 8-ft steel plate will be used to cover the channel that can fit inside of the 12-ft open bottom culvert. In section of utility installation, the channel will be restored with the channel width and depth as surveyed with 1:1 slope and the saved root rich bank materials plus some 12" anchoring stones extending 6" below the bottom elevation. This is added to our special notes.

WPA Performance Standards Comments and Recommendations

The Project, according to the WPA Form 3, proposes 947 square feet of BVW impacts. However, the Applicant

is required to quantify all temporary and permanent Resource Area impacts and demonstrate how the applicable Performance Standards are met. The submitted NOI does not provide information on compliance with Performance Standards. Additional information is also required to document compliance with the Massachusetts Stream Crossing Standards.

Bank (310 CMR 10.54)

W19. Depict all temporary and permanent Bank impacts associated with the construction of the crossing. It is anticipated that a Wildlife Habitat Evaluation for Bank impacts will not be required pursuant to 310 CMR 10.54(4)(a)6.

Response: Per the design, an open bottom box culvert is used for the stream crossing, most of the 35-ft wide stream channel will be protected during construction except for an 8" sewer line installation, which will impact about 4-5 ft section of the channel. The existing channel geometry is surveyed and will be used for restoration as we noted under W18 and in the special notes 4. We agreed that the project as designed will not significantly impact the wildlife habitat function. "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 310CMR 10.60."

W20. Provide a narrative to demonstrate compliance with the Performance Standards at 310 CMR 10.54(4).

Response: As we presented in the stream and wetland crossing design, the design meets all required standards for stream crossing with the preferred style of culvert. The stream section of crossing has less than 6" loose organic substrate due to reversed slope and stony underlay. The design will allow to keep the most of the existing channel intact. The water carry capacity is calculated based on the contributing watershed that is very consistent with the observed stream channel morphology. The stream and bank function will not be significantly impacted according to the design for channel stability, flow carrying capacity, and wildlife habitat.

W21. The following comments are provided regarding the Massachusetts Stream Crossing Standards:

a. The proposed crossing appears to meet the Massachusetts Stream Crossing Standards 1 through 4 (Type of Crossing, Embedment, Crossing Span, and Openness Ratio). However, the Applicant should clarify the proposed Openness Ratio. The Openness Ratio is listed as

0.30, which does not meet the 0.82 requirement. However, the design appears to provide sufficient openness in excess of the requirement.

Response: The openness ratio has length unit. The design used metric unit of meter and the state standard used ft. 0.82 ft = 0.25 m. So the design meets the openness ratio standard. The updated plan clarifies the unit.

b. Provide information to demonstrate compliance with Standard 5 (Substrate).

Response: The existing channel is surveyed and documented. The design and construction will keep the existing channel geometry and substrate.

c. Provide survey cross sections of the stream to demonstrate that the appropriate water depth and velocity will be achieved (Standard 6). Based on BETA's Site visit, it appears that a one (1)-foot-deep channel may be too deep for this location. The existing stream in this location appears to seep through a discrete hummock under low flow conditions and overtops the hummock in higher flow scenarios. Additional spot shots and revised channel grading should be provided to demonstrate that the deeper upstream water levels observed during the Site

visit, which appeared to be a result of the existing hydraulic restriction, will not be adversely affected. The proposed channel grading should result in hydraulic conditions comparable existing conditions.

Response: More information and survey data are provided in the plan to update the stream channel geometry more accurately. The channel has a reverse slope in the crossing section. Some boulders appear to be placed in the downgradient side of the crossing to acting as a broad crest weir condition to cause some backup pool upstream. We analyzed the hydraulics using weir function, which matches the surveyed stream bankfull flow condition very well. The existing survey data will be used to restore the channel if altered to the hydraulic condition comparable existing condition.

Bordering Vegetated Wetland (310 CMR 10.55)

W22. Provide a narrative describing the "Avoid/Minimize/Mitigate" considerations that were assessed during the design of the Project.

Response: The site is surrounded by wetlands and there is no alternative access that can avoid wetland alteration. The project has designed the crossing to meet all public safety and zoning requirement with retaining wall and open bottom culvert to minimize the impact meeting all crossing and replication ratio for mitigation.

W23. Although the Applicant has proposed a replication area that exceeds the size of the proposed BVW impacts, no discussion of BVW Performance Standards was included in the NOI. Demonstrate that the Project adheres to the Performance Standards at 310 CMR 10.55(4)(b).

Response: Field data is provided for soil and groundwater hydrology. The wetland scientist will supervise and monitor the replication process as designed for the wetland replication to comply with the performance requirements in 310 CMR 10.55(4)(b):

1. The replication area is more than twice of the filled area exceeding 1:1 required.
2. The groundwater and surface elevation of the replication area will mimic the filled area and suitable for wetland plants.
3. The replication area is in similar configuration as the filled wetland abutting the same stream.
4. The replication area has unrestricted hydraulic connection with the existing wetland around
5. The replication area is located in the immediate neighboring area abutting the same stream.
6. The replication area will be monitored for two consecutive growing seasons following replication planting to assure that 75% of the surface of the replacement area shall be reestablished with indigenous wetland plant species.
7. As a relatively small wetland replication, it is our professional judgement that the replication exceeds all required performance standards.

W24. 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: Four soil testing locations are provided with soil profile and groundwater data to assure the proper grading and wetland hydrology in the replication area.

Land Under Water (310 CMR 10.56)

W25. Depict all temporary and permanent LUW impacts associated with the construction of the crossing.

Response: As discussed above, the construction will be preferably conducted during no flow time. If timing

dictates work during flowing time. Dewatering plan is devised to route the water bypassing the construction section. Given that most of the channel will be kept intact. The LUW will not be impacted significantly. Any alteration will be restored to the documented existing condition.

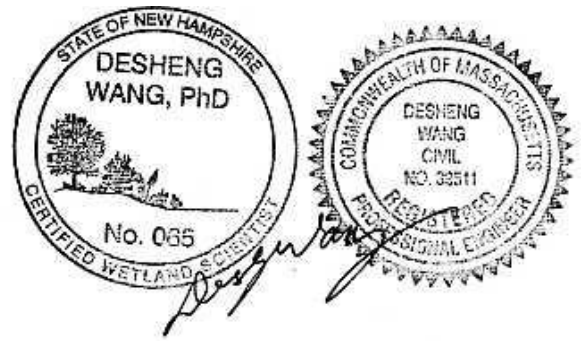
W26. Provide a narrative demonstrating compliance with 310 CMR 10.56(4).

Response: As we showed, the design will maintain the existing stream channel geometry and substrate by using large open bottom box culvert to meet and exceed all stream crossing standard that are in compliance with 310 CMR 10.56(4):

1. Analysis shows that the channel water capacity and other hydraulic pattern will be maintained as existing condition.
2. No significant ground and surface water is expected to be altered for the water body.
3. The capacity of said land under water will be significantly the same as the existing condition to provide breeding habitat, escape cover. No fish presence is expected for this intermittent stream.
4. The crossing will temporarily alter less than 200 sq ft of LUW in an existing used old car path section, which will unlikely adversely impact any significant wildlife habitat function with the preferred crossing method.
5. The proposed work on the stream crossing shall be presumed to meet the performance standard set forth in 310 CMR 10.56(4)(a) given that 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.

In summary, the project design engineer and wetland scientist has addressed all peer review comments regarding wetland and stream crossing design and mitigation replication. If you have further questions, please feel free to contact us.

Sincerely,
Creative Land & Water Engineering, LLC
By



Desheng Wang, Ph.D., P.E., CWS
Sr. Civil/Environmental Engineer
Certified Wetland Scientist
Certified Soil Evaluator

cc: Mike Hassett
Bruce Wheeler
Jon Niro

ENC.

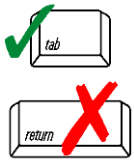
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

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):

0 Lincoln St (a. Street Address) | Franklin (b. City/Town) | 02038 (c. Zip Code)

Latitude and Longitude: 42.12022° N (d. Latitude) | 71.39527° W (e. Longitude)

Parcel ID# 219 (f. Assessors Map/Plat Number) | 178/002 (g. Parcel /Lot Number)

2. Applicant:

D. Bruce (a. First Name) | Wheeler (b. Last Name)

Oliver Crossing Realty Trust (c. Organization)

148 Park Street (d. Street Address)

North Reading (e. City/Town) | MA (f. State) | 01864 (g. Zip Code)

(978) 664-6900 (h. Phone Number) | (i. Fax Number) | bwheeler@habitechinc.com (j. Email Address)

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

Josephine (a. First Name) | Farina (b. Last Name)

see additional owners in the attached list (c. Organization)

P.O. Box 600269 (d. Street Address)

Newton (e. City/Town) | MA (f. State) | 02460 (g. Zip Code)

(h. Phone Number) | (i. Fax Number) | (j. Email address)

4. Representative (if any):

Desheng (a. First Name) | Wang (b. Last Name)

Creative Land & Water Engineering, LLC (c. Company)

P.O. Box 584 (d. Street Address)

Southborough (e. City/Town) | MA (f. State) | 01772 (g. Zip Code)

(508) 281-1694 (h. Phone Number) | (i. Fax Number) | deshengw@yahoo.com (j. Email address)

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

$20,850 (a. Total Fee Paid) | $10,412.50 (b. State Fee Paid) | $10,437.50 (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:

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)

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:

a. County	b. Certificate # (if registered land)
Norfolk	
c. Book	d. Page Number
7224	358, 370

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

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Provided by MassDEP:

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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. ☒ Bank	2x35 (1. linear feet)	2x35 (2. linear feet)
b. ☒ Bordering Vegetated Wetland	947 (259 temporary) (1. square feet)	2140 (restore 259 from Temporary alteration)
c. ☒ Land Under Waterbodies and Waterways	129 (1. square feet)	140 (2. square feet)
	3. cubic yards dredged	

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet	2. square feet
	3. cubic feet of flood storage lost	4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet	
	2. cubic feet of flood storage lost	3. cubic feet replaced
f. ☐ 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.

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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.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ 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. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ 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. ☒ Project Involves Stream Crossings

1
a. number of new stream crossings

1
b. number of replacement stream crossings

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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

   Mass Mapper 2022
   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/ma-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.

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

(c) ☐ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☐ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☐ Is this an aquaculture project? d. ☐ Yes ☐ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

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

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

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.

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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.

40B Development Plan
a. Plan Title

Guerriere & Halnon, Inc
b. Prepared By

Robert E. Constantine, II
c. Signed and Stamped by

09/16/2022
d. Final Revision Date

Indicated
e. Scale

Stream Crossing and Wetland Replication Plan
f. Additional Plan or Document Title

09/16/2022
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:

1030
2. Municipal Check Number

09/15/2022
3. Check date

1029
4. State Check Number

09/15/2022
5. Check date

Oliver Crossing, LLC
6. Payor name on check: First Name

7. Payor name on check: Last Name

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MassDEP File Number

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City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

1. Signature of Applicant	2. Date: 09/16/2022
See attached 3. Signature of Property Owner (if different)	4. Date
5. Signature of Representative (if any)	09/16/2022 updated 12/6/2022

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the “yes” box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

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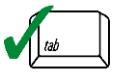
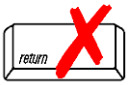
NOI Wetland Fee Transmittal Form

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

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





A. Applicant Information

1. Location of Project:

0 Lincoln St (Parcel ID# 219)	Franklin
a. Street Address	b. City/Town
1029	$10,412.50
c. Check number	d. Fee amount

2. Applicant Mailing Address:

D. Bruce	Wheeler
a. First Name	b. Last Name

Oliver Crossing Realty Trust
c. Organization

148 Park Street
d. Mailing Address

North Reading	MA	01864
e. City/Town	f. State	g. Zip Code

(978) 664-6900		bwheeler@habitechinc.com
h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

Josephine	Farina
a. First Name	b. Last Name

See more in the attached list
c. Organization

P.O. Box 600269
d. Mailing Address

Newton	MA	02460
e. City/Town	f. State	g. Zip Code

h. Phone Number	i. Fax Number	j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

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B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
3 (b) building	18	$1050.00	$18900.00
2 (g) - stormwater discharge	1	$500.00	$500.00
4 (a) - wetland and stream crossing for road and utilities	1	$1,450.00	$1,450.00

Step 5/Total Project Fee:

Step 6/Fee Payments:

Total Project Fee:	$20850 (a. Total Fee from Step 5)
State share of filing Fee:	$10,412.50 (b. 1/2 Total Fee **less $**12.50)
City/Town share of filling Fee:	$10,437.50 (c. 1/2 Total Fee **plus** $12.50)

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

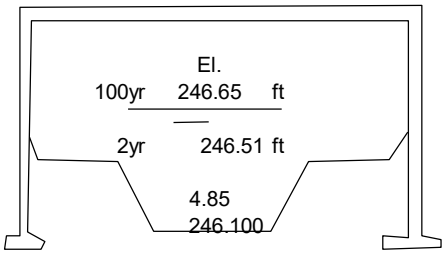
To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

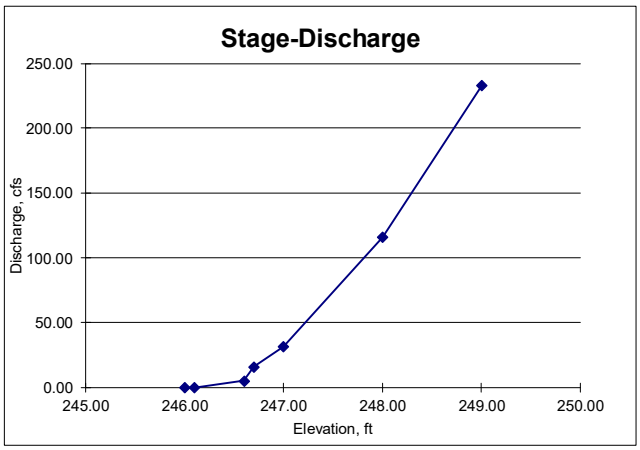
Table : **Outflow Analysis and Storage Indication**

at Road Crossing (Franklin Heights)

Broad-crested weir width (ft):			1.00		Triangular weir angle:	90.00	Bankheight:	0.50
Broad-crested weir length (ft):			4.85	12.00	Manning's n:	0.01	Net width (in.):	2.00
Weir crest elevation (ft):			246.10		dt	360 sec	Slot INV (ft):	250.00
Elevation	Total Q	2S/dt + Q	H-z		Qweir	Qtiw	Depression area	Storage
ft	cfs	cfs	ft		cfs	cfs	sq. ft	cu. ft
246.00	0.00	0.000	0.000		0.000	0	61.62	0.000
246.10	0.00	0.034	0.000		0.000	0	240	6.162
246.60	5.01	5.753	0.500		4.562	0.45	270	133.662
246.70	15.75	16.733	0.600		15.042	0.71	600	177.162
247.00	31.27	33.303	0.900		29.320	1.95	660	366.162
248.00	115.78	121.644	1.900		103.157	12.62	720	1056.162
249.00	233.05	242.918	2.900		196.732	36.32	720	1776.162

			Elev, ft	Vel, ft/s
Q2=	3.540	cfs	246.51	1.64
Q100=	15.600	cfs	246.65	4.82





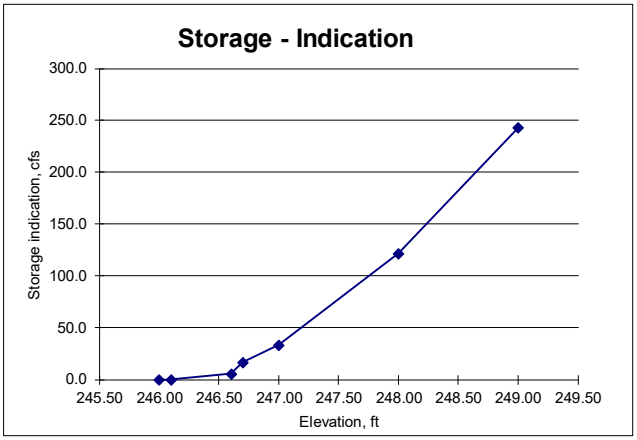


Figure 3: Rating Curve and Storage-Indication Curve

Table 1. **Estimating Magnitude and Frequency of Floods for Ungaged Sites**

Franklin Heights, Franklin, MA

Project: Franklin Heights
Stream: un-named

Hydrologist: Desheng Wang, Ph.D., P.E.
Company: Creative Land & Water Engineering, LLC
Date: 12/3/2022 8/27/2020

	Rural Area (Easton Mass., Wandle 1983)	Urban (State Wide, [2])
Q_2	$= 36.30\ A^{0.682}$	$2.35\ A^{0.41}\ SL^{0.17}\ (RI2+3)^{2.04}\ (ST+8)^{-0.65}\ (13\text{-}BDF)^{-0.32}\ IA^{0.15}\ RQ100^{0.47}$
Q_{10}	$= 72.12\ A^{0.660}$ A in Sq. miles, Q in ft^3/s	$2.99\ A^{0.32}\ SL^{0.15}\ (RI2+3)^{1.75}\ (ST+8)^{-0.57}\ (13\text{-}BDF)^{-0.30}\ IA^{0.09}\ RQ100^{0.58}$
Q_{25}	$= 96.71A^{0.651}$	$2.78\ A^{0.31}\ SL^{0.15}\ (RI2+3)^{1.76}\ (ST+8)^{-0.55}\ (13\text{-}BDF)^{-0.29}\ IA^{0.07}\ RQ100^{0.60}$
Q_{50}	$= 118.1\ A^{0.645}$	$2.67\ A^{0.29}\ SL^{0.15}\ (RI2+3)^{1.74}\ (ST+8)^{-0.53}\ (13\text{-}BDF)^{-0.28}\ IA^{0.06}\ RQ100^{0.62}$
Q_{100}	$= 143.1\ A^{0.638}$	$2.5\ A^{0.29}\ SL^{0.15}\ (RI2+3)^{1.76}\ (ST+8)^{-0.52}\ (13\text{-}BDF)^{-0.28}\ IA^{0.06}\ RQ100^{0.63}$
Q_{500}		$2.27\ A^{0.29}\ SL^{0.15}\ (RI2+3)^{1.86}\ (ST+8)^{-0.54}\ (13\text{-}BDF)^{-0.27}\ IA^{0.05}\ RQ500^{0.63}$

											Urbanization Impact Analysis					
Cross Section	Area, mi^2	Q_2, cfs	Q_{10}, cfs	Q_{50}, cfs	Q_{100}, cfs	Q_{500}, cfs	SL, ft/mi	RI2, in	ST, %	BDF (0 -12)	IA, %	UQ2,cfs	UQ10,cfs	UQ_{50}, cfs	UQ_{100},cfs	UQ_{500}, cfs
Stream Crossir	0.025	2.93	6.32	10.93758	13.60		617	1.5	20	0	5	3.54	7.81	**13.31**	**15.60**	

References:

[1] Wandle, S.W., 1983, Estimating peak discharges of small, rural streams in Massachusetts: U.S. Geological Survey Water-Supply Paper 2214, 26 p.

[2] The National Flood Frequency Program, Version 3: A Computer Program for Estimating Magnitude and Frequency of Flood for Ungaged Sites U.S. Geological Survey, compiled by K. G. Ries III and M.Y Crouse, Water Resources Investigations Report 02-4168.

[3] Zarriello, Philip, 2016 Magnitude of flood flows at selctd annual xceedance probabilitis for streams in Massachusetts U.S.G.S., Scientific invstigation Report 2016-5156.

where
UQ2, UQ5,... UQ500 are the urban peak discharges, in cubic feet per second (ft3/s), for the 2-, 5-, ... 500-year recurrence intervals;
A is the contributing drainage area, in square miles, as determined from the best available topographic maps; in urban areas, drainage systems sometimes cross topographic divides. Such drainage changes should be accounted for when computing A; **SL** is the main channel slope, in feet per mile (ft/mi), measured between points that are 10 percent and 85 percent of the main channel length upstream from the study site (for sites where SL is greater than 70 ft/mi, 70 ft/mi is used in the equations); **RI2** is the rainfall, in inches (in) for the 2-hour, 2-year recurrence interval, determined from U.S. Weather Bureau (USWB) Technical Paper 40 (1961) (eastern USA), or from NOAA Atlas 2 (Miller and others, 1973) (western USA);
ST is basin storage, the percentage of the drainage basin occupied by lakes, reservoirs, swamps, and wetlands; in-channel storage of a temporary nature, resulting from detention ponds or roadway embankments, should not be included in the computation of ST;
BDF is the basin development factor, an index of the preva lence of the urban drainage improvements; **IA** is the percentage of the drainage basin occupied by impervious surfaces, such as houses, buildings, streets, and parking lots; and **RQT**, are the peak discharges, in cubic feet per second, for an equivalent rural drainage basin in the same hydro- logic area as the urban basin, for a recurrence interval of T years; equivalent rural peak discharges are computed from the rural equations for the appropriate State, in the NFF program, and are automatically transferred to the urban computations. The basin development factor (**BDF**) is a highly significant variable in the equations, and provides a measure of the efficiency of the drainage basin. It can easily be determined from drainage maps and field inspections of the drainage basin. The basin is first divided into upper, middle, and lower thirds on a drainage map, as shown in figure 1A-C. Each third should contain about one-third of the contributing drainage area, and stream lengths of two or more streams should be approximately the same in each third. However, stream lengths of different thirds can be different. For instance, in figure 1C, the stream distances of the lower third are all about equal, but are longer than those in the middle third. Precise definition of the basin thirds is not considered necessary because it will not have much effect on the final value of BDF. Therefore, the boundaries between basin thirds can be drawn by eye without precise measurements. Within each third of the basin, four characteristics of the drainage system must be evaluated and assigned a code of 0 or 1. Summation of the 12 codes (four codes in each third of the basin) yields the BDF. The following guidelines should not be considered as requiring precise measurements. A certain amount of subjectivity will necessarily be involved, and field checking should be performed to obtain the best estimates. Channel improvements.—If channel improvements such as straightening, enlarging, deepening, and clearing are preva lent for the main drainage channels and principal tributar ies (those that drain directly into the main channel), then a code of 1 is assigned. To be considered prevalent, at least

Long, narrow basin

Upper Third

Middle Third

Lower Third

50 percent of the main drainage channels and principal tributaries must be improved to some degree over natural conditions. If channel improvements are not prevalent, then a code of 0 is assigned.
Channel linings.—If more than 50 percent of the length of the main channels and principal tributaries has been lined with an impervious surface, such as concrete, then a code of 1 is assigned to this characteristic; otherwise, a code
of 0 is assigned. The presence of channel linings would obviously indicate the presence of channel improvements as well. Therefore, this is an added factor and indicates a more highly developed drainage system.
Storm drains or storm sewers.—Storm drains are defined as those enclosed drainage structures (usually pipes), com monly used on the secondary tributaries where the drainage is received directly from streets or parking lots. Many of these drains empty into open channels; however, in some basins they empty into channels enclosed as box and pipe culverts. Where more than 50 percent of the secondary tributaries within a subarea (third) consists of storm drains, then a code of 1 is assigned to this aspect; otherwise, a code of 0 is assigned.
Curb-and-gutter streets.—If more than 50 percent of the subarea (third) is urbanized (covered with residential, com mercial, and/or industrial development), and if more than 50 percent of the streets and highways in the subarea are constructed with curbs and gutters, then a code of 1 is be assigned to this aspect; otherwise, a code of 0 is assigned. Drainage from curb- and-

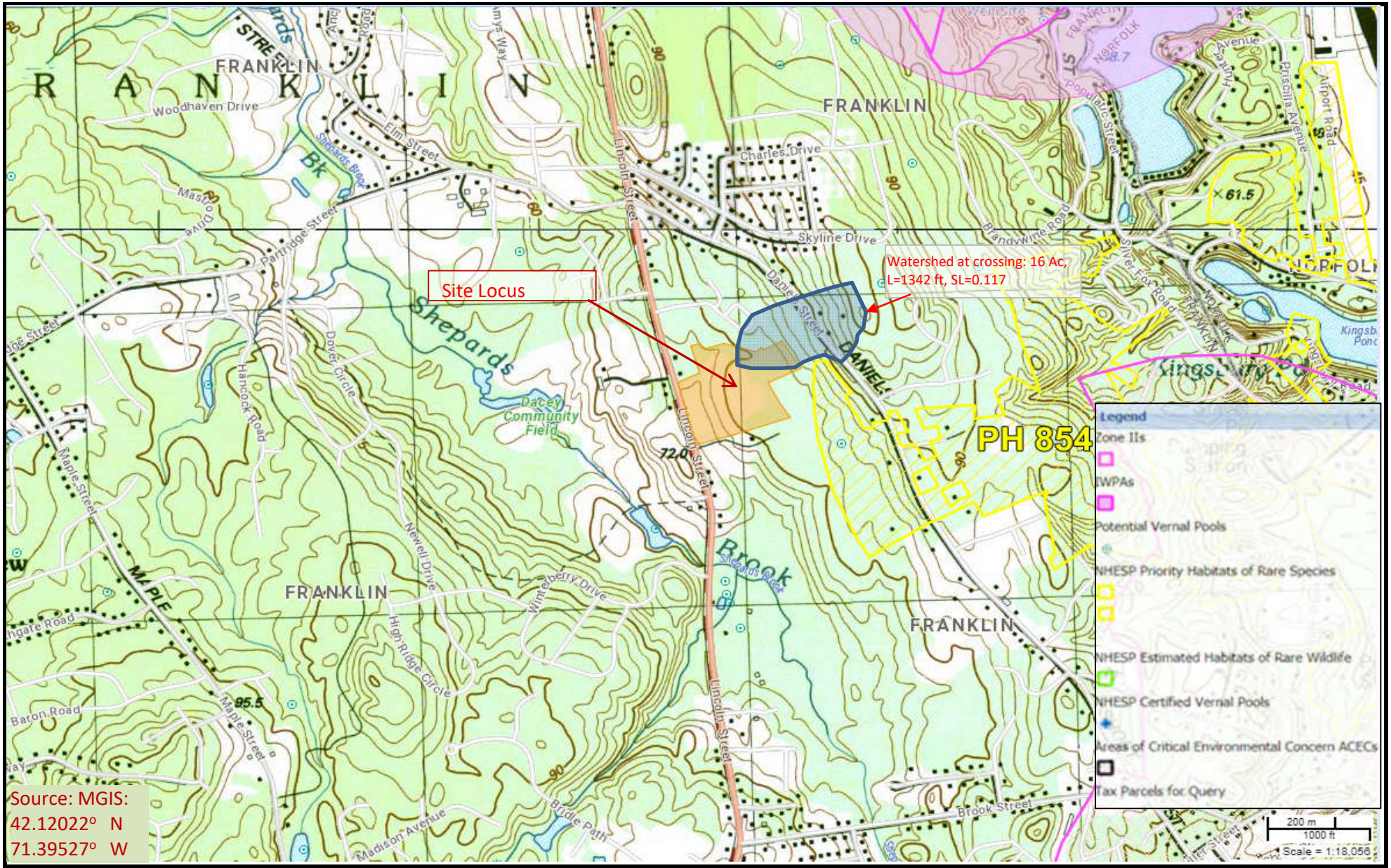


Figure 1. USGS Site Locus Map

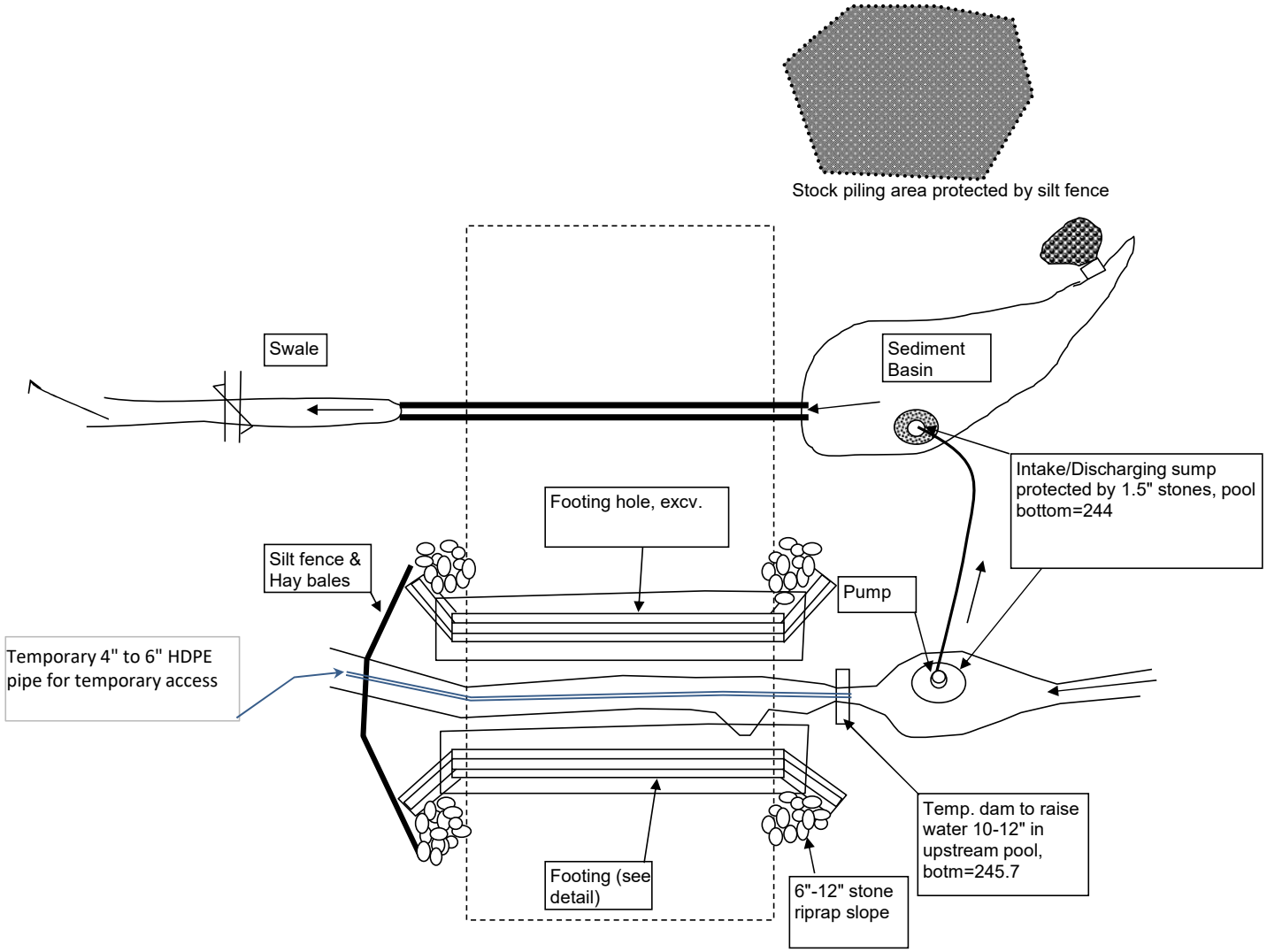
Project:
Franklin Heights
Trooper Paul Bary Way
Franklin, MA

By: .
Creative Land & Water Engineering, LLC
P.O. Box 584
Southborough, MA 01772
508-281-1694 www.claweng.com

Dewatering Plan - Stream Crossing , Franklin Heights, Franklin, MA

By Desheng Wang, Ph.D., P.E., Creative Land & Water Engineering, LLC

24-Mar-22 Rev. 12/5/2022



Dewatering Steps:

1. Install sediment and erosion control at the downstream end of the bridge footing hole.
2. Install discharging sump in temporary sediment basin and intake sump in the natural pool upstream of Crossing #2.
3. Install pump in the intake sump (sump shall be sized large enough to accomodate the stream flow).
4. Install the temporary dam to stop stream flow through the crossing.
5. Excavate the bridge footing holes and install footing as designed.
6. If the footing hole requires dewatering, it shall be pumped to Pond #3 as described above.
7. The design engineer shall inspect the dewatering setup before the excavation starts.
8. If the stream channel will be alterred temporarily, the surface substrate of the channel shall be excavated and saved on-site and be put back after the footing of the culvert is installed. The substrate shall be used to restore the channel to the same as the original geometry.
9. The restored channel shall be inspected by the design wetland scientist and hydraulic engineer.
10. It is also recommended that the footing installation be carried out in a time slot of a few consecutive days, when no rain is forecasted.

Dewatering Plan - Stream Crossing , Franklin Heights, Franklin, MA