TOWN OF BOXFORD

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Pamela Merrill
Massachusetts Department of Environmental Protection
Northeast Regional Office
205B Lowell Street
Wilmington, MA 01880

Re: Boxford, MA Middleton Road Culvert Replacement Project, DEP File #: **NE 114-1223**

Dear Ms. Merrill:

This letter is submitted in response to the several comments and requests contained in your correspondence dated January 8, 2016. While I believe that each matter that you have raised in your letter is addressed by the narrative that follows, we would be pleased to engage in further discussions and/or provide additional details, if required.

"Lost Bank" and "New Bank" Description.

The revised Plan drawings (attached) include a detailed description of the distinction between the lost bank and new bank. We have enlarged the plan view from a scale of 1inch = 20 feet to a scale of 1 inch = 10 feet and added labelling showing the altered and replacement banks. We have added to the plan the dimensions of the bank impact. Plan is titled " Notice of Intent, Crooked Pond Stream Crossing, Middleton Road, Boxford, Massachusetts" prepared by Michael O'Neill, P.E., dated December 2, 2015, latest revision date January 27th, 2016, Sheets 1 and 2 of 2, with scale noted on the plans.

Four-Sided Culvert vs. Open-Bottom Culvert.

When properly installed, a four-sided culvert is functionally the same as an open bottom culvert. It can be installed more expediently and at lesser cost. Where a streambed exists, it is preferable

to place an open-bottom culvert over the bed without disturbance. Such an installation, however, requires that footings be embedded beneath the "legs" of the culvert to a depth of at least 24". In this case, there is no existing streambed. In this project we have a buried and deteriorating 24" x 56' long corrugated metal culvert. We will have to create new streambed through excavation and replication both upstream and downstream from the existing culvert. We will also create new streambed within the culvert by building up gravel and stream stones of appropriate size. Cross vanes in the channel of the culvert will be added to hold streambed material in place. The streambed within the four-sided culvert will be every bit as natural and effective as an open box, without the expense and delay of placing concrete footings which would otherwise involve additional excavation, installing forms, pouring concrete, allowing a cure period and removal of the forms, all lengthening the period of delay and closure of a main public road. No concrete will be poured and the risk of adverse concrete truck activity (spillage, discharged oil, grease etc.) avoided.

Embedding of Culvert.

DEP has commented that the four-sided culvert "is not embedded 2-ft below grade". This observation is incorrect and inconsistent with the Plan drawings. As depicted in the Plan drawings, the culvert will be laid in an excavated sub-bed (below grade). The creation of the now non-existent stream bed will require the placement of gravel and stream rocks within the culvert to a depth of at least 18 inches that will match the grade of the existing streambed. Given that the thickness of the concrete culvert is at least 12 inches, the *buildup to grade* from the underside of the culvert will be, *at a minimum,* 30 inches, *with a 12" compacted subbase beneath the underside of the culvert.* Accordingly, the Plan design more than satisfies an embedding of at least 24".

Bankfull Width, Openness.

Based on three separate field measurements taken by different parties within the last 12 months, a bankfull width calculation of 8 feet (whether measured upstream or downstream) is a *very conservative* figure for the Project site. Our field measurements show an upstream bankfull of 5.5 feet @ 10 feet; 6.0 feet @ 20 feet; 6.0 feet; 6.0 feet @ 30 feet and 9.5 feet @ 40 feet. This compares favorably with an Ipswich River Watershed Association (IRWA) field team measurement of a mean of 7.8 feet for five points of upstream measurement. As DEP acknowledges in its comments, bankfull width is to be measured under existing conditions "without the influence of the culvert", so the width of the scour pool immediately downstream of the culvert is irrelevant and cannot be used to inflate bankfull width. To that end, our downstream measurement of bankfull below the lower lip of the scour pool shows bankfull of 8.0 feet @ 10 feet and 8.0 feet at 20 feet. This compares favorably with the IRWA measurement of a downstream mean of 7.6 feet for three points of measurement below the scour pool. As shown in our plans, the scour pool will be filled and streambed aligned with downstream bankfull dimensions.

Under the Stream Crossing Standards, please note that the culvert's internal dimensions after 18" of streambed is installed are 12 feet width x 4-1/2 feet height. Applying the Stream Crossing Standards, the width of the culvert must be at least 1.2x bankfull width to avoid channel constriction. In this case, the width of 12 feet accommodates this bankfull standard for a *bankfull*

width of up to 10 feet (10 feet x 1.2 = 12 feet). Even the lost extreme of bankfull measurements at this site will not yield a 10 foot width. With respect to the Standard on openness, the minimum General Standard is 0.82 feet calculated as (height x width)/length. In this case the formula yields as follows: 4.5 feet height x 12 feet width/56 feet length = 0.96. Given these calculations, the crossing width and openness requirements are fully satisfied.

Stream Profile.

The stream profile and section provided on the original plans have been enhanced to reflect the requested information, and are attached to this response.

By-Pass Channel/Flow Control.

Positioning of a by-pass channel, if needed, is now depicted in the Plan drawings. See attached. As shown, a 12" corrugated plastic pipe will be installed along the outer edge of the excavation as a temporary stream bypass. The inlet side of this temporary pipe will be located just upstream of the sandbag berm (see detail). The pipe will outlet into the existing plunge pool that will later be filled. Sumps will still be installed just above the sandbag berm and in the box culvert trench (as needed) when immediate de-watering is required. De-watering or sediment bags shall continue to be used when where upland areas cannot be used for discharging pumped water. The revised Plan also includes the following note: "Contractor is responsible for submitting a dewatering and stream flow control plan for approval by the Engineer and the local Conservation Commission prior if conditions do not allow for the above plan at the time of construction."

BVW Alteration.

After re-calculating the BVW, LUW and Bank length impacted, the affected area of BVW is now limited to 77 square feet. Almost all of the BVW impacts occur on the upstream side of the culvert, and part of the impacted BVW projects in a linear manner into the adjacent uplands. As depicted in the revised drawing and footnotes, this area will be replicated as part of this project in a manner that complies with 310 CMR 10.55. The site does not present many areas suitable for replicating the 77 square feet of filled-in wetlands. On the easterly side of Middleton Road there is an area between WF A11 and WF A13 and across the stream from these flags. In order to access these areas we would have to travel a distance of 400 feet from Middleton Road through Buffer Zone. Middleton Road has 2:1 fill slopes some 300 feet north and south of the existing crossing. The work would require an excavator and truck to haul away the unsuitable materials from the replication area. The stream has an elevation gradient between these flags which would make it difficult to construct a replication area and have it contiguous with the existing BVW. Traversing the buffer zone would cause significant removal of vegetation in the Buffer Zone and because of the high ground water will cause severe ruts damage to the Buffer Zone especially from the trucks hauling materials. Keeping in mind that we are trying to construct this culvert without intrusion of the equipment into the natural stream bed we suggest creating a finger like area of replication along the toe of slope on the northeasterly side of the crossing in the area of WF B5 and WF B6, as shown in the revised drawings. Excavating equipment can reach down from above on the shoulder to excavate the replication area. The new area will be sustained by groundwater, occasional stream flooding and runoff presently coming off the highway side slopes.

Finally, please note that an additional 285 square feet of LUW and 132 linear feet of Bank will be constructed as part of this project. Please see the revised drawings and notes for further details.

Tailwater Armoring Removal.

DEP notes "tailwater armoring at the outlet" that needs to be removed as this is considered an "additional bank". As reflected in the revised plan, we intend to regrade the culvert outlet to meet the grades of the stream channel in the new culvert. We are also planning to remove the accumulated debris located immediately downstream of the scour pool and use the good material to backfill the pool, creating a natural, continuous streambed.

Concrete Wing Walls.

Generally a wingwall is associated with a headwall to a culvert and has a footing and intended to hold back fill slopes. We are using that term to describe the sidewall to the precast entrance unit prior to the box culvert entrance and at the exit. The entrance and exit structures are monolithic precast structures with a bottom and "sidewalls". The plans have been highlighted to reflect that nomenclature.

Proposed Sideslope Grading.

Elevations with respect to sideslope grading are now depicted in the Plan drawings. See attached. In addition, a detail has been added to the Plan to show slope erosion control in the form of erosion control blankets.

Category 2 ACOE General Permit.

We have conferred with Kevin Kotelly of the U.S. Army Corps of Engineers and reviewed the Corp's notification and permitting requirements. We have concluded that, based on the specifications of this project and conformity with the MA Stream Crossing Standards, a Self-Verification Notification Form is required and will be timely filed along with a revised set of plans to the Corps. Accordingly, the project does not require a Category 2 ACOE General Permit.

Should you have any questions or require any additional information, please feel free to contact me directly.

Sincerely,

John C. Dold, PE
Public Works Superintendent
Town of Boxford, MA

cc: Robert Prokop
Wetlands Consulting Services

Ross Povenmire
Boxford Conservation Commission