



VERMONT

AGENCY OF TRANSPORTATION

FY 2016 Municipal Highway Grant Application

APPLYING FOR: Structures Class 2 Roadway Emergency

MUNICIPALITY: East Montpelier ADDRESS: 40 Kelton Road, PO Box 157 East Montpelier, VT 05651

MUNICIPAL CONTACT (name): C. Bruce Johnson

Phone: (802) 223-3313

E-Mail: eastmontadmin@comcast.net

ACCOUNTING SYSTEM: Automated Manual Combination

DUNS #: 10 887 3704

Grantee FY End Month (mm format): 06

DISTRICT CONTACT (name): Tom Anderson -- D6 Project Manager

Phone: (802) 828-2687

E-Mail: tom.anderson@state.vt.us

SCOPE OF WORK TO BE PERFORMED BY GRANTEE

Location of Work. The work described below involves the following town highway structure:

TH# 47, (Name) Murray Road which is a class 3 town highway.

Bridge # _____, which crosses _____

Culvert # 1, p. 4 for which the original size was 48" and the replacement size is 11'1" x 7'

Causeway: _____

Retaining Wall: _____

Estimated Completion Date: 11/01/2016

Work to Be Done:

Replace existing undersized 48" concrete pipe culvert with a 11'1" x 7' x 45' aluminum plate pipe arch with headwalls & wingwalls. New unit will exceed the minimum VTtrans hydraulic study recommendations.

Detailed Cost Estimate (below or attached):

Per proposal dated March 15, 2015 by Newton Technical Services

Estimated cost of project: \$ 88,804.85

Proposal included

Estimated Project Amount: \$ 88,804.85

Municipality has adopted Codes & Standards that meet or exceed the State approved template?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Municipality has a current Network Inventory? (less than 3 years old)	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO
Municipality <u>MUST</u> complete the following environmental resource checklist:		
EXISTING STRUCTURES: (check all that apply)		
<input type="checkbox"/> Steel Tube Culvert	<input type="checkbox"/> Concrete Box Culvert	
<input type="checkbox"/> Stone Culvert	<input type="checkbox"/> Concrete Bridge	
<input type="checkbox"/> Ditch	<input type="checkbox"/> Rolled Beam/Plate Girder Bridge	
<input type="checkbox"/> Metal Truss Bridge	<input type="checkbox"/> Wooden Covered Bridge	
<input type="checkbox"/> There are foundation remains, mill ruins, stone walls or other.	<input checked="" type="checkbox"/> Concrete Pipe Culvert	
<input type="checkbox"/> Stone Abutments or Piers	<input type="checkbox"/> Buildings (over 50 yrs old) within 300 feet of work	
PROJECT DESCRIPTION: (check all that apply)		
<input type="checkbox"/> The Project involves engineering/ planning only.	<input type="checkbox"/> The project consists of repaving existing paved surfaces only.	
<input type="checkbox"/> The project consists of reestablishing existing ditches only.	<input type="checkbox"/> All work will be done from the existing road or shoulder.	
<input type="checkbox"/> The structure is being replaced on existing location/alignment.	<input checked="" type="checkbox"/> There will be excavation within 300 feet of a river or stream.	
<input type="checkbox"/> There will be excavation within a flood plain.	<input type="checkbox"/> Road reclaiming, reconstruction, or widening	
<input type="checkbox"/> Tree cutting / clearing.	<input type="checkbox"/> Temporary off-road access is required.	
<input checked="" type="checkbox"/> New ditches will be established.	<input type="checkbox"/> The roadway will be realigned.	
The municipality has included photos of the Project. Must show infrastructure and surrounding features, as much as possible. <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		
The municipality has included a detailed Scope of Work. <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		

Below this line to be filled in by VTrans staff:

Recommended Award Amount: _____
 District Staff Approval: (name) _____ Date: _____
 Archaeology Approval: J. Russell B. Gauthier Date: _____
 Historic Preservation Approval: J. Ehrlich K. O'Shea Date: _____
 Archology/Historic Preservation Conditions/Comments:

Note:
 Projects may involve impacts to protected historic or archaeological resources. For more information, responsible parties are encouraged to contact the individuals listed below :

Jen Russell, VTrans Archaeology Officer,
 802-828-3981, jeannine.russell@state.vt.us
 OR
 Brennan Gauthier, VTrans Assistant Archaeologist,
 802-828-3965, brennan.gauthier@state.vt.us

Judith Ehrlich, VTrans Historic Preservation Officer,
 802-828-1708, judith.ehrlich@state.vt.us
 OR
 Kaitlin O'Shea, VTrans Historic Preservation Specialist,
 802-828-3962, kaitlin.OShea@state.vt.us

East Montpelier, TH 47 (Murray Road) over Brook						
Remove 48"RCP and Install New 11'-1" x 7'-0" x 40'-6" Plate Pipe Arch						
Item No.	Item Name	Quantity	Unit	Unit Price	Total	
203.15	Common Excavation	65	CY	\$ 8.44	\$ 548.60	
204.25	Structure Excavation	350	CY	\$ 21.21	\$ 7,423.50	
204.30	Granular Backfill for Structures	250	CY	\$ 35.75	\$ 8,937.50	
301.15	Subbase of Gravel	60	CY	\$ 27.55	\$ 1,653.00	
401.10	Aggregate Surface Course	30	CY	\$ 37.21	\$ 1,116.30	
529.15	Removal of Structure	1	EACH	\$ 500.00	\$ 500.00	
613.11	Stone Fill, Type II	40	CY	\$ 36.25	\$ 1,450.00	
621.20	Steel Beam Guard Rail, Galvanized	150	LF	\$ 15.58	\$ 2,337.00	
621.60	Anchor for Steel Beam Guard Rail	4	EACH	\$ 678.18	\$ 2,712.72	
621.80	Removal and Disposal of Guard Rail	150	LF	\$ 1.36	\$ 204.00	
635.11	Mobilization/Demobilization (7%)	1	LUMP SUM	\$ 5,547.98	\$ 5,547.98	
641.10	Traffic Control	1	LUMP SUM	\$ 3,000.00	\$ 3,000.00	
649.31	Geotextile Under Stone Fill	75	SY	\$ 2.19	\$ 164.25	
	New 11'-1" x 7'-0" x 40'-6" Aluminum Plate Pipe Arch	1	LUMP SUM	\$ 30,150.00	\$ 30,150.00	
	Assembly of New Plate Pipe Arch	1	LUMP SUM	\$ 10,000.00	\$ 10,000.00	
	Streambed Stone Fill, Type E2	33	CY	\$ 70.00	\$ 2,310.00	
	Temporary Diversion of Stream	1	LUMP SUM	\$ 3,500.00	\$ 3,500.00	
	Erosion Prevention & Sediment Control	1	LUMP SUM	\$ 2,000.00	\$ 2,000.00	
	Turf Establishment	1	LUMP SUM	\$ 1,250.00	\$ 1,250.00	
	Project Design, Permitting, Right-of-Way, Administration	1	LUMP SUM	\$ 4,000.00	\$ 4,000.00	
				Total	\$ 88,804.85	

Town of East Montpelier, TH No. 47, Murray Road over Brook

Proposed Scope of Work re: Aluminum Plate Pipe Arch

1. Dig-Safe Project Area including where Detour Signs will be Installed
2. Erect Detour Signs, Notify Appropriate Entities including City of Montpelier and Close Road to Thru Traffic
3. Mobilize and Erect Construction Signs/Barricades in Area of Project
4. Remove Existing Steel Beam Guard Rail
5. Implement Erosion Prevention and Sediment Control Measures
6. Excavate, Install Temporary Stream Diversion and Remove Existing 48" RCP
7. Assemble New 11'-1" x 7'-0" x 45' Aluminum Plate Pipe Arch, Headwalls and Wingwalls (Leaving 2-3 Roof Panels out of Pipe Arch)
8. Excavate for New Aluminum Plate Pipe Arch, Headwalls and Wingwalls
9. Install New Pipe Arch in Place
10. Place Streambed Stone Fill, Type E2 in Invert and Install Remaining Roof Panels
11. Install Headwall and Wingwall Panels
12. Backfill and Compact Area Around Pipe Arch, Headwalls and Wingwalls; Install Anchors for Headwalls and Wingwalls as Backfill Operations Progress
13. Place Geotextile under Stone Fill; Place Stone Fill, Type II around and in front of New Headwalls and Wingwalls and on Slope to 1' above Top of Pipe
14. Remove Temporary Stream Diversion, Turn Water Back Into Original Channel and thru New Structure
15. Backfill and Compact Excavated Portion of Murray Road up to Subgrade
16. Place, Grade and Compact Subbase of Gravel and Aggregate Surface Course
17. Install Steel Beam Guard Rail and Anchors for Steel Beam Guard Rail
18. Grade Thru Construction Area and Begin Cleanup Operations
19. Remove Detour Signs and Open Road to Traffic

Town of East Montpelier, TH No. 47, Murray Road over Brook

Proposed Scope of Work re: Aluminum Plate Pipe Arch (cont'd.)

20. Provide Turf Establishment on all Affected Areas

21. Remove Construction Signs and Demobilize

HYDRAULICS UNIT

TO: Tom Anderson, District 6 Project Manager
Paul Keegan, District 6 Technician

FROM: Justin Hadley, Hydraulics Project Engineer

DATE: September 26, 2013

SUBJECT: East Montpelier, TH 47 Murray Rd, 100' north of the Town Line
GPS coordinates: N 44.26468° W 72.54461°

We have completed our hydraulic study for the above referenced site, and offer the following information for your use:

Hydrology

This site has a hilly drainage basin that is about half forested and half fields. The total contributing drainage area is about 1.1 sq. mi. There is an overall length of 12,250 feet from the divide to the site, with a 340 -foot drop in elevation, giving an average overall channel slope of a little less than 3 %. The stream slope at the site was estimated to be about 2%. Using several hydrologic methods, we selected the following design flow rates:

<u>Recurrence Interval in Years</u>	<u>Flow Rate in Cubic Feet per Second (CFS)</u>
Q2.33	55
Q10	145
Q25	190 - Town Highway Design Flow
Q50	225
Q100	265 - Check flow

Existing Conditions

The existing structure is a 48" reinforced concrete pipe, providing a waterway opening of 12.5 sq. ft. The pipe sections are starting to come apart, and there is no headwall at the inlet. There is a stone block headwall at the outlet. The roadway is very narrow and the banks are steep to the inlet and outlet. I am guessing that the inlet has been shortened due to flood damage.

Our calculations show the existing structure is not adequate hydraulically. Headwater to depth ratios exceed the allowable values and water overtops the roadway below the design Q25. The existing structure constricts the channel width, resulting in scour at the outlet and increased potential for ice and debris blockage.

Recommendations

In sizing a new structure we attempt to select structures that meet the hydraulic standards, fit the natural channel width, the roadway grade and other site conditions. We measured a channel width of approximately 7' to 11' during our site visit. The Agency of Natural Resources 'VT Regional Hydraulic Geometry Curves' give a bank full width of 14' for this size drainage area. Those curves are only based on drainage area and do not consider other factors, such as storage, stream slope or other site specific conditions. They may not be valid for this drainage area. Based on our calculations and the information available, we recommend any of the following structures as a replacement at this site:

1. A concrete box with a 10' wide by 6' high inside opening, with 12" high bed retention sills (baffles) in the bottom. The box invert should be buried 24", so the top of the sills will be buried 12" and not be visible. That will result in a 10' wide by 4' high waterway opening above streambed, providing 40-sq. ft.

of waterway area. Sills should be spaced no more than 8'-0" apart throughout the structure with one sill placed at the inlet and one at the outlet. Sills should be cast in a V shape with a 10:1 lateral slope, to create a low flow channel in the center if the bed material in the structure is washed out. The spaces between sills should be filled with stone graded to match the natural stream bed material. This structure will result in a headwater depth at Q25 = 3.8' and at Q100 = 4.8', with no roadway overtopping up to Q100.

2. A 128" wide by 83" high corrugated metal pipe arch, with sills and buried 24" similar to the box above. This will provide approximately 43 -sq. ft. of waterway area and result in a headwater depth at Q25 = 4.0' and at Q100 = 5.1'.
3. Any similar structure with a minimum clear span of 10' and at least 43 -sq. ft. of waterway area, that fits the site conditions, could be considered. Any structure should have bed retention sills and a buried invert as described above.

General comments

If a new box is installed, we recommend it have full headwalls at the inlet and outlet. The headwalls should extend at least four feet below the channel bottom, or to ledge, to act as cutoff walls and prevent undermining.

If the pipe arch option is installed, concrete headwalls should be constructed at the inlet and outlet. The headwalls may be either half height or full height. The headwalls should extend at least four feet below the channel bottom or to ledge, to prevent undermining of the structure. We recommend a minimum cover of 3' over all pipe structures. Obtaining the minimum cover of 3' should be no problem at this site. Pipe manufactures can provide specific recommendations for minimum and maximum fill heights and required pipe thickness.

It is always desirable for a new structure of this size to have flared wingwalls at the inlet and outlet, to smoothly transition flow through the structure, and to protect the structure and roadway approaches from erosion. The wingwalls should match into the channel banks. Any new structure should be properly aligned with the channel, and constructed on a grade that matches the channel. A new structure should span the natural channel width.

Stone Fill, Type II should be used to protect any disturbed channel banks or roadway slopes at the structure's inlet and outlet, up to a height of at least one-foot above the top of the opening. The stone fill should not constrict the channel or structure opening.

The Agency of Natural Resources (ANR), Corps of Engineers, or other permitting agency may have additional concerns regarding replacement of this structure, or any channel work. The River Management Engineer should be contacted with respect to those concerns, before a replacement structure is ordered. If ANR requires the invert of the structure to be buried deeper, the size of the structure will have to be larger to provide the required waterway area.

Please keep in mind that while a site visit was made, these recommendations were made without the benefit of a survey and are based on limited information. The final decision regarding the replacement of this structure should take into consideration matching the natural channel conditions, the roadway grade, environmental concerns, safety, and other requirements of the site.

Please contact us if you have any questions or if we may be of further assistance.

JFH

cc: Patrick Ross, A.N.R. River Management Engineer
Hydraulics Project File via NJW
Hydraulics Chrono File